



University of Connecticut  
*College of Agriculture and Natural Resources*

Office of Dean and Director

Cooperative Extension System

Agricultural Experiment Station

Ratcliffe Hicks School  
of Agriculture

# PLAN OF WORK FY 2000-2004

## CONNECTICUT COOPERATIVE EXTENSION SYSTEM STORRS AGRICULTURAL EXPERIMENT STATION

This certifies that the University of Connecticut has submitted their 2000-2004 Plan of Work to USDA as of July 15, 1999.

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## 1. GENERAL TEXT

GOAL 1: An agricultural system that is highly competitive in the global economy. Through research and education, empower the agricultural system with knowledge that will improve competitiveness in domestic production, processing and marketing. (1862 Research, 1862 Extension)

COLLEGE PROGRAM TEAM PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

### AGRICULTURAL BIOTECHNOLOGY TEAM

#### Agricultural Biotechnology

Research Focus: Application of molecular/genetic techniques is projected to have a greater immediate impact on plant agriculture than either animal agriculture, clinical medicine or pharmaceutical development. The last several years has seen an explosion in the amount of acreage in the United States which is planted with transgenic crops.

This team does not at present have an integrated plan of work. The College administrator is currently acting as leader of this team. There are many new faculty hires, and also other faculty with research programs targeting various aspects of agricultural biotechnology. Measures of success are expected to be: a) new contracts and grants from agricultural biotechnology companies for continued support of applied projects i.e. product development, b) an increase in NSF and USDA-NRI competitive grant funds in the College in the area of plant and (agricultural) animal biotechnology research, c) the generation of commercially useful transgenic plants and animals, and new generation vaccines.

Research in the area of agricultural biotechnology will result in the generation of articles reporting the results of this research in peer-reviewed journals.

Collaborating companies and industrial consortiums: 1) Alexion Corp.; 2) PPL Laboratories; 3) DeKalb Genetics; 4) Imperial Nurseries; 5) Horticulture Research Institute. Federal grant agencies which are expected to provide continuing support for agricultural biotechnology research: 1) National Science Foundation; 2) USDA-NRI.

This work primarily focuses on development of techniques for the recovery and culture of oocytes from dairy cows for transgene expression, development of transgenic floriculture and nursery crops with improved traits, and development of animal vaccines (including those expressed in transgenic plants) which will provide prophylactic protection to farm animals against pathogens.

The strategies that will be employed will be to use standard transformation protocols, and either tissue culture regeneration of plants, or, in the case of animals, oocyte implantation into host females.

The target audience will be the agricultural and pharmaceutical industries, who will benefit from the availability of new plant cultivars with improved traits, transgenic animals which will generate clinically useful human proteins, and next generation vaccines.

The commercial acceptance of transgenic animals and plants will be the best monitor of the utility of the research program. If the new animals, plants, and pharmaceutical products are indeed superior to those already marketed, they should make an impact in the target industries.

#### Rhododendron Transformation

Academic Program Focus: Rhododendron is a popular flowering evergreen shrub in the Northeast. Sales of rhododendron by Connecticut nurseries total \$80 million annually. A major production problem is root rot caused by the phytophthora fungus. Chemical and cultural controls are expensive and often unreliable. Resistant plants need to be developed to make Connecticut growers more profitable.

Measures of success will be the development of patented disease resistant rhododendrons, royalty funds, grant dollars, transformation protocols.

This work will result in several peer reviewed articles.

Partners and resources will be: Connecticut Innovations, Inc. - \$141,000; Sanford Scientific, Inc. - supply and license gene constructs, licensing of biolistics method; Scotts, Inc. - grant dollars and marketing of new plant products; Imperial Nurseries, Inc. - in-kind grant match.

Strategies will include: 1) Determine methodology for regeneration and biolistic transformation of rhododendron. 2) Test and evaluate several antifungal constructs used in transformed rhododendron for efficacy against phytophthora rootrot. 3) Deliver transgenic material to growers. Secure patents for process and product.

Target audiences are commercial rhododendron growers and ornamental plant biotechnology companies.

Success will be based on development transformation methods. Evaluation methods and delivery of product to wholesale producers.

### Horticulture and Plant Biotechnology

Research Focus: The research focus is on new plant development and plant improvement through traditional breeding and biotechnological techniques. This area of research is one in which the University of Connecticut has traditionally been very strong and productive. UConn has been able to introduce new and improved plants and have demonstrated world-class research and scholarship as a result. The research conducted has focused in a unique area that has attained national and international distinction. UConn has also been able to improve the education of students, particularly the graduate students, from this research focus.

One measure of success has been the number of refereed, non-refereed and textbook publications that have been produced. In addition, over the past 15 years the program has attracted over \$600,000 in research grants from various private and government sources. Graduates have also been a measure of success for programs. Many of the graduate students have productive and leadership roles in private, state and national businesses or have received their Ph.D.s and have gone on to work at universities or industry.

This work will result in refereed articles and other peer reviewed articles, Extension publications, book chapters, and awards have been my primary outcome product. These include, but are not limited to, a recent Fulbright Fellowship, the CANRAA Excellence in Teaching Award, the University Outstanding Adviser Award and several other awards.

Partners will be: 1) Professor Flavia Schiapacasse, University of Talca, Talca, Chile – she plays a vital role in research of Chilean bulb species; 2) Dr. George Elliott, UConn - he continues to work with Alstroemeria research projects; 3) Mr. Kent Kratz, Just-for-Starters, Eastford, CT – he works collaboratively with micropropagation research; 4) Mr. Marc Laviana, Sunny Border Nursery, Inc., Kensington, CT - he works collaboratively with micropropagation research; 5) Dr. Yi Li, UConn – he collaborates on research projects pertaining to new plant development and improvement.

The research program is involved with new plant development and plant improvement through the use of traditional breeding and biotechnological procedures. In vitro procedures such as embryo culture, somaclonal variation, meristem culture for the production of pathogen-free plants, fertility restoration, somatic embryogenesis and micropropagation are all used to accomplish goals. Recent research programs have also been focusing on economic development initiatives with plant tissue culture in cooperation with state government agencies.

Audiences vary from undergraduate and graduate students, to consumer horticulturists, academics and horticultural professionals. The research strategy is to be at the forefront of new plant development, particularly as it applies to Connecticut, and to conduct world-class research of national and international distinction.

Target audiences are undergraduate and graduate students, Connecticut horticultural and biotechnological enterprises, and ultimately, consumers.

Evaluations are by the success of students.

### Viral Pathogenesis and Immunology/Vaccine Research and Development

Research Focus: The areas indicated below represent personal requirements and by all means do not exclude other areas. Research and Development - Biotechnological support in some aspects of vaccine and/or diagnostic test development. This may include synthesis and/or processing. Access to such type of services will have a positive impact in these areas. Transgenic Technology - It is clear that this type of technology will generate interdisciplinary work. The area of vaccinology and diagnostics can benefit from such interactions. For example, the applicability of transgenic plants as animal vaccines can be rapidly determined in joint projects involving vaccine and plant transgenesis researchers.

Measures of success will be vaccinology and diagnostics research integrate with the Agricultural Biotechnology Center. Such an interaction may strengthen even further the ability to attract research funds through joint projects.

This work will result in production which should include patents on vaccines and diagnostics, Extension and peer-reviewed publications, and presentations in national and international scientific events.

Strategies include standard methods and techniques which are tailored to specific research needs.

Target audiences are students, scientific community and public at large.

The results are evaluated as they are generated by each laboratory, papers are prepared jointly and submitted for publication and these in turn are peer-reviewed prior to acceptance.

## Plant Biotechnology

Academic Program Focus: Plant biotechnology will change the agricultural industry dramatically within the next 10-20 years. Plant gene transfer techniques will be widely and effectively used for crop improvement in agriculture, horticulture and forestry, and for production of cost-effective pharmaceuticals, industrial materials and enzymes. College: develop and maintain strong research and Extension programs in biotechnology; develop a biotech minor and then a major in the College; develop and maintain strong research collaborations with agricultural, pharmaceutical and diagnostic industries; encourage more collaborations in biotech research and product development among faculty members within the College; publish biotech newsletters regularly; organize biotech workshops to promote collaborations between the College and private companies located in Connecticut and in the New England area; develop a web site for the biotech program; sponsor and organize biotech conferences.

Measures of success will be: well-funded research and product development programs in biotech; undergraduate program of biotech; more graduate students in the field of biotech.

This work will result nationally recognized research programs in biotech and strong undergraduate and graduate programs in biotech.

Resources include: current grants from USDA, USDA and DOE and private companies; and proposals will be submitted to federal and state funding agencies, and private industries in the next 5 years.

Key components of the program will be to use gene transfer techniques to improve quality and performance of crop plants economically important to agriculture, horticulture and forestry. Some of the projects are production of seedless fruits, improvement of wood productivity, delay of senescence/Extension of shelf life; compact plants with more branches and flowers, improvement of seed productivity, production of antibodies and vaccines in transgenic plants. Strategies will also be developed for production of pharmaceuticals and industrial materials and enzymes.

Strategies include gene transfer techniques which will be used to develop strategies for improvement of agriculture, horticulture and forestry and also for production of pharmaceuticals and industrial enzymes.

Target audiences for the program: education/teaching - undergraduate student, students and postdoctoral scientists and other types of research scientists; research/product development - industrial partners, domestic and international collaborators.

Evaluations will be reviewed by: the published peer reviewed articles; invited scientific presentations; patents; grants; contracts; scientists trained.

## Sustainable Development

Cooperative Extension System Focus: The Agricultural Biotechnology Team seems like a very good way to bring many of the diverse interests of science and culture represented in the College together to showcase collaborative relationships and projects. Every one of the College's academic departments has some interest or potential contribution to the idea of sustainable development, whereas many of the others involve relatively specific interests which might span only a few departments' potential activities. As it becomes more and more imperative to use resources - from land and water to soil and vegetation - more wisely and efficiently, the College should have a team that addresses sustainability holistically, in addition to the teams that look at specific aspects. The Millennium Celebration for the College has chosen "Learning for a Sustainable Future" as its organizing principle and it seems like the perfect time to initiate a program team to carry the activities planned for the celebration forward.

The main measure of impact from such a program would be change in development and management patterns of communities and rural and wild areas. This change could be recognized through an increase in sustainable agricultural and landscape practices, development of alternative transportation corridors (such as bikeways, mass transportation and roadside revegetation with native species), watershed planning and protection, bio-regional planning initiatives, and many other types of efforts that could be developed and demonstrated through the work of the team.

This work will result in demonstration projects, workshops, Extension publications and conference presentations.

Resources and partners include: 1) granting organizations such as the Northeast Regional Center for Rural Development, the Connecticut Department of Environmental Protection, etc.; 2) state or federal agencies - President Clinton has recently established the President's Council on Sustainable Development, which has recommended a significant role for land grant institutions in "creating a learning infrastructure for sustainable communities," 3) other land-grant institutions; 4) communities; 5) private businesses, professionals involved in "green" industries.

This program could foster collaborative experimentation, study and outreach across fields in identifying critical natural and cultural resources at risk, reducing resource waste and degradation, increasing knowledge and application of regenerative (vs. consumptive) technologies, and increasing public awareness and value for resources of unique value to the region.

Educational methods include: demonstration projects, community workshops, multidisciplinary short courses, written publications, symposia among land grant university Colleges of agriculture.

Research strategies include: develop consensus among team on definition and goals for sustainable development within the context of the College's areas of academic pursuit; target areas of multidisciplinary research (such as watershed planning, rural sustainability or urban agriculture) for which to develop experimentation and demonstration projects in stakeholder communities; incorporate team members' individual research areas into larger comprehensive projects; incorporate community involvement in development of demonstration projects; analyze and monitor demonstration projects in Extension publications, workshops and short courses to disseminate research.

Target audiences are communities, business and industry, farmers and homeowners.

Evaluation techniques will be surveying stakeholder communities for changes in attitudes, development patterns and monitoring demonstration projects over time for short term and long term sustainability – both quantitative and qualitative

### Environmental Health

Research Focus: The development of effective animal and human vaccines is a high priority and the basis of a multi-billion dollar industry. Efforts will continue in this area, working on vaccines to protect animals against *Mycoplasma gallisepticum*, foot and mouth disease virus and aflatoxins. In addition, the development of methods that increase the efficacy of DNA vaccines administered at mucosal surfaces will continue.

Success will be measured by conducting challenge studies that indicate that the intervention (vaccination) results in a statistically significant decrease in incidence or severity of the disease. Other intermediate end-points may also be useful in this regard, such as viral neutralization assays (in vitro) or antibody titers. The advancement of knowledge, reflected by manuscripts accepted in peer-reviewed journals, and the receipt of grant support for these studies are also measures of success and scientific impact.

The desired scientific output from these research efforts is the publication of manuscripts in highly esteemed scientific journals, invitations to speak at conferences and symposia, the receipt of extramural grant support, and the training and graduation of graduate students.

Internal partners are: Drs. Geary, Garmendia, Marcus, Sekellick, Darre, Van Kruiningen and Lynes. Most of this effort center's around the development of a mucosal vaccine for *Mycoplasma gallisepticum*. External partners are: Drs. Edith Mathiowitz (Brown University); Yong Jong working on encapsulated DNA vaccines and particle uptake across the Peyer's patch; Dr. Fred Brown at the USDA ARS laboratories at Plum Island developing approaches to induce upper respiratory tract immunity to foot and mouth disease virus using retro-inverso-peptides; Dr. Marian Neutra (Harvard University) on mucosal uptake and expression of DNA vaccines.

Key components of the project include: Active - 1) Development of a mucosal *Mycoplasma gallisepticum* vaccine for Poultry. USDA Hatch Act. 10/1/98 – 9/30/01. \$26,946. 2) Vaccine Trials for Avian Influenza Virus, Protein Sciences Inc. 6/1/97 – 5/31/99 \$23,143. 3) FACSCalibur Fluorescence Activated Cell Sorting Core Facility – UConn major equipment competition, 1/1/98 – 12/31/99 \$72,665. 4) Development of *Mycoplasma gallisepticum* strain as a live attenuatee vaccine and vector for the protection of chickens and turkeys from respiratory disease, 1/1/99 – 12/31/00. \$300,000 (Co-P.I. with Drs. Geary, Marcus and Sekellick). Pending - Bioadhesive Microspheres for oral DNA vaccination. NIH, Subcontract with Spherics, Inc. \$30,000.

The research strategy revolves around the development of mucosal vaccines that can induce local, cellular and humoral immunity to a variety of infectious organisms and toxins. This approach requires the use of biochemical approaches (i.e. coupling of immunogens to mucosal adjuvants) and molecular biology (developing mammalian expression plasmids for use as DNA vaccines).

The target audience is the readers of scientific journals relating to vaccine development and specific diseases.

Learning will be assessed by the publication of peer-reviewed scientific articles and citations to these articles in other people's papers.

### Reproductive Physiology and Biotechnology

Research Focus: Transgenic Animal Facility provides an effective platform for effective multi-disciplinary research both within and among Colleges. With the establishment of an adequate facility, many of faculty, staff and

students would benefit from the research, training and educational experience. This includes assisting the recruitment of top-notch faculty members and attracting extramural supports to the State.

The measure of success for the key component (transgenic technology) in the agricultural biotechnology team is reflected by the impact of the facility and expertise on assisting faculty members attracting extramural supports. Because this represents the facility services to other faculty members, investment on space and personnel by the College and the university is essential.

The outcome products of research efforts are peer-reviewed scientific publications, invitations for guest/keynote lectures and conference/symposium chairs, awards and breakthrough news etc.

Partners include: Dr. Thomas Chen on developing improved transgenic technology and Dr. Martin Fox on developing advanced ultrasound technology for biological applications. UConn is also participating a region project on improving embryo development and advanced biotechnologies such as cloning and transgenesis. This project involves UC Davis, Illinois, Wisconsin, Colorado, Louisiana, Utah and Iowa etc. Partners and resources also include collaboration and funding from companies both within the State (e.g. Alexion Pharmaceutical, CABA Inc., and Fairvue Farms) and other states (e.g. Genzyme Transgenics, MA; Genex Inc., NY; PPL Therapeutics, UK).

Key components of the program include: Active - 1) USDA - Maximize Viable Embryo Production from Pre- and Peri-Puberal Calves, 9/1/96-8/31/99, \$179,877. 2) Genzyme Corporation - Developing Effective Protocols for Collecting Competent Oocytes from Heifers, 5/1/97-9/30/99, \$346,080. 3) Genzyme Corporation - Production of Transgenic Dutch-Belted Rabbits, 7/1/96-12/31/99, \$313,500. 4) CII - Novel Approach to Produce Transgenic Pigs as Animal Model Xenogenic Transplant, 7/15/98-7/15/00. 5) CII - Cloning Pigs - An Ideal Approach to Generate Organs for Transplantation, 12/31/98-12/31/00. Pending - USDA - Cloning Cows: Effects of Cell Types and Long-term Culture, 7/1/99-6/30/02, \$327,448.

Research strategies include both contemporal molecular and cellular biology techniques as well as classical embryology and reproductive biology techniques. These strategies place UConn Transgenic Animal Facility and group among leaders in the areas of cloning and other genetic manipulations of embryos.

Project efforts are to maintain high research standard and continue to lead in research areas.

The evaluation techniques are based on standard peer-review. These include peer-reviewed publications, grant supports and recognitions (awards, invited scientific presentations and chairmanship).

## AQUACULTURE TEAM

### Aquatic Animal Health

Focus: The University of Connecticut has made a commitment to developing an undergraduate teaching program in aquaculture science, which is embodied in the formulation of a multidisciplinary aquaculture minor, including courses from the Departments of Animal Science (ANSC 253), Natural Resources Management and Engineering (NRME 208 and 235Q), Ecology and Evolutionary Biology (EEB 200 and 294), and Pathobiology (PATH 256).

Measures of success will be an established Aquaculture Minor.

This work will result in expanded Undergraduate and Graduate Programs in Aquaculture, enhanced research efforts, collaborations and funding levels.

The partners will be the College of Agriculture and Natural Resources faculty and University faculty with aquatic animal research efforts.

The purpose of the program is to promote teaching, research and Extension efforts in the area of aquaculture in the State of Connecticut and New England region.

Strategies will include biannual meeting and course development.

Target audiences are state, national and international community.

Evaluation techniques will be Aquaculture minor student enrollment, course attendance.

### Fisheries Management and Conservation

Focus: The Atlantic States Marine Fisheries Commission governs all coastal conservation laws, and through this body, the decisions and integration of state/off-shore federal regulatory controls are established. Fishing communities, natural resource quality and sustainable marine stock production will benefit by application of current statistical data to a cooperative allocation process. Practical applied research on all phases of fisheries dynamics will allow more prudent and expeditious decision by commissioner and advisory groups.

Measures of success will be Fishery Management Plans (FMP's) published by ASMFC boards which will be subject to public hearing modification and eventual law for all coastal states. Various documents will be authored

(i.e. American Eel FMP, Herring FMP, Lobster (amendment, Habitat SAV Policy, etc.) for board and committee appointments on which the Connecticut Governor's appointee (L. Stewart) has input and chairs.

The work will result in the Commission working meetings and minutes (6/year); public hearing and documentation (10/year); advisory groups council (3/year), all comprise the legal process of public record and comment, plus commissioner accountability to constituent groups and their respective states. The process of law adaptation for several species under ASMFC jurisdiction requires state compliance as overseen by the entire ASMFC. This assures equitable position between states; law enforcement codes and practices and modification of research agendas and statistical needs.

Partners will be interested CANR and CLAS faculty; DEP, DABA, State Legislature, Commercial and Recreational fishing sectors; trade journals and media; NMFS, USFWS, EPA, Coast Guard, Secretary of Commerce, Congress (MS).

The guidance of multi-state research and statistical needs, provides the framework necessary for the ASMFC to evolve the various FMP's for over 20 coastal species. In addition, more stringent fisheries conservation laws (i.e. revised Magnuson Act/present unique challenges for definition and national plans to preserve "critical" fisheries habitat and institute restoration measures.

Target audiences are estimated to be: fisherman (1,000); state/federal agency direction (76); scientist/technical staff (150); elected advisory group (150); public attendance (3,000+).

Evaluations will be the effectiveness of ASMFC management can be judged by the increasing number of species designated under their authority (state vs. federal control); and the restoration of greater population size and more spawning success. Maintenance of the fishery, continued funding of the cooperative government commission, and complimentary response of stakeholder fishers engaged in new conservation laws would prove ASMFC functions.

## DAIRY/LIVESTOCK TEAM

### Microchemistry Laboratory

Focus: Provide drug testing and analytical services to the Connecticut Division of Special Revenue, Jai Alai Fronton(s), chemical and pharmaceutical industries, state agencies and University departments, graduate students and faculty.

Measures of success will be to maintain funding for greyhound drug testing programs and acquire additional funding from analytical problems resolution service provided to industry and academia.

This work will result in continued success as leader in greyhound drug testing. Maintaining state of the art instrument capabilities, provide graduate student financial support.

Partners will be the Connecticut Division of Special Revenue and analytical clients. Resources include grants from the Association of Racing Chemists, International.

Key components of the program include discussions with colleagues, determination of industry needs from literature and attendance at professional meetings (duration: ongoing).

Strategies include maintaining knowledge of legislation regarding greyhound drug testing in Connecticut. Foster collaborative relationship with state agencies and industry. Utilize marketing approach to increase financial base of the laboratory.

Target audiences are pharmaceutical companies, regulatory agencies, clinical labs and graduate students.

Evaluation techniques will include an increase in base funding by industry customers and grants, providing graduate student financial support, maintaining level of excellence in drug testing and analytical services.

### Poultry Disease Diagnosis/Avian Pathology and Poultry and Pet Birds Health Surveillance Program

Cooperative Extension System Focus: Health and well being of poultry, game birds and pet birds in Connecticut.

The measures of success will be the control of diseases, 5 million commercial poultry and 30 thousand game birds and several hundred pet birds.

This work will result in control of poultry, game and pet birds diseases in Connecticut.

Partners include Pathobiology CT Veterinary Diagnostic Testing Service: service fees; Department of Agriculture, State of Connecticut, Experiment Station: funds.

Key components include ongoing diagnosis and surveillance of poultry, game and pet bird diseases.

Strategies include poultry and producers, local, regional and national poultry health meetings.

Target audiences are poultry producers, pet bird owners, allied industries.

Evaluation techniques include poultry meeting surveys, control of important poultry diseases such as Newcastle disease, avian influenza, infectious bronchitis virus, psittacosis.

### Equine Teaching

Academic Program Focus: There are approximately seven million horses in the United States at the present time. This number is rapidly growing from a low of approximately 3 million reported in 1959. The 1959 numbers showed a rapid decrease from the 1915 report of approximately 26 million equine. The initial decrease of horse numbers resulted from the rapid mechanization of farms and the development of gas driven tractors etc. The remarkable increase in horse interest and horse numbers is thought to be the result of increasing leisure time and spendable income. Whatever the reason there is an explosion in the interest in horses. Connecticut, with its 50,000 horses, is the nation's most densely populated horse state. There are approximately 1,500 4-H youth horse projects in Connecticut, more than all the other livestock projects combined!

The large and increasing interest in horses provides a great opportunity for the University of Connecticut to attract new students. The equine program at the University of Connecticut has grown steadily over the last 30 years. The number of classes taught and the number of students in Horse Practicums is at an all time high. National recognition has been achieved in polo (six National Championships), Horse Judging (National Championship), Equestrian Team (National Championship riders) and Morgan Horses (many National Championships).

Outcome products desired include producing a well rounded student who will be able to compete successfully in the job market upon graduation.

The intercollegiate program works with other Colleges and universities at the local and national levels. At the Extension level, the program also works at the local and national level.

The Equine Program has been in existence since 1931 and has been continuous. The program includes educational, research and Extension components.

The UConn Horse Barn is one of the main tourist attractions on campus. During the year, bus loads of children and adults visit the barn. It has been estimated that over 2,000 individuals visit barns each month! Other attractions such as Holiday Barn, Spring Horse Sale, FAA Judging Contest, Intercollegiate Equestrian Shows, Intercollegiate Polo Matches, etc. attract many additional visitors to the UConn Horse Facilities.

Target audiences are potential College students, horse enthusiasts and 4-H Members and Leaders, FFA Member and Leaders and the general public.

Evaluations will be reviewed by: 1) team awards; 2) regional and national awards; 3) public support - attendance at events, donation of horses, donation of money and sale of horses.

### Livestock Management - Beef, Sheep, Swine

Cooperative Extension Focus: In Connecticut, as well as the other New England states, there are numerous part-time/hobby farms with small to moderate-sized herds/flocks of beef, sheep and swine. Many of the owners are newcomers to large animal management and need practical advice on nutrition, health, housing, and national production issues such as environmental assurance and food safety. Additionally, beef, sheep and swine projects continue to be an active component of the 4-H programs in New England and the youth, leaders, and parents are eager for educational opportunities centered on large animal management issues.

Measures of success will be based on a) attendance at program events and b) written and oral feedback directly from the participants.

This work will result in Dairy-Livestock Team Newsletter articles targeting producers and 4-H youth/leaders/parents, and Extension publications.

Partners will be: Connecticut Sheep Breeders Association - volunteers, program resources and financial support; Connecticut Pork Producers Association - volunteers, program resources and financial support; New England Sheep and Wool Growers Association - volunteers, program resources and financial support.

Annual or semi-annual educational programs, field days, and occasional newsletter articles.

Educational methods for livestock producers are lectures, demonstrations, clinics and animal sales.

Target audiences are livestock producers and 4-H youth and leaders/parents.

Evaluations will be feedback from target audiences and annual program evaluations by attendees.

### Dairy Livestock

Livestock (dairy, beef, sheep) are an important component of Connecticut's agriculture. These animals are fed forage-based diets. One role in this team effort is to supply some agronomical support expertise relative to forage crop production.

## Dissemination of Information to Dairy and Livestock Producers in Connecticut

Cooperative Extension Focus: Disseminating information to dairy and livestock farmers is a challenge in today's farming environment. Time constraints for farmers limit the ability to reach a large number of farmers at day and evening meetings. New technologies and reemphasizing documented technologies is a goal of Cooperative Extension. With this in mind, the College Dairy/Livestock team has developed a newsletter that is designed to provide new information, encourage use of recognized technologies and highlight agricultural activities within the College.

Measures of success will be: 1) increased knowledge of current nutritional practices by dairy producers, with the anticipated results of an increase in milk production and profitability; 2) provide a forum for disseminated agricultural research conducted at the University of Connecticut; 3) continue with Extension presentations in this area.

This work will result in a high-quality eight-page newsletter targeted to dairy and livestock producers and associated agribusiness personnel and provide a calendar of events.

Internal partners will include: All members of the Dairy/Livestock Steering Team: Mr. Arnold Nieminen, Dairy Farm Manager; Ms. Joyce Meader, Dairy/Livestock Extension Educator; Mr. Richard Meinert, Dairy/Livestock Extension Educator, Dr. Tom Morris, Plant science, Dr. Frank Himmelstein, Plant Science, Ms. Diane Lis, 4-H Youth Educator, Dr. Paul Stake, Livestock Specialist, and Dr. Ian Hart, Team administrator. Also, members of the team at large and other faculty members in the College who supply newsletter articles. Also, partners include the personnel at the Office of Communications and Technology for design and construction of the newsletter.

This newsletter has been developed to provide current, factual information to dairy and livestock producers. Topics include nutrition, reproduction, milk quality, dairy farm recognition programs, weed and soil science, food safety, and highlights of the College's research programs. This newsletter has been published for four years and it is a goal to provide three issues per year and continuously update the mailing list to assure that it is reaching current producers.

Methods will be through monthly meetings to determine what topics will be timely and informative and different members have responsibility for writing or procuring articles.

Target audiences are: dairy farmers and livestock producers in Connecticut and New England; University Extension personnel at the Land Grant Colleges in the U.S.A.; feed industry personnel; Connecticut Department of Agriculture personnel.

Evaluations will be direct feedback from farmers, telephone calls from producers, discussion of the newsletter on dairy and livestock internet discussion lists, newsletter dissemination on internet sites. A survey of needs will be developed that will include an evaluation of the newsletter to determine if it is meeting the needs of producers and if any changes should be made.

## Dairy/Livestock Team

A SARE grant entitled "Alternative and Herbal Livestock Health Practices: A Conference and Sourcebook based on the German "E" Commission Format" has been received. Interest in natural alternatives to chemical and antibiotic based therapies for animal disease has increased in recent years, due to environmental and food safety concerns. The goal of this conference, published proceedings and source book would be to compile information on herbal and other remedies used for common animal disease problems, determine the extent of controlled clinical studies available for the products, and to help determine which may be appropriate candidates for subsequent animal clinical trials.

Number of attendees at the conference will measure success, as will sales of sourcebooks and future clinical studies based on information compiled here.

This work will result in a conference (200 attendees), published proceedings sourcebook.

Partners will be SARE who has funded this project, several departments within CANR are involved, as well as veterinarians and scientists with expertise in alternative medicine.

The program plan will be: 2000-2001 develop materials for workshop and source book; 2001-2002 host workshop, publish proceedings and source book.

Target audiences include veterinarians, scientists, and innovative farmers with an interest in alternative animal medicines and organic livestock farming. It is anticipated 200 conference attendees and the sale of over 500 sourcebooks.

Evaluations administered will be the conference assessment tool. Sourcebook sales and proceedings used should indicate interest.

## Vaccine Research

Research Focus: Despite advances in veterinary medicine and animal husbandry infectious disease remains a major factor in decreased animal production and increased mortality, resulting in substantial monetary losses to the U.S. agricultural community. This directly impacts the domestic food production and pricing, inhibits transportation of animals, and can also negatively impact international trade agreements, as exemplified by the recent situation confronting Great Britain as a result of Mad Cow Syndrome (Bovine Spongiform Encephalopathy). Protecting the food animals from diseases caused by bacterial and viral pathogens is best afforded by effective vaccines. Development and use of such vaccines will decrease the perceived need for, and inevitable use of, broad spectrum antibiotics which has led to the evolution of multiply antibiotic resistant pathogenic bacteria recently. These resistant strains of pathogenic bacteria pose a very real health threat not only to the farm animals but in many instances to the animal handlers and the general public as well. These vaccines will result in increased food quality and production which will strengthen markets at home and abroad.

The University of Connecticut has made a commitment to the development and growth of the Center of Excellence for Vaccine Research (CEVR). The research focus and strength of the CEVR is the elucidation of the mechanisms of pathogenesis of, and mucosal immune responses to, primary viral and bacterial/mycoplasmal respiratory pathogens with the goal of developing safe and effective vaccines. No comparable University based vaccine center exists in the United States.

The CEVR is soon to be housed in a new \$35 million, 99,000 sq. ft. state-of-the-art research facility on the UConn campus, complete with containment units for the testing of candidate vaccine antigens in large animals such as cows, pigs and sheep. The University of Connecticut Department of Pathobiology has an Avian Research building available to the CEVR where bird vaccination/challenge experiments are conducted in isolator units. The animal facilities comply with the provisions of the Institutional Animal Care and Use Committee as specified by the Animal and Plant Health Inspection Service, USDA in 9 CFR Part 1 (1-19).

Pfizer, Animal Health, Groton, CT, is one of the largest animal health concerns in the world and is a major supplier of all veterinary vaccines in the United States. Pfizer has recently entered into an agreement with the University of Connecticut to further develop the Center of Excellence for Vaccine Research. Although not limited to negotiations exclusively with Pfizer, this unique University/corporate association will facilitate rapid technology transfer in the forms of patents and licensing agreements resulting in commercialization of new vaccines developed by CEVR faculty.

The faculty comprising the CEVR have active research programs which are extramurally funded by Federal agencies such as the NIH, the USDA as well as by corporate sponsors. Funding awards for vaccine research for the combined programs in the CEVR total in excess of \$2 million to date. The results of the CEVR principal investigators research have resulted in 166 publications in well respected, peer reviewed journals. The Principal Investigators comprising the CEVR and their areas of research activities are: 1) Dr. Steven J. Geary, Professor of Microbiology, Department of Pathobiology and CEVR Deputy Director for Exploratory Research *M. gallisepticum*: Chronic Respiratory Disease of Avian *M. hyopneumoniae*: Enzootic Pneumonia of Pigs *M. pneumoniae*: Atypical Pneumonia of Humans; 2) Dr. Antonio Garmendia, Associate Professor of Pathobiology, Pseudorabies virus, PRRS (Porcine Respiratory and Reproductive Syndrome) virus; 3) Dr. Philip Marcus, Professor of Molecular and Cell Biology and Adjunct Professor of Pathobiology; 4) Dr. Margaret Sekellick, Associate Professor in Residence, of Molecular and Cell Biology and Adjunct Associate Professor of Pathobiology - Interferon induction by viruses, Avian Influenza virus, Vesicular Stomatitis virus, Newcastle virus, Marek's disease virus, Avian leukosis virus, Virus evolution and quasispecies, Development of avian interferon system; 5) Dr. Lawrence Silbart, Associate Professor of Animal Science and Adjunct Associate Professor of Pathobiology - Mucosal Immunity: Human Immunodeficiency Virus (HIV), Foot and Mouth Disease Virus, Aflatoxin B1 mucosal vaccine.

Collaborative research status is maintained with the USDA research facility at Plum Island. Under this arrangement investigators have access to foreign animal disease agents which are restricted from the U.S. mainland. This affords the opportunity of researching viral and bacterial pathogens that are not currently a problem in the U.S. but that pose a risk which would have catastrophic consequences if introduced to the animal populations.

The combination of CEVR faculty expertise and collaborative approach to problem solving uniquely positions the CEVR to contribute to the development of vaccines for the protection of the food animal industry from pathogens that may threaten in the future.

The measures of success will be continued growth of the CEVR in terms of faculty and reputation, publications, grant funding, development of efficacious vaccines.

This work will result in continued growth of the CEVR in terms of faculty and reputation, publications, grant funding, development of efficacious vaccines.

The partner will be Pfizer Inc.

Strategies are collaborative grants, special grant funding through USDA and partnership with the University of Missouri's Program for Prevention of Animal Infectious Diseases.

The target audiences are researchers interested in microbial virulence and vaccine development, industrial partners, and the agriculture community.

### Master Livestock Volunteers

In addition to full time farms, part-time and diversified farming is of importance to the management of New England's open space for food production and aesthetic value. For example, Connecticut residents raise cattle on 750 farms, sheep on 350 farms, and swine on 300 farms on a part-time basis (New England Agricultural Statistics 1997). In addition, dairy goats, rabbits, llamas, and horses are bred and raised on many small farms. These citizens often do not have a farm background and depend on the Cooperative Extension System to help with animal husbandry and forage production on their small acreage. The Dairy/Livestock educators and Livestock Specialists in New England are not able to answer these calls on a timely basis, due to their other teaching, research, and Extension responsibilities. Cooperative Extension has benefited from the partnership with local volunteers, who can provide working farm expertise to these beginning farmers. Educational materials need to be updated with the New England flavor of a thriving backyard livestock industry. Volunteers could help review appropriateness of these new fact sheets, while having access to the finished product to help in their educational efforts. These volunteers have been providing education for years, and should be acknowledged for the time freely spent to continue New England's livestock industry.

Measures of success will be: Exemplary livestock producers will be nominated and chosen for their management skills and willingness to share their knowledge with other livestock owners: "Master Livestock Volunteers" Master Livestock Volunteers will increase their knowledge of current University research studies on livestock production. Beginning livestock producers will understand good livestock husbandry and environmentally safe management practices after contacting the Cooperative Extension System or Master Livestock Volunteers.

The work will result in New England appropriate livestock production fact sheets will be updated; a list of Master Livestock Volunteers will be established for beginning livestock producers to contact for more information; and an Extension newsletter article will contain new fact sheets as well as a description of the Master Livestock Volunteer program.

Partners will be Livestock Associations, Farm Bureau, (MS).

Master Livestock Volunteer coordinator position filled to coordinate volunteer selection, training, and revision of livestock production fact sheets. Livestock producers surveyed for nominations of Master Livestock Volunteers and educational needs. Master Livestock Volunteers chosen by a judging committee of livestock producers and Extension faculty. Volunteer training with closing banquet for chosen winners conducted in each state. Fact sheets distributed throughout New England to be printed with each state's own letterhead, but with common MLV theme. A list compiled of Master Livestock Volunteers willing to share their management expertise with beginning farmers.

Methods will include volunteer nomination brochure, education seminars for winners, fact sheets updated and distributed New England wide, tours of volunteers' farms.

Target audiences are experienced and beginning livestock producers.

Master Livestock Volunteers will be given an evaluation after educational seminar, asking for knowledge gained. Updated fact sheets will be evaluated for usefulness to their operation. A personal farm visit one year later will assess any new management practices adopted by volunteers. Beginning farmers will be called to determine management practices adopted after receiving fact sheets or contacting Master Livestock Volunteers.

### Nutrient Management Planning

Cooperative Extension System Focus: Nutrients, particularly nitrogen and phosphorus have been documented as pollutants of Connecticut's ground and surface water. Nonpoint sources from agricultural operations have been identified by EPA as having a detrimental effect on over 35,000 miles of streams and rivers in the United States. The USDA-EPA Unified National Strategy for Animal Feeding Operations proposes a national expectation that all animal feeding operations will develop and implement comprehensive nutrient management plans by the year 2008. Connecticut has an estimated 770 beef farms, 267 cow dairies, 5 goat dairies, 312 sheep farms, 293 hog farms and 391 poultry operations, all of which will need to develop plans to meet the compliance goal. Cooperative Extension's role in this process is to develop a set of criteria in cooperation with USDA NRCS that will outline the requirements of an acceptable plan. A demonstration project using farms applying to USDA FSA for EQIP funding for nutrient management planning will be used to develop the planning process, and training materials that individual producers could use/follow to develop their own plans.

This work will result in numbers of plans developed, numbers of plans implemented after incentive funding is exhausted. Nutrient Management Planning Criteria published, Nutrient Management Planning Computer Program for individual use available in print, on disk and off the Internet, research data on the profitability of hauling manure with various types of equipment to farm fields in Connecticut, change in attitude and behavior of farmers to view manure as a resource not a waste to be disposed of, documented decrease in the rate of accumulation of phosphorus in individual farm fields

Outcome products desired are: Comprehensive Nutrient Management Plans for producers participating in the demonstration project; Computerized spreadsheet for farmers to use to develop their own plans; a peer reviewed, article on the economics of hauling manure in Connecticut; Popular press and newsletter articles on the economics of hauling manure in Connecticut; An Extension published workbook in print and on the Internet for farmers to use to develop their own plans; GIS maps of farm fields for demonstration project participants.

USDA NRCS is the only external partner in this project. Pass through funding in the amount of \$27,000 has already been received.

The demonstration project will be funded for a minimum of five years. Farms sign five year contracts to participate in the project. They agree to keep detailed farm records of cropping practices and to supply them to CES and NRCS. UConn in turn develops GIS maps of the farm field layouts and travel routes to the fields. Baseline data on soil fertility levels and manure handling practices is collected the first year for comparison purposes. Farmers receive a nutrient management plan from CES and agree to implement it for five years. NRCS pays up to \$10,000 per year for the first three years of the contract as an incentive. Farmers complete the last two years without any incentive payment. Soil samples in the first, third and fifth years for each farm will be used to document nutrient accumulation trends.

For those livestock operations not participating in the demonstration project obtaining data and documenting change will be significantly more difficult. Farms that obtain training materials, plan workbooks or software will be documented. Soil sample data coming into the UConn Soil Test lab from farms known to have obtained nutrient management planning information will be monitored for change in accumulation rates. Statewide trends in nutrient levels of farm fields will be monitored for overall trends.

A follow up questionnaire will be developed and sent to those individuals that requested/purchased planning workbooks or other materials to obtain data on proposed or implemented change in farming practices following use of planning materials provided.

Workshops will be conducted following the development of the computer programs and other training materials to educate producers in the need for nutrient management planning and the techniques used to develop plans. Workshops will be targeted to individual species of livestock where practical and general sessions for anyone to attend will be offered.

Target audiences are livestock producers in the state.

Evaluation will be by the numbers of plans developed; the numbers of plans implemented after incentive funding is exhausted; the change in attitude and behavior of farmers to view manure as a resource not a waste; documented decrease in the rate of accumulation of phosphorus in individual farm fields; soil samples in the first, third and fifth years for each demonstration project farm will be used to document nutrient accumulation trends. For those livestock operations not participating in the demonstration project obtaining data and documenting change will be significantly more difficult. Farms that obtain training materials, plan workbooks or software will be documented. Soil sample data coming into the UConn Soil Test lab from farms known to have obtained nutrient management planning information will be monitored for change in accumulation rates. Statewide trends in nutrient levels of farm fields will be monitored for overall trends. A follow up questionnaire will be developed and sent to those individuals that requested/purchased planning workbooks or other materials to obtain data on proposed or implemented change in farming practices following use of planning materials provided.

## INTEGRATED CROP MANAGEMENT TEAM

### Turfgrass Integrated Pest Management

Cooperative Extension System Focus: To educate, train, and assist commercial and non-commercial individuals, companies and governments on IPM principles. The purpose is to increase awareness and adoption of IPM methodology. For information on significance of this issue see: State of Connecticut Integrated Pest Management Program 1990-1999 Annual Reports to the Legislature. Plan to work with the turfgrass service industry conducting applied research through full-season field training. Work with turfgrass industry disseminating applied research results through educational Extension or College credit courses, twilight meetings, state and

regional conferences, and other events. Consulting activities with the turfgrass service industry, golf course superintendents, municipalities, schools, and state and government agencies.

Pesticide and fertilizer impacts will be measured through surveys to assess use and obtain reductions as a result of training and education. Individuals and businesses will change nutrient and pesticide management strategies after training to be documented by surveys and record review.

Outcome products desired will include the Turfgrass Integrated Pest Management Manual, new and updated Extension fact sheets, an insect collection, turfgrass pathology collection and possibly development of a turfgrass training video.

Resources and partners include: a) DEP 319 grant: Development of A Turfgrass Integrated Pest Management Manual, collaboration with industry groups including the Connecticut Grounds Keepers Association and the Environmental Industry Council for manual input; b) DEP 319 Quinnipiac River Grant Project, collaboration with lawn care operators, municipalities, CT DEP, Quinnipiac working groups and homeowners; c) Department of Plant Science, turfgrass initiative; d) Department of Natural and renewable resources; e) CSREES Water Quality; f) Northeast IPM program (MS).

Key components of the program: Plan to conduct applied research through full-season field training in the Quinnipiac River Watershed, CSREES Water Quality program and possible other future watershed projects. Disseminate applied research results from the DEP 319 Turfgrass Manual and Quinnipiac River Watershed, Department of Plant Science turfgrass program, Water Quality Sustainable Landscape program and NE IPM program.

Strategies include: Plan to work with the turfgrass service industry conducting applied research through full-season field training in the Quinnipiac River Watershed, CSREES Water Quality program and possible other future watershed projects. Work with turfgrass industry disseminating applied research results from the DEP 319 Turfgrass Manual and Quinnipiac River Watershed, Department of Plant Science turfgrass program, Water Quality Sustainable Landscape program and NE IPM programs. Educational methods to be used include educational Extension or College credit courses, twilight meetings, state and regional conferences, homeowner demonstrations and other events. Consulting activities with the turfgrass service industry, golf course superintendents, municipalities, schools, and state and government agencies. The total number of approximate program participants to be 13,000 to 15,000 people.

Target audiences are the turfgrass service industry (lawn care operators), golf course superintendents, municipalities, schools, master gardeners, homeowners and state and government agencies.

Pesticide and fertilizer impacts will be measured through surveys to assess use and obtain reductions as a result of training and education. Individuals and businesses will change nutrient and pesticide management strategies after IPM training, to be documented by surveys and record review.

### Commercial Vegetable Production

Cooperative Extension System Focus: Commercial vegetable farmers face concerns related to international, national, regional and local competition and shrinking profit margins. Solutions may include more competitive production practices, sustaining high yields, new crops, better marketing, eliminating potential pesticide pollution problems, as well as improving management techniques and trouble shooting skills. The USDA/CSREES have goals of maintaining a safe, secure and highly competitive agricultural system while protecting natural resources and the environment for a healthy and well nourished population. Teaching skills to address the above mentioned concerns helps maintain profitability and assure a safe and secure agricultural system for years to come. Production of fresh vegetables at the local level benefits every man, woman and child in the United States.

Measures of success would include a change in knowledge levels and the behavior of state and regional vegetable producers.

Outcome products will include a variety of readily available educational opportunities for vegetable producers including: local, state and regional commodity meetings, workshops and seminars; a regional newsletter; web site information and fact sheets.

Partners will include: Connecticut Farmers, New England Vegetable and Berry Growers Association, members of UConn College of Agriculture and Natural Resources and other New England universities. All partners will participate in planning and delivery of educational events.

Key components include multiple educational opportunities for commercial vegetable producers - The New England Vegetable and Berry Growers Conference, Annual Connecticut Vegetable and Small Fruit Growers Conference, Yankee Grower Newsletter, The New England Vegetable Management Guide, IPM commodity manuals, web site informational fact sheets (duration: continual through 2005).

Strategies include: Participate in College, State and Regional planning and steering committees to provide educational opportunities or events. Production, IPM, marketing and other information will be provided to clientele groups through presentations, displays, workshops and seminars at commodity meetings. Legislators will be informed about IPM through events such as Connecticut Agricultural Day at the State Capital and in the publication of the IPM Annual Report to the Connecticut Legislature. IPM information will also be included in state and regional newsletters, bulletins, fact sheets, manuals, web sites, and commodity recommendations. Users and attendees will exceed 3,000 people annually.

Target audiences will include commercial vegetable producers, other scientists, Extension Vegetable Specialists and Educators, legislators, and the general public.

Periodic participant or user surveys will be conducted to assess program results and effectiveness.

### Integrated Pest Management

Focus: Department of Plant Science will develop pest and nitrogen management strategies that reduce dependence on pesticides and ground and surface water contamination by pesticides and nitrogen.

This work will result in Extension publications, web site, online tutorial presentations, grower meetings, field training.

Partners will include: state municipal and town governments including the Department of Environmental Protection, recreation commissions, conservation commissions, wetland agencies and schools will participate where appropriate in the sponsorship, dissemination and adoption of IPM materials and practices.

Cooperating commercial farms will serve as demonstration, training and evaluation sites for IPM programs. Pesticide Applicator Training programs will teach safe handling, risk assessment and proper application of pesticides. NEREAP-IPM will provide coordination of IPM programs including the sharing of program materials within the northeast region (MS).

Coordination of Connecticut IPM Programs include: 1) development and maintenance of program support services such as the IPM web site and Yankee Grower newsletter; 2) representation of the ICM Team, Cooperative Extension System, Storrs Agricultural Experiment Station and College of Agriculture and Natural Resources at meeting with resource/partner groups and coordinating agencies or committees; 3) annual evaluation of IPM impacts; 4) preparation of IPM Program reports for the state legislature, Federal government, and other funding or cooperating agencies; 5) coordination and development of undergraduate teaching and graduate research programs in IPM; 6) identification of funding opportunities in IPM; 7) facilitation of success of ICM/IPM Team members; 8) development of distance learning system for program delivery.

Target audiences are: ICM Team Members, commercial farmer and groundskeepers, homeowners, state and local governments, school systems.

ICM/IPM compliance standards will be developed for each program area. A random sample of clients will be surveyed annually to determine use of ICM/IPM methods by each program area.

### Integrated Pest Management (IPM)

Focus: Results of applied research projects using Integrated Pest Management (IPM) methods (please see individual plan) will be incorporated into training programs for commodity growers and natural resource managers to a) encourage reduction of pesticide usage while maintaining crop quality and b) conserve biological diversity. IPM will also be taught as a component of one or more courses in the College of Agriculture and Natural Resources.

Measures of success include: reductions in pesticide usage from adoption of IPM methods; an increase in IPM knowledge by growers of agricultural commodities, natural resource managers and students; and increased adoption of IPM principals and practices by commodity growers.

This work will result in technical reports, reports for legislators, peer-reviewed articles, Extension and trade journal publications, Internet web site development, presentations at grower meetings, poster display exhibits, educational materials.

Internal partners are: a) commodity specialists and Extension Educators in CANR; b) faculty and professional staff in other UConn departments. External partners are: a) federal agencies - USDA, EPA, NRCS, U.S. Dept. of Interior, U.S. Geological Survey (grants have been received previously from these agencies and are anticipated to continue); b) state agencies - CT Agric. Expt. Sta., DEP, CT DOT, SWCD, Dept. of Agriculture; and c) state cooperators from land grant universities and Dept. of Agriculture - entomologists, weed scientists, plant pathologists, nematologists (MS); d) grower groups - CT Greenhouse Grower's Assoc., CT Nurserymen's Assoc., CT Pomological Society; e) environmental groups - The Nature Conservancy, Audubon Society, Sierra Club (MS).

Integrated Pest Management training and outreach programs will be conducted, with emphasis on agricultural commodities and natural areas. Programs will be conducted from 12 months in duration to 5 years or as determined by supporting grant timelines.

Program results will be disseminated to growers, natural area managers, federal and state agencies, non-governmental organizations (NGOs), schools/universities, municipalities and the general public. Educational outreach will occur via presentations, field demonstrations and volunteer training, dissemination of prepared materials, poster displays, Internet web site development, publications and the news media. The number of attendees will vary by event, ranging from several individuals to several hundred.

Target audiences are agricultural commodity growers, natural resource managers, volunteers, the general public, school children and College students.

Evaluation techniques are annual technical reports summarizing program accomplishments for each applied research and survey program, preparation of Extension publications and manuscripts for peer-reviewed journals where applicable, continued development of IPM web site, outreach activities.

#### Home and Garden Education Center

Academic Program Focus: Team/Advisory Committee support for Centers educational outreach programs, disciplines to be covered and program content.

Measure of success include impacts in course development, course evaluations, funding/support received and Annual Report Advisory Committee

This work will result in: annual number new publications, exhibits, awards, workshops and meetings; annual contact reports for Home and Garden Education Center (phone, walk-in, diagnostics, referrals, etc.).

Internal partners are: Other departments, CTAES, Master Gardeners, Home and Garden Education Advisory Committee. External partners are: Other state departments, agencies, Connecticut Department of Agriculture, CAEMG, garden clubs.

Key components of the program include: revision Master Gardener core manual and course data; new educational program on the web, CD-ROM, distance learning techniques; digital distance diagnostics program to link with Extension Centers and Master Gardener program; applied research/grant opportunities; fund raising mission; core staff support group positions.

Strategies include: Annual Master Gardener and Advanced Master Gardener courses; updated diagnostics program coupled with computerized technology; FAX on demand; new web sites, information and cooperative linkages; provide plant, home insect, disease and gardening, pest diagnostics and recommendations for problem management; develop an IPM program; demonstration garden at UConn and Extension Centers; and develop distance learning and diagnostics program.

Target audiences are annually to reach 5,000-10,000 Connecticut citizens.

Evaluation techniques are: course surveys and evaluation forms; newsletter surveys and data acquisition forms; Advisory Committee program review.

#### Fruit Specialist/Entomologist

Cooperative Extension System Focus: Revival of CES wine grape, wine grape council support to commercial wineries.

Measures of success will be: economic/tourism impact plan study and practical assessment; CES production, IPM, pest management support plan to encourage grape growing, wine making in Connecticut; education program development plan proposed; and development of entomology information.

This will result in wine grape acreage increased for Connecticut, new wineries developed, public interest increased and table grape acreage increased in Connecticut.

Internal partners will be: IPM Team, fruit specialist CES Tourism specialist. External partners will be: Connecticut AEG, Connecticut Department of Agriculture, Commissioner of Agriculture.

Key components of the program are: Connecticut Wine Council Advisory Board; CANR, CES, IPM support team; draft plan of work.

Strategies include: economic assessment of Connecticut wine growers; varietal/yield crop management considerations; newsletter article outreach; development of enology base (Master Gardener volunteers) and educational outreach program; newsletter audience for grape growing outreach increased; conferences.

Target audiences are: commercial vineyards; hobbyists, viticulturists; target new growers of grapes/tobacco growers.

Evaluation techniques will include developing surveys.

### Integrated Crop Management

**Research Focus:** Collaboration will be actively sought with members of the IPM team and with other personnel within the College. The interdisciplinary nature of this collaborations should enhance the ability to tackle complex problems and seek funding. Information will continue to be contributed on entomology, biological control and IPM.

Measures of success are the establishment of multi-disciplinary research projects or educational programs to serve CT agricultural industries and CT residents.

This work will result in funding to establish new programs or for research projects and publications in entomological and horticultural journals; presentations at scientific and trade organization meetings.

Internal partners are: commodity specialists at the university; IPM program specialists; and CANR personnel. External partners are: contacts will be established with individual growers and with organizations such as greenhouse grower's associations and nursery/landscape associations. In addition contacts will be established with CT organic growers; CT Department of Agriculture and CT Agricultural Experimental Station; funding will be sought from USDA, EPA, and Northeast Regional IPM Grants program, among others.

Key components of the program will include collaboration with personnel from different academic disciplines, start-up funding for particular projects.

Target audiences are CT agricultural industries, residents in urban or rural areas.

Evaluation techniques will include: comments by grant proposal and journal reviewers; comments and discussion at scientific/trade meetings; feedback from CANR, university and state personnel.

### Integrated Pest Management (IPM)

**Cooperative Extension System Focus:** There are many problems and concerns related to the use of pesticides in agricultural and non-agricultural areas. Some of the concerns include overuse and misuse of pesticides, pollution of ground and surface waters, unwanted residues on food and feed, drift to non-target areas, hazards to beneficial and other non-target organisms, resistance of pests to pesticides, and public and pesticide applicator safety. Extension education programming involves training fruit growers to utilize IPM techniques as part of their normal production practices. Applied research projects will focus on pests of fruit crops in order to develop pest management techniques to address the issues mentioned above. Research results will be disseminated to growers. With the recent passage of the Food Quality Protection Act (FQPA), alternatives to managing pests without traditional pesticides are particularly important. Examples of applied research topics include usage of biological control organisms to control fruit pests, monitoring methods for fruit pests, particularly minor crops (e.g. peaches) and usage of weather data to predict pest occurrence.

Measures of success include: reductions in pesticide usage from increased adoption of IPM methods; reduction in pesticide risk by IPM program participants due to usage of less toxic pesticides and usage of biological control organisms; growers will increase agricultural profitability by reducing pesticide costs; funding from submitted grants will allow research in fruit IPM to continue; increased privatization of IPM due to training of consultants.

This work will result in: state and regional Extension bulletins and fact sheets – editor of New England Apple Pest Management Guide (MS); newsletters edited/written – e.g. Yankee Grower (MS); presentations of research results at grower/clientele meetings; on-farm applied research demonstrations; quarterly and annual reports written for granting agencies (depending on contracts); use of electronic media for dissemination of research results, etc. e.g. New England Apple Information Manager (AIM) web site, Weekly Pest Messages on CT IPM web site. (MS); recorded phone pest messages; reports for CT legislators – IPM Annual Report to the CT Legislature.

Internal partners are: a) Commodity Specialists and Extension Educators in CANR. External partners are: a) grower and clientele groups (e.g. CT Pomological Society) – Stakeholder input; b) CT Department of Environmental Protection – source of grant funding; c) CT Agricultural Experiment Station- Collaboration with scientists on applied research projects; d) IPM Specialists from other Universities – Expect continued involvement with multi-state grants (MS).

Extension educational programs in IPM will be conducted for growers of tree fruit crops (e.g. apples, peaches, pears) and small fruits (e.g. strawberries, and possibly grapes). The primary objectives of the programs will be to provide growers with the knowledge and skills needed to reduce potential risks of pesticides. Programs will be offered on a statewide basis, however locations may depend on grant requirements in particular years. For example, from FY97 through FY99, the IPM program has been partially funded by the CT Department of Environmental Protection to conduct IPM programs in the Quinnipiac River watershed. One applied research emphases will continue to be on pest monitoring and alternatives to traditional pesticides. Pertinent information will be added to the IPM programs for local pilot testing and demonstration. With the anticipated loss of pesticides due to the Food

Quality Protection Act (FQPA), there will be an increased need for pesticide alternative research. Applied research projects will be conducted from 1 to 5 years in duration or as determined by grant funding.

The key educational component will be IPM full-season training programs for agricultural producers. Hands-on intensive training will occur at the orchard or farm sites. Demonstration plots will be used to illustrate the results of applied research projects. Other educational methods will include presentations, displays and workshops at state and regional commodity meetings. IPM training will also be provided to private applicators through the Pesticide Applicator Training Program. IPM information will also be disseminated through newsletters, state and regional Extension publications, and via electronic media (web site, e-mail).

Target audiences are producers of tree fruit and small fruit in Connecticut and other Northeastern states (MS).

Growers will be surveyed at the end of IPM training to determine IPM knowledge gained, level of IPM adoption and level of pesticide reduction achieved.

#### Home and Garden Education Center

Cooperative Extension System Focus: Provide information to team on all phases of horticulture including but not limited to proper cultural conditions, identification of and control measures for insects, disease and cultural problems. This may include cultural and/or approved chemical controls. Such information will include timing for the pesticide application and where applicable, methods to determine timing.

Methods used will be daily review of most of the material coming into the center using the video camera mounted microscopes to show / point out the damaging agents.

Measures of success will include the proper identification of plant problems and measures to correct such problems.

This work will result in producing necessary fact sheets and developing a useable web page for the center.

Partners include selected members of the home and gardener staff.

Educational methods include training a top notch diagnostic staff.

Target audiences are center staff as well as the people of Connecticut.

Evaluations will be by the reduced questions from the staff with higher degree of accuracy in their answers.

#### Pesticide Application Technology

Focus: Over the last 10 years considerable expertise has been developed in the area of spray drift. This has previously been applied to aerial applications of pesticides on forests. Current technology is being tested (computer models, drift measurement and spray management recommendations) in horticulture crops and will soon begin with ornamentals. One plan is to rely on the IPM team members to set priorities, guide and work with me to develop spray drift control recommendations which will help the Connecticut applicators.

Measures of success will be the inclusion of current knowledge of spray drift control in the actions of arborists, golf course superintendents, orchard and vegetable growers, etc.

This work will result in spray application technology recommendations for various Connecticut operations.

Partners and resources are: IPM cooperators for spray trials, demonstrations etc. and Plant Science Farm spray equipment and help with spray trials.

Key components of the program are to: develop library of LIDAR pictures demonstrating drift from various spray operations including: golf course sprayers, ornamental tree spraying, boom spraying of crops, orchard spraying (2 years); develop recommendations based on above trials for controlling drift from the various operations (2 years); and incorporate recommendations into CT IPM program (2 years).

Strategies include incorporating new information into current IPM educational program with cooperation of IPM team.

Target audiences are spray applicators.

Evaluation techniques include IPM team annual evaluation follow-ups.

#### Integrated Crop Management (ICM)

Focus: There are many concerns related to the use of pesticides in agricultural areas. Some of the risks associated with pesticide use include pollution of ground and surface waters, drift to non-target areas, hazards to beneficial organisms, resistance of pests to pesticides and pesticide applicator safety. Integrated crop management is the use of a variety of pest control methods designed to protect the environment and to produce high quality crops with the most judicious use of pesticides. The production of high quality crops will contribute to an agricultural system that is competitive in a global economy.

Measures of success include: increased adoption of ICM practices; pesticide risk reduction and nutrient reductions; increased in agricultural profitability and competitiveness by reducing pesticides and application costs, maintaining or increasing crop quality.

This work will result in: state and regional Extension bulletins and fact sheets; state and regional Extension IPM manuals and recommendations for commodities; presentations at grower and clientele meetings; on farm demonstration projects; technical reports; reports/fact sheets for legislators; and use of electronic media for dissemination of information via the UConn IPM web site.

Partners are: grower and clientele groups; CT Department of Environmental Protection; CT Agricultural Experiment Station; federal agencies – USDA, EPA; commodity specialists within Plant Science and Natural Resources Department.

The goals of the UConn CES ICM program are to provide pesticide users with the knowledge, skills, methods, experience and confidence needed to produce high quality crops with the safest and least amount of pesticides. Current ICM programs includes vegetable crops, fruit crops, field corn, turfgrass, and greenhouse crops. ICM educational programs will be offered on a statewide basis. Based upon funding availability, ICM staff will continue to conduct applied research to investigate new techniques that can be incorporated into educational programs. Research will focus on methods such as biological control organisms, cultural controls and biorational pesticides.

The key educational component will be full-season ICM training to provide hands-on intensive training at the grower location. The focus of this training is to provide pesticide users with the knowledge and skills to begin adoption of ICM practices and techniques. ICM information will be provided to clientele groups through presentations, at annual meetings. ICM information will be provided to commercial and private pesticide applicators through the pesticide applicator training program.

The target audience for the statewide ICM program is commercial producers of vegetable crops, fruit crops, field crops and greenhouse crops plus commercial turfgrass managers. The Master Gardeners and general public are also the target audience for IPM information.

Each educator will survey or interview program participants to determine: IPM knowledge gained, skills learned, level of ICM adoption, and level of pesticide risk reduction. Six months to one year after the participation in the program has ended, the Extension educator will conduct a follow-up survey to determine the continued level of adoption of IPM techniques.

#### SMALL GROUP PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

##### Field Corn and Forage Crop Integrated Weed Management

Cooperation Extension Focus: The potential for groundwater contamination by pesticides may be much greater than was commonly believed a decade ago. Concerns involving herbicides in groundwater, particularly the most frequently used field corn herbicides have substantially heightened public awareness regarding the safety of the water. The effect of herbicides on water quality will continue to be a major public issue. Reducing herbicide use and managing needed treatments on field corn and other forage crops will be an important step in maintaining groundwater and environmental quality. With the large acreage of field and forage crops in the New England region, and the national goal of having IPM programs in place on 75 percent of the nation's farmland acreage, reduction in pesticide use is of national as well as local importance.

Control of triazine resistant and other problem weeds in field corn has resulted in increased herbicide use on many farms. These problems have also placed additional burdens on production costs and agricultural viability. Financial hardships currently facing many farmers have led to considerations that farm profitability might be increased by reducing the rate or use of pesticides, if effective less costly alternatives were available. IWM strategies provide growers with effective weed control yet reduce the amount of herbicides required to provide this control. Alternative weed management practices that significantly reduce the use of herbicides with moderate and severe risk potential for soil leaching or runoff in watershed areas will likely reduce the potential for future contamination of ground and surface waters. The problem of increased weed pressure, coupled with the groundwater concerns of field corn herbicides, has increased the demand for greater utilization of IWM practices for weed management in field corn.

Measures of success are defined as the change of knowledge or behavior with respect to farmers. Farmers will increase use of recommended integrated weed management practices for field corn and other forage crops to maintain or increase crop yields. Farmers will reduce the amount of herbicides used to achieve needed weed control for field and forage crop production as shown in Extension demonstrations and maintain or increase agricultural

viability. Farmers will decrease the use of those herbicides classified as having severe potential for soil leaching in order to reduce and prevent water degradation from pesticides.

This work will result in journal articles, abstracts, conference presentations and papers for professional audiences, growers meetings at on-farm demonstration plot sites during the growing season and winter meetings, grower meetings for farmers in other New England States, impact sheets to legislators, USDA. Extension publications, fact sheets. Experiment Station bulletins, and articles in trade publications.

Partners include the Consolidated Farm Service Agency, The National Resource Conservation Service, The Connecticut Department of Environmental Protection, The Connecticut Department of Agriculture, The Connecticut Farm Bureau, and the Soil Conservation Districts.

The Connecticut Integrated Weed Management (IWM) Field and Forage Crop Program is a research-based program which addresses herbicide use by farmers growing field corn and other forage crops. The objectives of this program are to use an IWM approach to reduce the rate and number of herbicides used in field corn and other forage crops through field-scale applied research and on-farm demonstration plots. IWM training and education to field and forage crop growers, and delivery of new techniques through educational materials such as the existing New England Guide to Weed Control in Field Corn and other widely read publications are also important aspects of the program. Individual farm educational programs and group meetings are held throughout the year to deliver the results of the IWM recommendations for field corn and other forage crops. On-farm research and demonstration sites are established across the State to demonstrate alternative management strategies on weed control and yields of field corn. Farmers implementing demonstration trial results are primarily responsible for the success of the program. Farmers can use the knowledge gained from this program to resolve problem weed infestations; lower crop production costs, and address environmental concerns including the potential threat of agricultural chemicals on water quality.

To achieve program goals, individual grower and group meetings are organized throughout the season. Meetings at on-farm research trial sites allow growers to view the results of new technological advances. These research trials provide the basis for improved IWM practices and recommendations for weed control in field and forage crops. Grower training in proper weed identification and weed scouting is a high priority. Successful growers in the program integrate cultural, mechanical, biological, and chemical control strategies into a systematic approach to optimize crop yields while minimizing the environmental impact associated with agricultural chemicals. Field-scale applied research and on-farm site demonstration plots evaluating the effectiveness of reduced dosage rates of currently available and recently developed preemergence and postemergence herbicides on weed control and crop yields allow growers to make sound weed management decisions. New herbicide-tolerant corn hybrid variety trials introduce farmers to weed management alternatives. Narrow row corn plantings and competitive crop varieties, two cultural practices that could reduce herbicide use, will be included in demonstration projects. The studies will evaluate losses due to weeds, and the potential environmental and economic benefits resulting from different weed management practices. The research trials serve as valuable educational demonstration plots that provide growers with the knowledge, experience, alternatives, and confidence needed to produce optimum yields of field corn with the safest and least amount of pesticides.

Target audiences for the program effort consist of field and forage crop producers.

The impact of the program on participating clientele is measured by written and oral surveys to help determine the success and effectiveness of the IWM program. Producer satisfaction with knowledge gained and weed control is assessed in addition to the number of acres impacted, and adoption rate of new practices. Review of pesticide application records and grower interviews document the reduction in the pounds of pesticide active ingredient and change in pesticide use. Pesticide cost is determined and compared with previous years.

#### Commercial Vegetable Production and Integrated Pest Management

Research Focus: Continued research towards a second level (alternative control based) integrated whole-crop management system for commercial pepper production. Whole-crop management systems offer the potential of complete integration of cultural, physical, genetic, and biological controls to minimize or eliminate the use pesticides. The USDA/CSREES have goals of creating and maintaining a safe, secure and highly competitive agricultural system while protecting natural resources and the environment for a healthy and well nourished population. Producing fresh vegetables free of toxic residues while preventing pollution of ground and surface waters satisfies all of the agencies goals. Vegetable production systems free of potentially harmful chemical residues benefits every man, woman and child in the United States by maintaining a safe food system and environment. Current pesticide use on peppers is quite high. Conventional pepper producers in Connecticut average around 14.6 pounds active ingredient per acre on some farms. Total pesticide use in the northeast region on over 9,000 acres of peppers is estimated to exceed 184,000 pounds of active ingredient. Many of the most commonly used pesticides

(e.g. methomyl, endosulfan, diazinon, metalaxyl, metam-sodium, and methyl bromide) have high or moderate leaching potentials and toxicity.

Measures of success would include the submission and acceptance of journal articles. An additional measure of success would be the substitution of microbial insecticides or trap crop techniques that do not disrupt natural predators and parasite populations, for broad-spectrum chemical sprays.

Outcome products will include peer reviewed journal articles (2-3), an Extension manual (1), trade journal articles (1-2), proceeding/abstracts (2-3), and numerous fact sheets and newsletter articles. Grant dollars in excess of \$5,000 per year are expected.

Partners will include Connecticut Farmers, Specialist within UConn's Department of Plant Science, and federal research funding agencies.

Research projects will be aimed at developing alternative management practices for European corn borer and the pepper maggot. Key components will include: a) efficacy trials to develop microbial insecticide recommendations to replace broad-spectrum chemical pesticides sprays for both insects; b) insect spacial and temporal oviposition habitats will be studied; c) a combination habitat manipulation/trap crop system will be developed to replace pesticide applications; d) various publications will be written on the results of the project; and e) these techniques will be incorporated into the Extension outreach IPM program, along with newly developed thresholds based on critical weed-free-period, genetic disease resistance and insect monitoring studies.

Small plot trials will be used to screen pesticides. Large, unsprayed research plots located on commercial farms will be used to determine insect spacial and temporal oviposition habits and to test alternative management techniques. Investigation of these key components is expected to take five years.

Target audiences for the information developed will include other scientists, Extension Vegetable Specialists and Educators, commercial vegetable producers, legislators, and the general public.

A combination of ANOVA, mean separations, and regression analysis will be used to evaluate these research projects.

#### The Economic Viability of Agricultural Biotechnology

Measures of impact are based upon the overall expansion of the Agricultural Biotechnology program. Specifically, this means to be active partners with government, industry, and the citizenry in the promotion of the economic, social, and cultural development, of the State of Connecticut and beyond. Moreover, to create an understanding among the people of the state of the importance of agricultural biotechnology. Impact will be measured by an increase in the number of ag biotech patents produced by UConn and an increase in the geographic economic development coming from those patents produced.

Outcome products desired include scholarly articles, articles in the popular press on the importance of ag biotech and the creation of 5 new start-up companies in the biotech field in the state.

Partners of the program are both internal and external linkages. Internal linkages are located at the University of Connecticut. Specifically, they are: Ron Cotterill, Director of the Food Marketing Policy Center; Charles Goodman, Director of the Office of Technology Transfer; and Jerry Yang, professor of Animal Science. The only external linkage is Bradford Barham, Professor of Agricultural Economics at the University of Wisconsin-Madison.

Many land grant institutions are in the process of investing heavily in research and education efforts in agricultural biotechnology as part of an effort with state and local support to assist in developing a vibrant and proximate biotechnology sector. This study seeks to go beyond the current work in the field by providing an empirical examination of the importance of university research in the agricultural biotechnology industry. An understanding of these linkages will be used to generate teaching opportunities for students, faculty, and university administrators. This can further the development of the ag biotech sector in the state of Connecticut.

The Extension work will be presentations to the target audiences described below at a number of different forums including classrooms, Extension meetings.

Target audiences include the people of the state of Connecticut involved in ag biotech or who might become involved: scientists, businesspeople, venture capitalists. Other target audiences include farmers, policy makers and students of UConn.

The program will be evaluated based on its ability to meet the goals described above as evidenced by the measures of success and the desired outcome products. This evaluation can be completed with discussions with the target groups.

### Agricultural Biotechnology

Research Focus: The potential now exists to make major improvements in both agricultural production and animal and human health through the use of Biotechnology. This has the potential to have world wide impact by improving both the food supply (producing animals which have higher quality meat, grow faster or are more disease resistant) and providing improved animal and human health products and techniques (using animals as bioreactors to produce human and animal hormones, and other proteins needed for treatment or producing organs which could be transplanted to humans.)

Success is best measured by improvements in the understanding of the basic biological steps involved and the improvement of specific techniques. (Increasing the % of cultured eggs reaching blastocyst stage, elucidating a new biological mechanism in the process of egg maturation, etc.)

The major outcome product desired from this research is a better understanding of the process of egg maturation from the dictyate stage to blastocyst development including such processes as maturation, genome reprogramming, and culture requirements of the different developmental stages. This will be reflected in peer reviewed articles which will allow us to share the information learned with others and also design better ways to manipulate the process to enhance animal production and improve animal and human health.

Partners of the project include Jerry Yang, Tom Hoagland and John Riesen.

This is an ongoing project involving the study and manipulation of the developing oocyte and early embryo development. As this area appears to still be in its infancy, active research is expected to continue in the area for at least another 30 years.

The immediate target audiences are fellow scientists working in this area worldwide. The ultimate audience is the world population who will benefit from improved food quality and supply and improved health. Many of these people will not know or care about the specific scientific publications generated, however, important they may be in allowing scientists to confirm and build on each others work in developing an improved food supply and better methods for animal and human health maintenance.

Evaluation techniques consist of publications, citations and hindsight. The publication of peer reviewed papers provides documentation of progress. Citations of papers published would be one indication the importance of any given discovery. Final evaluation (only available when looking back over periods of several years) would be the role papers played in leading to useful techniques in improving the human condition.

### Agricultural and Resource Economics Academic Program

Teaching is a critical mission for the DARE at the graduate and undergraduate level.

One measure of success is the improvement in understanding of the economic organization and performance of the food system.

Desired outcomes include one undergraduate agribusiness course and a graduate Empirical Industrial Organization course.

Partners of the program include: Rigoberto Lopez, DARE; Charles Clark, Farmtek, South Windsor; Emmanuel Hirth, Central Connecticut Farmers Co-op; and William Simpson, UConn Cooperative. All of which were guest lecturers in an undergraduate course.

Educational methods include the offering of an Undergraduate course in agribusiness principles during the Fall semester and a Graduate course in Empirical Industrial Organization during the Spring semester.

Evaluation techniques involve the use of surveys, which are completed for each class.

### Connecticut/New England Aquaculture Education

Academic Focus: State Regional Aquaculture schools in Bridgeport, Bloomfield and New Haven are implementing science/math curricula with an "aquaculture" theme that encompasses marine sciences, marine technology and related aquatic husbandry and environmental management courses. Through the Advisory Board planning process new facilities, innovative curricula, student articulation, teacher certification and intern programs are established statewide. A proposed Southeastern Connecticut vo-aqua school is presently being vigorously competed for by local school systems. The site selection and evaluation procedure will be critical to advise foundation of the regional agriculture institution. The New England NSF grant has offered other states an example of the Connecticut vo-aqua model and the support mechanism necessary for continued operation. New curricula are needed and will be developed through coordination; in Connecticut special lecture and research topics have evolved (i.e. scallop and eel) to create international scientific exchange with China and the valuable student opportunities. Over 300 high school students will improve math/science skills through the aquaculture discipline focus and eventually chose careers in related fields. State universities are responding by offering "aquaculture"

concentrations at the community College, technical and four-year university level to meet their academic responsibility.

Success will be measured by the attainment of set goals. Goals of accomplishment include: Establishment of a Southeastern Connecticut Regional Vocational Aquaculture School; implementation of aquaculture schools and defined curricula developed under my NSF/NEBHE project, increased number of "aquaculture oriented students enrolling in state universities (i.e. University of Connecticut CANR -Aquaculture minor); continued state/federal funding to improve the "aquaculture/agriculture" umbrella for alternative regional high school education (past years included state appropriations of around \$15 million for each school construction, and foundation grants supplemented scientific equipment and international scholarly exchange. Student/teacher presentation will be delivered at school ceremonies, workshops (co-sponsored with UConn CES grant funds), and paper/poster delivered at the annual NMFS Shellfish seminars. General media coverage will continue as community focus highlights significant coastal school activities (i.e., field trips, research vessel applications, environmental quality).

Outcome products desired include NSF and school newsletters, media articles and video productions, aquaculture curricula developed and refined for national use, continued teacher training and N.E. aquaculture programs.

Partners of the program include UConn - CANR (Pathobiology, Aquaculture and Natural Resources, Resource Economics and Environmental Engineering and Management) NMFS, Regional Vocational Aquacultural Schools, NEBHE, NSF-ATE DA/BA, DEP, Industry (internships), (MS).

Key components of the five-year aquaculture education plan will include strategic planning at the middle school, high school, community College, technical school and four-year university track. The funding and guidance for Connecticut RVAS programs will be conducted by Advisory Boards, the superintendents and local Board of Education for participating schools. A component for both this plan and the Tier I Shellfish Hatchery goal will be to incorporate HACCP seafood safety and water quality lessons and working agenda where ever appropriate in the student to industry spectrums.

New curricula offered will enlighten students in the sciences and lead to diverse careers in aquatic disciplines; needs assessment and documentation of student academic progress and eventual career choice will measure value of this unique educational process; exposure to field experiences and at-sea operations will intrigue students in natural resource and engineering subjects; collaboration with regional New England wide educational organization will strengthen the common concepts of aquaculture theme development.

The target audiences for the program effort include students/parents/teachers; Boards of Education; Universities; the respective state legislatures' appropriate agencies, NEBHE expanded inter-state opportunities and NSF-ATE program.

Evaluation of the program will be based upon participant evaluation, grant dollars received and level of community interest. Several workshops have received extensive participant evaluation and the respective process will continue; tracking of student career paths will be continued by RVAS; level of community interest and legislative dollar support will be a gauge of confidence; assure quality of academic and educational personnel involved in the planning and delivery.

### Aquatic Animal Health

Research Focus: The present program aims at pursuing diagnostic service and related research to evaluate the health status of different species of aquatic animals ranging from shellfish to finfish and marine mammals. This will ensure the health of collections of aquariums for public display, allowing for public education, as well as the health and good quality of fisheries and aquaculture food products, allowing for maintaining a high level of public health.

Impact will be measured by the success of continuous funding of research efforts and dissemination of the information through peer-reviewed publications.

The partners of the program include Sal Frasca, Richard French, Louis Pierro (UConn), John Volk, John Karolus and Inke Sulina (CT Bureau of Aquaculture), with collaboration in oyster immunology, pathology and diagnosis of pathogens and diseases. Additional partners include the Mystic Aquarium and the Maritime Aquarium, with collaboration in the health of display aquatic species.

Resources include sources of external funding such as the USDA/CREES, CT Sea Grant, Institute for Teaching and Learning.

Key components of the program include oyster pathology (8/97-present), aquatic animal pathology (8/98-present) and oyster immunology (11/98-present).

The primary strategy is the use of original sound scientific experiments based on hypothesis-oriented research, according to proposals to granting agencies, and publication of results in peer-reviewed scientific journals.

The target audience consists of the scientific community and eventual diffusion to the general public. Evaluation is based upon the success at obtaining grants and at publishing results in peer-reviewed scientific journals.

#### Undergraduate Teaching Program in Aquatic Animal Health

**Research Focus:** This program focuses on developing an archive of pathology case material with which to teach aquatic animal pathology at the undergraduate level within the context of the University of Connecticut's aquaculture initiative. The program involves collaborations with Mystic Aquarium and the Maritime Aquarium at Norwalk to accession a wide variety of marine mammal, finfish and aquatic invertebrate pathology cases. This will initiate the creation of the archive. The long-term goal is the creation of a teaching program in aquatic animal pathology that incorporates collaborative investments from regional aquariums, state finfish hatcheries, and shellfish producers. The result will be a broad-based teaching program that will expose undergraduate students to didactic teaching and experiential learning from a wide variety of sources of aquatic animal species and an equally broad range of culture scenarios. In addition, students will be able to participate in externships to acquire experience and training from professionals with expertise not readily available on the University's campus.

Success will be measured by increased undergraduate enrollment, undergraduate participation in externships, and successful competition for external funding.

Desirable outcomes include the success of continuous funding efforts and by increased undergraduate participation in the aquaculture minor. Increased numbers of externships and increased numbers of undergraduates wanting to pursue advanced study (i.e. Masters, Ph.D.) in aquaculture-related fields are also desired outcomes.

The partners of the program include Sylvain De Guise, Richard French and Louis Pierro, all of which are from the University of Connecticut. Additional partners include John Volk, John Karolus and Inke Sulina, from the CT Bureau of Aquaculture. Moreover, the Mystic Aquarium and the Maritime Aquarium at Norwalk are also valuable partners.

Resources of the program are external sources of funding, such as the Institute for Teaching and Learning at the University of Connecticut and the Connecticut Sea Grant College Program.

A key component of the program description is to propose a plan for a collaborative undergraduate teaching program in aquatic animal health.

The primary strategy is to use the diagnostic pathology services of the Department of Pathobiology and the unique aquatic animal culture scenarios in place at regional aquariums to create an archive of pathology case material with which to teach aquatic animal pathology to undergraduates in the context of the University's aquaculture minor.

The principal target audience is the undergraduate community of the University of Connecticut, followed by undergraduates at regional universities, scientific collaborators, and eventually the general public.

Evaluation of the program will be accomplished through surveys of participating undergraduates, quality control of pathology services to collaborative institutions, success at external funding, and publication of some case material in peer-reviewed scientific journals.

#### Aquatic Animal Health

The contribution of the Department of Pathobiology to this multidisciplinary aquaculture minor is to provide didactic and active teaching and research in the field of aquatic animal health (e.g. preventive medicine, disease recognition and treatment, mechanisms of disease, health surveillance). To this end the University has hired new veterinary research faculty in the Department of Pathobiology, myself being one of those faculty members.

An anticipated measure of success is the realization of a new undergraduate course entitled, "Systemic Finfish and Shellfish Pathology and Microbiology," (PATH 256) will be offered in Spring Semester 2000.

Desired outcomes include continued funding of research efforts and dissemination of the information through peer-reviewed publications and national and international conferences.

Partners of the program include Richard A. French, Salvatore Frasca, Jr., Sylvain De Guise, and Herbert J. Van Kruiningen.

Key components of the program are to promote research, diagnostic medicine and Extension efforts in the area of aquatic animal health in the State of Connecticut and New England region.

Strategies include collaborative research and teaching efforts.

The target audience for the program effort consists of state, national and international scientific community and aquaculture industry.

Evaluation techniques are based upon the diagnostic case load, grant funding and publications.

### Fruit Specialist/Entomologist

Measures of success are based upon publications, newsletters, fact sheets, educational instruction, grower/twilight meetings, New England Fruit Consortium meetings, Extension Annual Conferences, field visits, special workshops, web site linkages, knowledge gained, newsletter surveys

This work will result in expansion of newsletter subscriptions, new fact sheets/bulletins published in Extension, adoption of IPM practices and new growers educated in IPM and crop management.

Internal partners will be: CANR Plant Science and Extension staff, CTAES, IPM Team. External partners will be: Rutgers, Cornell, UMass, University of New Hampshire, Maine, Penn State Fruit Specialists, New England Fruit Team, Extension Councils.

Key components of the program include: Yankee Grower Newsletter Editorial Committee; Editor, Home and Garden News; New England Small Fruit Team; New England IPM Team (vegetables and small fruit); Consultant, Connecticut Pomological Society; Liaison for Connecticut Wine Council; Commercial Industry contacts CES Annual Fruit and Vegetable Conference Committee.

Educational methods include: Annual Extension Meetings - seminars and panels; New England wide fruit conferences - Sturbridge, MA - annual winter meetings; Grower Twilight meetings sponsored by Connecticut Pomological Society; Quinnebaug Growers Association Annual Meeting; Extension newsletter fruit articles; Interpretation and recommendations - fruit soil test reports; educating growers in IPM proper use of pesticides and pest management, increased knowledge of principles of crop production. Instruction in proper planting, pruning, trellising, fertilization of fruit crops.

Evaluation techniques include grower newsletter surveys.

### Commercial Vegetable Production and Integrated Pest Management

Cooperative Extension System Focus: There are many problems and concerns related to the use of pesticides in commercial vegetable production. Some of the concerns include overuse and misuse of pesticides, pollution of ground and surface waters, unwanted residues on food, drift to non-target areas, hazards to beneficial and other non-target organisms, pest resistance, and public and applicator safety. Integrated pest management (IPM) is the use of a variety of pest control and crop management methods designed to protect public health and the environment and to produce high quality crops and other commodities while minimizing pesticide use and maximizing farm profitability. The USDA/CSREES have goals of maintaining a safe, secure and highly competitive agricultural system while protecting natural resources and the environment for a healthy and well nourished population. Producing fresh vegetables free of toxic residues while preventing pollution of ground and surface waters satisfies all of the agencies goals. Vegetable production systems free of potentially harmful chemical residues benefits every man, woman and child in the United States by maintaining a safe food system and environment.

Measures of success would include the substitution of microbial insecticides or other alternatives control measures for broad-spectrum chemical sprays and an increase in applicator knowledge. Grant dollars in excess of \$10,000 per year are expected to deliver educational programs.

Outcome products will include numerous fact sheets, newsletter articles and an Annual Report to the Connecticut Legislator.

Partners of the program are Connecticut Farmers, County Soil and Water Conservation Districts, CT DEP and other commodity IPM program leaders at UConn. All of the partners will cooperate on grants to deliver the educational program to the producers.

Commercial vegetable producers and others will be trained in methods to assess and control pest populations in the most environmentally sound manner possible while sustaining maximum profitability. Currently, vegetable IPM programs are available in the following commodities: cole crops, sweet corn, peppers, tomatoes, eggplant and squash. Key components will include on-farm grower training sessions and demonstration projects, publications and oral presentations, and project and user evaluations.

The key educational component will be IPM full-season field training programs for commercial vegetable growers. The program will consist of periodic visits to participating clients sites to provide hands-on, intensive training in the field. The following topics will be included in field training: IPM (environmental and profitability) goals and benefits; monitoring of pests with traps; weather monitoring for diseases; pest scouting; action thresholds; biological and natural control organisms; resistance management; pest management decision-making; pesticide selection and equipment calibration. Demonstration plots will also be used in some commodities to illustrate the results of successful IPM practices and recommendations.

Target audiences will include commercial vegetable producers, other scientists, Extension Vegetable Specialists and Educators, legislators, and the general public.

Evaluation techniques consist of surveys and interviews. IPM educators will survey and/or interview program participants to determine: the knowledge gained in IPM and vegetable production; skills learned; the level of IPM adoption; and the level of pesticide risk reduction achieved by the use of less toxic pesticides, the use of pesticides with lower leaching potentials, the use of pesticides with fewer effects on non-target organisms and the reduction in the total amount of pesticide used.

Pre- and post-program surveys will also be conducted to determine these changes. In situations where sustained efforts are made to train growers within a defined area, such as a specific watershed, additional evaluations will be made to assess total change over time (3-5) years.

### Equine Teaching (Dairy/Livestock)

**Academic Program:** There are approximately seven million horses in the United States at the present time. This number is rapidly growing from a low of approximately 3 million reported in 1959. The 1959 numbers showed a rapid decrease from the 1915 report of approximately 26 million equine. The initial decrease of horse numbers resulted from the rapid mechanization of farms and the development of gas driven tractors etc. The remarkable increase in horse interest and horse numbers is thought to be the result of increasing leis.

The large and increasing interest in horses provides a great opportunity for the University of Connecticut to attract new students. The equine program at the University of Connecticut has grown steadily over the last 30 years. The number of classes taught and the number of students in Horse Practicums is at an all time high. National recognition has been achieved in polo (six National Championships), Horse Judging (National Championship), Equestrian Team (National Championship riders) and Morgan Horses (many National Championships).

Perhaps the most desired outcome is to produce a well rounded student who will be able to compete successfully in the job market upon graduation.

Partners of the program include other Colleges and universities. The intercollegiate program works with other Colleges and universities at the local and national levels. At the Extension level, the program also works at the local and national level.

The Equine Program has been in existence since 1931 and has been continuous. The program includes educational, research and Extension components.

The UConn Horse Barn is one of the main tourist attractions on campus. During the year, bus loads of children and adults visit the barn. It has been estimated that over 2,000 individuals visit the barns each month! Other attractions such as Holiday Barn, Spring Horse Sale, FAA Judging Contest, Intercollegiate Equestrian Shows, Intercollegiate Polo Matches, etc. attract many additional visitors to the UConn Horse Facilities.

Target audiences for the program effort include potential College students, horse enthusiasts, 4-H members and leaders, FFA member and leaders as well as the general public.

Evaluation of the program is based upon team results and public support. Team results include awards, such as regional and national awards. Public support is based upon attendance at events, monetary donations, and the donation and/or sale of horses.

### Home and Garden Education Center

**Cooperative Extension System Focus:** The UConn Home and Garden Education Center is designed for educational outreach to the public to meet the needs of an increasingly diverse variety of issues including home horticulture, entomology, soil science education, food safety, nutrition, drinking water and water quality, family financial management and gardening.

Measures of success are based upon increases in the dissemination of information through toll free statewide 800 number, voice mail and fax on demand and recorded messages and the dissemination of published information through VCR tapes, fact sheets, Extension bulletins, home pages and web sites, linkages and hotline items.

Outcome products desired include a Home and Garden Education Center Newsletter, educational television programming and digital diagnostic sites linked to the Center. Also desired is the development of new short courses for home horticulture, video education tape series in entomology, new Extension bulletins, fact sheets and brochures.

Partners of the Home and Garden Education Center include both internal and external linkages. Internal linkages include the UConn Extension Centers, Master Gardener volunteers, CAEMG (Connecticut Extension Master Gardeners), CANR faculty and staff, Soil Testing Laboratory and the 4-H program. External linkages include collaborating agencies such as the Department of Agriculture, garden clubs, garden centers, nurseries and science groups.

The education program for the Home and Garden Education Center is multifaceted and diverse utilizing a variety of methods to deliver information. One of these methods is to develop new publications for specific pests, insects and gardening problems. Another method is to train program assistants partners and commercial garden centers. Moreover, adapting computer technology for databases, web page, hotlines and CD-ROM programs is an important method. The last method is to expand public outreach educational programming via workshops, seminars and courses.

Educational strategies involve providing digital distance diagnostics, specimen ID, web site information and core manuals to homeowners, master gardeners, center users and UConn alumni. Research strategies include urban pest management grant research (household pests) and the use of an advisory committee for CANR collaborative research.

Target audiences include roughly 50,000 public citizens, 5,000 center users annually and a master mailing list of 10,000 to 25,000 people over the next five years.

Evaluation techniques consist of surveys, questionnaires and feedback. Annual pre and post test surveys are used to evaluate the courses offered. Survey evaluations and questionnaires are used to evaluate the newsletter. Feedback in the form of user letters of appreciation and acknowledgement evaluate the Center itself. Lastly, program participants perform Instructor/Teacher evaluations.

### Nutrient Management Planning

Cooperative Extension System Focus: Nutrients, particularly nitrogen and phosphorus have been documented as pollutants of Connecticut's ground and surface water. Nonpoint sources from agricultural operations have been identified by EPA as having a detrimental effect on over 35,000 miles of streams and rivers in the United States. The USDA-EPA Unified National Strategy for Animal Feeding Operations proposes a national expectation that all animal feeding operations will develop and implement comprehensive nutrient management plans by the year 2008. Connecticut has an estimated 770 beef farms, 267 cow dairies, 5 goat dairies, 312 sheep farms, 293 hog farms and 391 poultry operations, all of which will need to develop plans to meet the compliance goal. Cooperative Extension's role in this process is to develop a set of criteria in cooperation with USDA NRCS that will outline the requirements of an acceptable plan. A demonstration project using farms applying to USDA FSA for EQIP funding for nutrient management planning will be used to develop the planning process, and training materials that individual producers could use/follow to develop their own plans.

Measures of success are based upon the number of plans developed, numbers of plans implemented after incentive funding is exhausted and the publication of Nutrient Management Planning Criteria. Other measures of success include: a Nutrient Management Planning Computer Program for individual use available in print, on disk and on the internet; research data on the profitability of hauling manure with various types of equipment to farm fields in Connecticut; changes in attitude and behavior of farmers to view manure as a resource not a waste to be disposed of; and a documented decrease in the rate of accumulation of phosphorus in individual farm fields.

Outcome products desired include plans, spreadsheets and various publications. For example, Comprehensive Nutrient Management Plans for producers participating in the demonstration project and computerized spreadsheets for farmers to use in order to develop their own plans. In addition, a peer reviewed, popular press and newsletter articles on the economics of hauling manure in Connecticut are desired. Lastly, GIS maps of farm fields for demonstration project participants are also among the desired outcome products.

The only external partner of this project is the USDA NRCS. Pass through funding in the amount of \$27,000 has already been received.

The demonstration project will be funded for a minimum of 5 years. Farms sign 5 year contracts to participate in the project. They agree to keep detailed farm records of cropping practices and to supply them to CES and NRCS. UConn in turn develops GIS maps of the farm field layouts and travel routes to the fields. Baseline data on soil fertility levels and manure handling practices is collected the first year for comparison purposes. Farmers receive a nutrient management plan from CES and agree to implement it for 5 years. NRCS pays up to \$10,000 per year for the first 3 years of the contract as an incentive. Farmers complete the last 2 years without any incentive payment. Soil samples in the first, third and fifth years for each farm will be used to document nutrient accumulation trends.

For those livestock operations not participating in the demonstration project obtaining data and documenting change will be significantly more difficult. Farms that obtain training materials, plan workbooks or software will be documented. Soil sample data coming into the UConn Soil Test lab from farms known to have obtained nutrient management planning information will be monitored for change in accumulation rates. Statewide trends in nutrient levels of farm fields will be monitored for overall trends.

A follow up questionnaire will be developed and sent to those individuals that requested/purchased planning workbooks or other materials to obtain data on proposed or implemented change in farming practices following use of planning materials provided.

An important strategy or method is the use of workshops. Workshops will be conducted following the development of the computer programs and other training materials to educate producers in the need for nutrient management planning and the techniques used to develop plans. Workshops will be targeted to individual species of livestock where practical and general sessions for anyone to attend will be offered.

Target audiences for the program effort include livestock producers in the state.

Evaluation of the program is based upon: the number of plans developed; the number of plans implemented after incentive funding is exhausted; changes in attitude and behavior of farmers to view manure as a resource not a waste; and documented decreases in the rate of accumulation of phosphorus in individual farm fields. Moreover, soil samples in the first, third and fifth years for each demonstration project farm will be used to document nutrient accumulation trends.

For those livestock operations not participating in the demonstration project obtaining data and documenting change will be significantly more difficult. Farms that obtain training materials, plan workbooks or software will be documented. Soil sample data coming into the UConn Soil Test lab from farms known to have obtained nutrient management planning information will be monitored for change in accumulation rates. Statewide trends in nutrient levels of farm fields will be monitored for overall trends.

A follow up questionnaire will be developed and sent to those individuals that requested/purchased planning workbooks or other materials to obtain data on proposed or implemented change in farming practices following use of planning materials provided.

#### Diagnostic Toxicology

Epinephrine and acetaminophen represent two drugs of interest that have wide reaching clinical implications. Evidence of epinephrine poisoning is compromised by the inability of known methods to differentiate between endogenously produced epinephrine or epinephrine that has been administered. There is no method available to make this differentiation. The goal of the program is to develop a method that can make this determination. Acetaminophen toxicity is well known and documented. Early detection of this problem by conventional blood concentrations and liver enzyme levels has not been successful. This project aims to develop a method of early detection of acetaminophen toxicity.

Measures of success include collaboration and shared funding in addition to successfully developing methods for clinical use.

Outcome products desired include peer-reviewed articles, improved reliable testing methods and trained graduate students.

Partners include Drs. Wu and Tsongalis from Hartford Hospital's Department of Pathology and Dr. Cohen from the University of Connecticut School of Pharmacy.

An important resource is the Hartford Hospital Clinical Chemistry Training Grant, which lasts from 1994 to present.

Key components of the project description include the ratios of metanephrine/normetanephrine as an indication of exogenous epinephrine administration, 1998-2001. Another key component is the acetaminophen binding protein as a toxicity marker, present to 2005.

Earlier studies have identified a protein in the liver that increases in concentration with acetaminophen toxicity. (1,2) Plasma levels of this protein could be used as a marker for early acetaminophen toxicity. Use GC/MS, LC/MS and ELISA technologies to identify, characterize and quantify this protein in the plasma. Determine metanephrine/normetanephrine ratios in fluids and tissues of experimental animal models and correlate to exogenous administration and toxicity of epinephrine.

Target audiences are government and regulatory agencies, clinical labs, pharmaceutical industry and graduate students.

Evaluation techniques will include success of new methods to differentiate between administered and endogenous epinephrine; successful completion of graduate student research projects, publications and grant funding. Identifying acetaminophen early toxicity marker.

#### Role of Toroviruses in Diarrheal Diseases of Animals and Man

Research Focus: Toroviruses are small RNA viruses that infect the GI tract and cause diarrhea. Disease usually affects the young causing intractable diarrhea, and in animals, death from dehydration. Toroviruses affect horses, cattle, swine, cats and human infants. Because the viruses cannot readily be cultivated in tissue culture, it has

been difficult to generate reagents to study the disease - one needs antigen and antibody. The virus is being studied that induces calfhood diarrhea, called Breda virus. It is hoped to develop reagents and methods for diagnosis.

Measures of success will be to find the virus by EM on diarrheac feces or on diseased intestinal villi. Calf feces said to contain the original Breda virus have been obtained and a new-born colostrum will soon be inoculated - deprived calf or two in hopes of amplifying the virus and recovering same from feces. Dr. Garmendia will then attempt to grow the virus in various cell lines. Virus antigen can be generated by separation from feces but that is time consuming. Success will be had if the virus is recovered, i.e. cultivate it successfully in some cell line - then antibody can be produced, diagnostic testing can be done, (the toroviruses cross-react with one another), incidence of disease can be ascertained and there is the potential to produce a vaccine.

Outcome products desired is funding from Pfizer, the Research Foundation, USDA and even NIH or WHO, in the latter instance to study the virus of human infant diarrhea and to be published in peer-reviewed journals of veterinary medicine or virology.

Partners will be: H. J. Van Kruiningen, Antonio E. Garmendia, A.B. West. Dr. Garmendia is a highly skilled virologist who will succeed in recovering calfhood torovirus. Dr. West will provide electron microscopy.

Key components of the project include: generate Breda virus in calves; cultivate Breda virus; generate polyclonal antibody; generate monoclonal antibody; and test for the frequency of disease in calves from Connecticut and New England. The project will last from the year 1999 until the year 2005.

Calves less than three months of age that are presented for autopsy and that have diarrhea will be examined by light and electron microscopy for the presence of characteristic lesions and virus particles. Frozen intestine can then be retrieved for virus isolation attempts on segments known to be rich with the infectious agent. Polyclonal antibody will be generated in rabbits and monoclonal antibody in mice. ELISA can be designed to test animals for antibody, and immuno-cytochemistry can be used to demonstrate virus in tissues of affected animals.

Target audiences for the program are dairy and beef producers then swine producers. If successful, target audiences will move into the human infant field of research.

Evaluations will use EM and the limited supply of antibody given to test cell lines, for the presence of growing virus. Then the attempt is made to reproduce the disease in calves in classic fashion - reproducing the disease and recovering the agent would fulfill Koch's postulates.

### Environmental Health

The development of effective animal and human vaccines is a high priority and the basis of a multi-billion dollar industry. Efforts will continue in this area, working on vaccines to protect animals against *Mycoplasma gallisepticum*, foot and mouth disease virus and aflatoxins. In addition, efforts will continue to develop methods that increase the efficacy of DNA vaccines administered at mucosal surfaces.

Success will be measured by conducting challenge studies that indicate that the intervention (vaccination) results in a statistically significant decrease in incidence or severity of the disease. Other intermediate end-points may also be useful in this regard, such as viral neutralization assays (in vitro) or antibody titers. The advancement of knowledge, reflected by manuscripts accepted in peer-reviewed journals, and the receipt of grant support for these studies are also measures of success and scientific impact.

The desired scientific output from these research efforts is the publication of manuscripts in highly esteemed scientific journals, invitations to speak at conferences and symposia, the receipt of extramural grant support, and the training and graduation of graduate students.

Internal linkages located on campus include Drs. Geary, Garmendia, Marcus, Sekellick, Darre, Van Kruiningen and Lynes. Most of this effort centers around the development of a mucosal vaccine for *Mycoplasma gallisepticum*. External linkages off campus include collaborations with Drs. Edith Mathiowitz (Brown University) and Yong Jong working on encapsulated DNA vaccines and particle uptake across the Peyer's patch, Dr. Fred Brown at the USDA ARS laboratories at Plum Island developing approaches to induce upper respiratory tract immunity to foot and mouth disease virus using retro-inverso-peptides. Work is also closely being done with Dr. Marian Neutra (Harvard University) on mucosal uptake and expression of DNA vaccines.

Key components of the program include active and pending grants. Active grants include: Development of a mucosal *Mycoplasma gallisepticum* vaccine for Poultry. USDA Hatch Act. 10/1/98 - 9/30/01. \$26,946; Vaccine Trials for Avian Influenza Virus, Protein Sciences Inc. 6/1/97 - 5/31/99 \$23,143; FACSCalibur Fluorescence Activated Cell Sorting Core Facility - UConn major equipment Competition, 1/1/98 - 12/31/99 \$72,665; Development of *Mycoplasma gallisepticum* strain as a live attenuatee vaccine and vector for the protection of chickens and turkeys from respiratory disease. 1/1/99 - 12/31/00. \$300,000. (Co-P.I. with Drs. Geary, Marcus and Sekellick)

Pending grants include: Bioadhesive Microspheres for oral DNA vaccination. NIH, Subcontract with Spherics, Inc. \$30,000.

The research strategy revolves around the development of mucosal vaccines that can induce local, cellular and humoral immunity to a variety of infectious organisms and toxins. This approach requires the use of biochemical approaches (i.e. coupling of immunogens to mucosal adjuvants) and molecular biology (developing mammalian expression plasmids for use as DNA vaccines).

The target audience is the readers of scientific journals relating to vaccine development and specific diseases.

Evaluation techniques consist of publications of peer-reviewed scientific articles and citations to these articles in other people's papers.

### Equine Science Education for Youth, College Students and Adults

There are an estimated 6.9 million horses in the United States today. Years ago, the horse was a necessity as a work animal. The horse population in the United States reached a peak at 26.6 million in 1915, and then suffered an enormous decline as the perceived usefulness of the horse was replaced by machine. In 1959, the horse population in the United States sunk to a low of 3 million, and unfortunately, as a result, much knowledge in regard to care and use of the horse was lost. Since the early 1960s, an increase in the leisure time of Americans has enhanced interest in the use of the horse for recreation. With the increasing economy, it is more and more common for the horse to be a companion animal for middle class families, rather than limited to horse business or the lifestyle of the rich. The horse provides a positive experience for many people: youthfulness for adults, responsibility for youth, mental therapy for troubled individuals and important physical therapy for those physically challenged. In Connecticut, there are an estimated 48,000 to 50,000 horses (CECA, 1996), or one for every 65 people, a greater per capita concentration than in any other state. There are approximately 1,500 4-H youth horse projects in Connecticut at present, more than dairy, beef, sheep, hogs and poultry combined. In some cases, these youth are continuing a family tradition, but more often these youth stem from backyard horse owners—from a generation of parents who have purchased the horse as a family companion without the knowledge base of optimal care and management. Thus, the enhanced interest and use of the horse has increased demands for education regarding facilities and waste management, pasture management, nutrition, reproduction, exercise and conditioning, first aid and veterinary care.

Measures of impact are based upon the change in knowledge of the program participants. Overall, the horse will benefit from informed individuals, and the horse industry will continue to be sustained by an influx of new and knowledgeable owners. The suggested program also provides an opportunity for the University of Connecticut to attract new students. The Department of Animal Science has been growing steadily for many years, and the number of horse-interested students is at an all-time high. National recognition has been attained in the Polo Teams, the Equestrian Team, the Horse Judging Team and many individuals riding University-bred Morgan horses. Additionally, these programs help to get the public involved, and as people become more involved, the potential for donations to the program increases.

Optimally, the program participants will gain knowledge about the importance of properly managing a horse, with the care and welfare of the animal first in mind. As youth learn more about proper horse care, a foundation of knowledge will be built and will provide the tools needed to compete successfully in the horse industry. Adult backyard owners and parents of horse-interested youth will also gain knowledge to enhance the care and welfare of their horses.

Partners include the UConn Horse Unit, which comprises the small group of individuals associated with this program. The Cooperative Extension System at the University of Connecticut provides resources related to facilities, advertising, and an umbrella for possible funding and liability for related events.

The Equine Program in the Department of Animal Science has been in existence since 1931 and includes Extension, research and educational components. Some of the Extension components include Horse Science Community Lectures and Workshops (Hoffman), the Horse Science Symposium (Hoffman), Safety Clinic for Camp Horsemanship Instructors (Hoffman and Bennett), Teen Connection (Hoffman and Bennett), Horse Practicum (Dinger, Callahan, Bennett and Pelletier), Holiday Barn (Dinger), Intercollegiate Horse Shows (Callahan), Intercollegiate Polo Matches (Dinger), FFA State Horse Contest (Hoffman, Bennett and Dinger), 4-H State Horse Contest (Hoffman), New England Regional 4-H Contest, Eastern National 4-H Round-up, and Eastern States 4-H Selection and Horse Show (Hoffman).

The Horse Science Community Lectures and Workshops are designed to reach all people in the state through changing location. The Extension centers and private facilities have been used as resources in which to hold the programs. The Horse Science Symposium is central to UConn but is designed to provide a wide range of

exposure to horse industry components by centralizing nationally recognized horse industry leaders and combining their strengths to provide a well-rounded weekend program. The Safety Clinic for Camp Horsemanship Instructors is designed to teach proper horse safety to all horse instructors in Connecticut summer camps. In this manner, information is dissipated to a small number of individuals who in turn teach safety to youth and also teach their programs more safely. Teen Connection, Horse Practicum, Holiday Barn and the Intercollegiate Horse Shows and Polo Matches are designed to teach youth and adults about the horse while also familiarizing them to UConn's horse program, thus potentially attracting students. The FFA and 4-H State Horse Contests, as well as the New England Regional 4-H Contest, Eastern National 4-H Round-up, and Eastern States 4-H Selection and Horse Show provide a fun method of reinforcing what has been learned by youth in the programs.

The target audience includes youth, aged 7-18; 4-H and FFA members and leaders, potential College students, College students and adults, both in the horse industry and the general public.

Evaluation techniques include assessments of all components of the program, attendance at events, records of scores achieved at 4-H and FFA contests, numbers of students entering the UConn Equine Program, and perhaps, donation of money and horses to the program.

### Integrated Crop Management (ICM)

There are many concerns related to the use of pesticides in agricultural areas. Some of the risks associated with pesticide use include pollution of ground and surface waters, drift to non-target areas, hazards to beneficial organisms, resistance of pests to pesticides and pesticide applicator safety.

Integrated crop management is the use of a variety of pest control methods designed to protect the environment and to produce high quality crops with the most judicious use of pesticides. In Connecticut, water quality issues are of particular concern. Several agricultural pesticides have been found in groundwater wells in Connecticut. The report, Pesticides in Ground Water, recommended that there should be an emphasis on developing ICM strategies for major crops and support for implementing ICM. Best management practices for nutrient management has also been developed.

Measures of success will be: increased adoption of ICM practices; pesticide risk reduction and nutrient reductions; and an increase in agricultural profitability by reducing pesticides and application costs, maintaining or increasing crop quality.

This work will result in: state and regional Extension bulletins and fact sheets; state and regional Extension IPM manuals and recommendations for commodities; presentations at grower and clientele meetings; on-Farm demonstration projects; technical reports; annual reports and fact sheets for legislators; and the use of electronic media for dissemination of information via the UConn IPM web site.

Resources of the program include: grower and clientele groups; CT Department of Environmental Protection; CT Agricultural Experiment Station; Federal Agencies - USDA, EPA; and IPM Specialists.

The goals of the UConn CES ICM program are to provide pesticide users with the knowledge, skills, methods, experience and confidence needed to produce high quality crops with the safest and least amount of pesticides. Current ICM programs includes vegetable crops, fruit crops, field corn, turfgrass, and greenhouse crops. ICM educational programs will be offered on a statewide basis. Based upon funding availability, ICM staff will continue to conduct applied research to investigate new techniques that can be incorporated into educational programs. Research will focus on methods such as biological control organisms, cultural controls and biorational pesticides.

The primary educational method consists of full-season ICM training to provide hands-on intensive training at the grower location. The focus of this training is to provide pesticide users with the knowledge and skills to begin adoption of ICM practices and techniques. ICM information will be provided to clientele groups through presentations, at annual meetings. ICM information will be provided to commercial and private pesticide applicators through the pesticide applicator training program.

The target audience for the statewide ICM program is comprised of commercial producers of vegetable crops, fruit crops, field crops and greenhouse crops plus commercial turfgrass managers. The volunteer Master Gardeners, homeowners, and state and local governments are also part of the target audience.

Evaluation techniques include the development of standards and surveys. ICM standards will be developed. A random sample of clients will then be surveyed to determine adoption of ICM methods.

### Commercial Vegetable Production and Integrated Pest Management

There are many problems and concerns related to the use of pesticides in commercial vegetable production. Some of the concerns include overuse and misuse of pesticides, pollution of ground and surface waters, unwanted residues on food, drift to non-target areas, hazards to beneficial and other non-target organisms, pest resistance, and

public and applicator safety. Integrated pest management (IPM) is the use of a variety of pest control and crop management methods designed to protect public health and the environment and to produce high quality crops and other commodities while minimizing pesticide use and maximizing farm profitability. The USDA/CSREES have goals of maintaining a safe, secure and highly competitive agricultural system while protecting natural resources and the environment for a healthy and well nourished population. Producing fresh vegetables free of toxic residues while preventing pollution of ground and surface waters satisfies all of the agencies goals. Vegetable production systems free of potentially harmful chemical residues benefits every man, woman and child in the United States by maintaining a safe food system and environment.

Measures of success will be the substitution of microbial insecticides or other alternatives control measures for broad-spectrum chemical sprays and an increase in applicator knowledge. Grant dollars in excess of \$10,000 per year are expected to deliver educational programs.

Outcome products desired include numerous fact sheets, newsletter articles and an Annual Report to the Connecticut Legislator.

Partners will include: Connecticut Farmers, County Soil and Water Conservation Districts, CT DEP and other commodity IPM program leaders at UConn. All of the partners will cooperate on grants to deliver the educational program to the producers.

Commercial vegetable producers and others will be trained in methods to assess and control pest populations in the most environmentally sound manner possible while sustaining maximum profitability. Currently, vegetable IPM programs are available in the following commodities: cole crops, sweet corn, peppers, tomatoes, eggplant and squash. Key components will include on-farm grower training sessions and demonstration projects, publications and oral presentations, and project and user evaluations.

The key educational method will be IPM full-season field training programs for commercial vegetable growers. The program will consist of periodic visits to participating clients' sites to provide hands-on, intensive training in the field. The following topics will be included in field training: IPM (environmental and profitability) goals and benefits; monitoring of pests with traps; weather monitoring for diseases; pest scouting; action thresholds; biological and natural control organisms; resistance management; pest management decision-making; pesticide selection and equipment calibration. Demonstration plots will also be used in some commodities to illustrate the results of successful IPM practices and recommendations.

Target audiences will include commercial vegetable producers, other scientists, Extension Vegetable Specialists and Educators, legislators, and the general public.

Evaluation techniques consist of surveys and interviews. IPM educators will survey and/or interview program participants to determine: knowledge gained in IPM and vegetable production; skills learned; and the level of IPM adoption. Also needed to determine is the level of pesticide risk reduction achieved by: use of less toxic pesticides; use of pesticides with lower leaching potentials; use of pesticides with fewer effects on non-target organisms; and reduction in the total amount of pesticide used. Pre- and post-program surveys will be conducted to determine these changes. In situations where sustained efforts are made to train growers within a defined area, such as a specific watershed, additional evaluations will be made to assess total change over time (3-5) years.

### Integrated Pest Management (IPM)

Results of applied research projects using Integrated Pest Management (IPM) methods (please see individual plan) will be incorporated into training programs for commodity growers and natural resource managers to a) encourage reduction of pesticide usage while maintaining crop quality and b) conserve biological diversity.

Measures of impact include reductions in pesticide usage from adoption of IPM methods and an increase in IPM knowledge by growers of agricultural commodities and natural resource managers.

Outcome products desired include: technical reports; reports for legislators; peer-reviewed articles; Extension and trade journal publications; internet web site development; presentations at grower meetings; poster display exhibits; and most importantly, educational materials.

Partners include commodity specialists and Extension educators in the College of Agriculture and Natural Resources. Other linkages consist of faculty and professional staff in other UConn departments. Resources include external linkages such as state and federal agencies, environmental groups and grower groups. Important resources are federal agencies such as the USDA, EPA, NRCS, U.S. Department of the Interior and the US Geological Survey (MS). Grants have been awarded by these agencies in the past and are anticipated to continue being awarded. Other important resources are state agencies such as the Connecticut Agricultural Experiment Station, DEP, CT DOT, SWCD and the Department of Agriculture.

In addition to state and federal agencies, grower groups, environmental groups, state cooperators from land grant universities and the Department of Agriculture are invaluable resources. Specifically, entomologists, weed

scientists, plant pathologists and nematologists (MS) provide their expertise. Grower groups such as the CT Greenhouse Grower's Association, the CT Nurserymen's Association and the CT Pomological Society are resources of the program. Finally, environmental groups such as the Nature Conservancy, the Audubon Society and the Sierra Club (MS) are also available resources.

Integrated Pest Management training and outreach programs will be conducted, with emphasis on agricultural commodities and natural areas. Programs will be conducted from 12 months in duration to 5 years or as determined by supporting grant timelines.

Program results will be disseminated to growers, natural area managers, federal and state agencies, non-governmental organizations (NGOs), schools, municipalities and the general public. Educational outreach will occur via presentations, field demonstrations and volunteer training, dissemination of prepared materials, poster displays, Internet web site development, publications and the news media. The number of attendees will vary by event, ranging from several individuals to several hundred.

The target audience for the program effort includes agricultural commodity growers, natural resource managers, volunteers, the general public and school children.

Evaluation techniques consist of: annual technical reports summarizing program accomplishments for each applied research and survey program; preparation of Extension publications and manuscripts for peer-reviewed journals where applicable; continued development of IPM web site; and outreach activities.

### Turfgrass Integrated Pest Management

The statement of issue is to educate, train, and assist commercial and non-commercial individuals, companies and governments on IPM principles. The purpose is to increase awareness and adoption of IPM methodology. For information on significance of this issue see: State of Connecticut Integrated Pest Management Program 1990-1999 Annual Reports to the Legislature. The plan is: to work with the turfgrass service industry conducting applied research through full-season field training; work with turfgrass industry disseminating applied research results through educational Extension or College credit courses, twilight meetings, state and regional conferences, and other events; consulting activities with the turfgrass service industry, golf course superintendents, municipalities, schools, and state and government agencies.

Measures of impact are based upon the change in behavior with respect to pesticide application. Pesticide and fertilizer impacts will be measured through surveys to assess use and obtain reductions as a result of training and education. Individuals and businesses will change nutrient and pesticide management strategies after training to be documented by surveys and record review.

This work will result in the Turfgrass Integrated Pest Management Manual, new and updated Extension fact sheets, an insect collection, turfgrass pathology collection and possibly the development of a turfgrass training video.

An invaluable resource of the program is the Connecticut Department of Environmental Protection (CT DEP), which has provided grants. The first is the DEP 319 grant: Development of A Turfgrass Integrated Pest Management Manual, collaboration with industry groups including the Connecticut Grounds Keepers Association and the Environmental Industry Council for manual input. The second is the DEP 319 Quinnipiac River Grant Project, collaboration with lawn care operators, municipalities, CT DEP, Quinnipiac working groups and homeowners.

Partners will be: Department of Plant Science, turfgrass initiative; Department of Natural and Renewable Resources; CSREES Water Quality; and the Northeast IPM Program (MS).

The program plan is to conduct applied research through full-season field training in the Quinnipiac River Watershed, CSREES Water Quality program and possible other future watershed projects. Disseminate applied research results from the DEP 319 Turfgrass Manual and Quinnipiac River Watershed, Department of Plant Science turfgrass program, Water Quality Sustainable Landscape program and NE IPM program

The primary strategy is to work with the turfgrass service industry conducting applied research through full-season field training in the Quinnipiac River Watershed, CSREES Water Quality program and possible other future watershed projects. Work with turfgrass industry disseminating applied research results from the DEP 319 Turfgrass Manual and Quinnipiac River Watershed, Department of Plant Science turfgrass program, Water Quality Sustainable Landscape program and NE IPM programs. Educational methods to be used include educational Extension or College credit courses, twilight meetings, state and regional conferences, homeowner demonstrations and other events. Consulting activities with the turfgrass service industry, golf course superintendents, municipalities, schools, and state and government agencies. The total number of approximate program participants to be 13,000 to 15,000 people.

The target audience includes the turfgrass service industry (lawn care operators), golf course superintendents, municipalities, schools, master gardeners, homeowners and state and government agencies.

Evaluation techniques include the use of surveys and record reviews. Pesticide and fertilizer impacts will be measured through surveys to assess use and obtain reductions as a result of training and education. Individuals and businesses will change nutrient and pesticide management strategies after IPM training, to be documented by surveys and record review.

### Integrated Pest Management

Collaboration will be actively sought with members of the IPM team. Their experience and awareness of current problems that CT producers face will help to direct research efforts and to seek funding. Emphasis will be placed on those commodities (ornamental plants, turf) likely to be affected by the Food Quality Protection Act of 1996. Due to this mandate, certain pesticide active ingredients may no longer be available and alternatives should be in place when that happens. At the moment, a research project has been initiated in collaboration with Lorraine Los, Fruit IPM Specialist. The goal is to reduce the preventive use of insecticides and to explore alternative methods of pest control for peach orchards.

Measures of success are based upon reductions in pesticide applications, improved communication and grant dollars received. Information generated should benefit CT agricultural industries by providing alternative pest management measures and reductions in pesticide applications. A measure of success will be good communication between producers and the IPM program. In addition, success of the research projects should lead to generation of funding.

This work will result in: funding to deal with the problem at hand and to establish new programs as needed; publications in entomological and horticultural journals; presentations at scientific and trade organization meetings; fact sheets; and IPM guidelines.

Internal partners will be commodity and IPM program specialists, both of which provide their expertise. External partners will be Lyman's Orchard, CT Department of Agriculture, CT Agricultural Experiment Station and IPM and Extension personnel in other states.

In addition, contacts will be established with individual growers and with organizations such as greenhouse grower's associations, nursery/landscape associations and with CT organic growers. Moreover, funding will be sought from USDA/NRI, EPA, and Northeast Regional IPM Grants program, among others.

For the work on peaches, preliminary research includes monitoring of pest levels and fruit damage. Access to unsprayed peach trees has been provided by Lyman's Orchard. Other research projects will involve cooperation of growers and IPM specialists. Experiments will be carried out in laboratory, greenhouse and field settings. Duration of projects will depend on the nature of the pest problem, funding, and availability of personnel to take over on-going projects.

Target audiences for the program effort are identified by themselves or Extension personnel as having new pest problems or in need of alternative management tactics.

Evaluation is based upon comments by grant proposal and journal reviewers; comments and discussion at scientific/trade meetings; and feedback from growers/producers and Extension personnel.

### Integrated Pest Management (IPM)

There are many problems and concerns related to the use of pesticides in agricultural and non-agricultural areas. Some of the concerns include overuse and misuse of pesticides, pollution of ground and surface waters, unwanted residues on food and feed, drift to non-target areas, hazards to beneficial and other non-target organisms, resistance of pests to pesticides, and public and pesticide applicator safety. One Extension education programming involves training fruit growers to utilize IPM techniques as part of their normal production practices. Applied research projects will focus on pests of fruit crops in order to develop pest management techniques to address the issues mentioned above. Research results will be disseminated to growers. With the recent passage of the Food Quality Protection Act (FQPA), alternatives to managing pests without traditional pesticides are particularly important. Examples of applied research topics include usage of biological control organisms to control fruit pests, monitoring methods for fruit pests, particularly minor crops (e.g. peaches) and usage of weather data to predict pest occurrence.

Measures of impact will include: reductions in pesticide usage from increased adoption of IPM methods; reduction in pesticide risk by IPM program participants due to usage of less toxic pesticides and usage of biological control organisms; growers will increase agricultural profitability by reducing pesticide costs; increased privatization of IPM due to training of consultants; and funding from submitted grants will allow research in fruit IPM to continue.

Outcome products desired include: state and regional Extension bulletins and fact sheets – editor of New England Apple Pest Management Guide (MS); newsletters edited/written – e.g. Yankee Grower (MS); presentations

of research results at grower/clientele meetings; on-farm applied research demonstrations; quarterly and annual reports written for granting agencies (depending on contracts); and the use of electronic media for dissemination of research results, etc. e.g. New England Apple Information Manager (AIM) web site and Weekly Pest Messages on CT IPM web site. (MS) Also desired are recorded phone pest messages and reports for CT legislators – IPM Annual Report to the CT Legislature.

Partners of the program are commodity specialists and Extension educators in the UConn College of Agriculture and Natural Resources. External linkages include: grower and clientele groups (e.g. CT Pomological Society) – stakeholder input; CT Department of Environmental Protection – source of grant funding; CT Agricultural Experiment Station- collaboration with scientists on applied research projects; IPM Specialists from other Universities – expect continued involvement with multi-state grants (MS).

Extension educational programs in IPM will be conducted for growers of tree fruit crops (e.g. apples, peaches, pears) and small fruits (e.g. strawberries, and possibly grapes). The primary objectives of the programs will be to provide growers with the knowledge and skills needed to reduce potential risks of pesticides. Programs will be offered on a statewide basis, however locations may depend on grant requirements in particular years. For example, from FY97 through FY99, the IPM program has been partially funded by the CT Department of Environmental Protection to conduct IPM programs in the Quinnipiac River watershed. One applied research emphases will continue to be on pest monitoring and alternatives to traditional pesticides. Pertinent information will be added to the IPM programs for local pilot testing and demonstration. With the anticipated loss of pesticides due to the Food Quality Protection Act (FQPA), there will be an increased need for pesticide alternative research. Projects will be conducted from 1 to 5 years in duration or as determined by grant funding.

The primary educational method consists of IPM full-season training programs for agricultural producers. Hands-on intensive training will occur at the orchard or farm sites. Demonstration plots will be used to illustrate the results of applied research projects. Other educational methods will include presentations, displays and workshops at state and regional commodity meetings. IPM training will also be provided to private applicators through the Pesticide Applicator Training Program. IPM information will also be disseminated through newsletters, state and regional Extension publications, and via electronic media (New England Apple Information Manager (AIM) web site, e-mail).

The target audience for the program effort consists of producers of tree fruit and small fruit in Connecticut and other Northeastern states (MS).

Surveys will be used as an evaluation technique in order to assess if learning and results occurred. Growers will be surveyed at the end of IPM training to determine IPM knowledge gained, level of IPM adoption and level of pesticide reduction achieved.

#### Complementary and Alternative Health Care Practices for Livestock

There are no reliable, concise sources of information about complementary and alternative approaches to livestock nutrition and health available to the agricultural community. Information about complementary and alternative approaches is needed because conventional antibiotic therapies may not eliminate all infections and because of concern about antibiotic residues in meat and milk. There is a growing interest among livestock producers for information about complementary and alternative approaches to livestock nutrition and health as evidenced by the number of articles in popular magazines like Stockman Grass Farmer and by the many discussions on SANET-mg or GRAZE-L on the Internet. Unfortunately, information about complementary and alternative approaches to livestock nutrition and health is scattered in many technical and research libraries or in difficult to access sources.

Measures of success will be the knowledge gained by people who will attend the conference on complementary and alternative livestock health practices.

This work will result in a conference, a sourcebook and a web page about complementary and alternative livestock health practices.

An important resource of the program effort is the \$86,000 grant from the USDA Northeast Regional Sustainable Agricultural Research and Education Program.

Numerous scientists who are experts in complementary and alternative livestock health practices will be involved. For example, Mark Blumental, from the American Botanical Council, Austin, TX; Dr. James Duke, Herbal Vineyard, Inc., Fulton, Maryland; Dr. C. Edgar Sheaffer, VDM, Clark Veterinary Clinic, Palmyra, Pennsylvania; Dr. Mary Rose.Paradis, Associate Professor, School of Veterinary Medicine, Tufts University, North Grafton, Massachusetts; and Dr. E. Ann Clark, Associate Professor, Department of Crop Science, University of Guelph, Guelph, Ontario, Canada.

A workshop will be convened that is a mix of lectures about fundamental information and interactive workshops with knowledgeable specialists. A sourcebook will be developed about complementary and alternative livestock health practices and a web page will be created on this topic.

Target audiences for the program effort include Extension educators, NRCS personnel, other agricultural professionals and veterinarians farmers.

A primary means of evaluation will be pre-and-post workshop measurements taken at the beginning and end of the workshop. Such measurements will include short-term learning level increases, interest in follow up activities, and an assessment of the topics presented at the workshop. The usefulness of the information contained in the sourcebook will be evaluated by conducting a survey of people who have received the book. The number of people who use the web page will be recorded. There will be a hot-link on the web page for people to send their comments about the information provided on the web page.

### Livestock Management - Beef, Sheep, Swine

In Connecticut, as well as the other New England states, there are numerous part-time/hobby farms with small herds/flocks of beef, sheep and swine. Many of the owners are newcomers to large animal management and need practical advice on nutrition, health and housing issues. Additionally, beef, sheep and swine projects continue to be an active component of the 4-H programs in New England and the youth, leaders, and parents are eager for educational opportunities centered on large animal management issues.

Measures of success will be based upon attendance at program events as well as written and oral feedback directly from the participants.

Desired outcomes include newsletter articles targeting producers and 4-H youth/leaders/parents.

Partners include the CT Sheep Breeders Association, the CT Pork Producers Association and the New England Sheep and Wool Growers Association. All of which provide volunteers, program resources and financial support.

Key components of the program are annual or semi-annual educational programs, field days and occasional newsletter articles.

Educational methods include the use of lectures, demonstrations, clinics and animal sales.

The target audience for the program effort consists of livestock producers as well as 4-H youth and their leaders/parents.

In order to assess if learning occurred, feedback from target audiences and annual program evaluations by attendees will serve as the evaluation techniques.

### Livestock Production

Research efforts will center on production of transgenic swine. A group has been formed to produce transgenic swine for xenogenic transplantation. This project is a joint effort between Drs. Hoagland, Riesen, Yang and Dr. William Fodor from Alexion Pharmaceuticals in New Haven, CT. There is a serious shortage of organs for organ transplantation in people will end-stage organ failure. This shortage of organs has kindled interest in the field of cross-species transplantation.

Pigs have become the species of choice for xenogenic transplantation in humans for many reasons. The major barrier to clinically successful xenogenic transplantation is the lack of effective therapies to eliminate antibody and complement-dependent hyper-acute rejection (HAR). Specific proteins are necessary for both recognition and rejection to occur. The carbohydrate component of membrane proteins has been determined to be important in cellular recognition and subsequent rejection. Human and swine proteins have different carbohydrate complexes. Specific enzymes are required for these differences to be realized. If a pig could possessed the gene that codes for the human enzymes then the pig's cells would have the human carbohydrate complexes. If a pig could have the human genes that code for the major histo-compatibility proteins then that pig would express the human histo-compatibility proteins. Combined the pig that possesses both of these genes would make cells that were more like human cells. Consequently these cells would not be as quickly rejected and the organs could be used in humans.

In January 1996 there were 44,000 people on the waiting list for organ transplants. For many reasons, these people will or will not get a new organ before they die. If swine organs could function in these people will they wait for a perfect organ of human origin there could be 100s of people save each year. Besides this obvious value for organ transplantation, the swine that possess these human genes need to be produced and raised in highly diseased free and clean environment. People to produce these animals will be necessary. Units could be built and swine produced in areas that require traditionally greater funds as the products would be worth more. New England and other areas that are traditionally too costly to produce swine for pork could again be competitive and successfully make a profit in animal agriculture.

It's anticipated that a pig with three human genes will be born. An in-vitro development, fertilization and maturation techniques for swine ova will be functional. Embryo transplantation surgery procedures for swine will be developed and functional. In vitro techniques for cloning swine will be started.

Desired outcomes are based upon anticipated research results and publications. Specifically, a pig with three human genes will be born and two peer reviewed journal articles will be submitted.

This work will be a joint effort between Drs. Hoagland, Riesen, Yang, and Fodor. The first three are from the ANSC department and the fourth is from Alexion Pharmaceutical Inc. located in New Haven, CT. This project will be funded in part by a grant (\$190,000) from Connecticut Ingenuity Inc. and in part by per diems (\$50,000) paid by Alexion Pharmaceutical Inc. Novel approaches to produce transgenic pigs as animal models for xenogenic transplantation. Hoagland, Riesen, Yang, Fodor; \$199,728; 7/1/98 to 8/30/00; funded by CII.

The goal of this collaborative research is to genetically engineer porcine tissues to express a human terminal complement inhibitor, hCD59 and an enzyme to the expression of the epigenic Gal $\alpha$ -1,3-Gal epitope. Expression of hCD59 and H-transferase on porcine cells will protect the cell against the destructive effects of the human humoral immune system, specifically the lytic effects of human complement. The working hypothesis is that the expression of the human complement inhibitor, hCD59 along with the expression of H-transferase (to express H-epitope in place of the Gal $\alpha$ -1,3-Gal epitope) in a large domesticated animal will facilitate the development of primate xenogenic transplantation models. This series of experiments will provide insight into preventing the complement-mediated hyper-acute rejection response that occurs in these xenogenic transplantation models. Specific aims are the following: to provide transgenic founder pigs that express both hCD59 and H-transferase genes using in vitro produced embryos; and to establish H2Kb-CD59-H-transferase transgenic founder animals by introducing the H-transferase gene into embryos derived from the positively expressed homozygous hCD59 transgenic pigs.

The experimental procedures to accomplish aims will focus on producing pigs homozygous for the hCD59 gene by traditional breeding methods. These animals will be sacrificed and their ovaries removed and as many ova recovered as possible. The recovered ova will be matured in-vitro with a procedure under development. These ova will then be fertilized in-vitro, injected with a gene (various genes will be used as discussed previously) and allowed to grow and be transferred into recipient gilts to carry out the remainder of gestation. A screening technique to identify embryos that have the transgenes in their genome and perhaps expressing it will be developed. This would allow the screening of potentially positive embryos only to be transfer into recipient gilts.

Transgenic research community will be the main target audience. Also, the livestock research community will be interested and portions of the data will be published in Journal of Animal Science.

Evaluation techniques are based upon successful research results. For instance, if pigs are produced with multiple genes and they express the proteins in question, the research will have succeeded. The development of in-vitro techniques to mature, fertilize and grow swine embryos would also be considered a success.

### Livestock Production

Efficient management of livestock is critical to a continued supply of meat products. Agricultural students need a course in modern livestock husbandry techniques. The producers in the State are entitled to a source of acceptable management procedures when they need advise. This work will generate environmentally sound management techniques for the production of beef cattle, swine and sheep. The presentation of these practices will be through Power Point presentations, short articles and Extension Bulletins. The topics will be applicable to livestock producers in New England and perhaps the entire Northeast.

Success is measured by the change in knowledge of program participants. The knowledge of the people that are presented the material will be increased. The audiences will leave the sessions with a better understanding of environmental sound and efficient livestock systems and procedures.

This work will result in presentations, publications and fact sheets. The development of PowerPoint presentations is anticipated. Several articles will be prepared and sent to region newspapers (Country Folks) for publication. These articles will be archived for future update and additional publications. The Extension Fact Sheets will be submitted for publication through the Extension review system.

Partners of the Extension effort consist of Thomas A. Hoagland, Paul Stake, John Riesen, Steve Zinn, Ian Hart, Joyce Meader and Rich Meinert.

This program will be ongoing for critical updates, however, the major effort to generate the initial material will take three years. There are no funds to defray any of the cost to produce this material. Funds will be applied for from the Teaching Institute after the initial (first year) work is in hand to show preliminary efforts.

An important strategy is the use of materials in the classroom (ANSC 283 and SAAS 070). Moreover, four articles per year will be sent to Country Folks and the Fact Sheets will be available to all interested parties.

The target audience will be the students that enroll in the courses and the livestock producers in the state and region.

Students will have a chance to evaluate the Power Point presentations through their teacher evaluation forms. Continuous input from students will be encouraged and anticipated throughout the semesters. The publication of the newspaper articles will denote some level of positive evaluation as well as the letters to the editor. The peer review system of the Extension service will evaluate all the Fact Sheets.

### Master Gardener Program

Recent years have seen strong support for continued improvement in the natural environment and the positive consequences it can have on community development and values. Actions that are taken at the individual level can have positive environmental and community consequences, including urban food production, horticultural therapy, and sustainable landscapes. The Cooperative Extension focus will be statewide, with consumers as the major audiences.

The overall impact will be due to the implementation of a holistic approach to management of residential and associated landscapes, development of successful and sustained efforts in horticultural therapy, and implementation of urban gardens in each of the state's three largest cities - Bridgeport, New Haven, and Hartford. Specific measures of success will include implementation of changed design approaches and plant selection, utilization of better landscape management practices, increased food production in urban gardens, and increased involvement of physically and mentally challenged individuals in horticultural activities.

Desired outcome products consist of publications. Specifically desired are six (6) new Extension publications on environmental landscapes, with a particular focus on site assessment procedures, on-site composting, and landscape design techniques.

Internal linkages consist of the University of Connecticut's Department of Plant Science, Department of Natural Resources Management and Engineering and the Department of Agricultural and Resources Economics. External linkages are the Bartlett Arboretum, the Connecticut Department of Environmental Protection, Special Olympics and the University of Rhode Island.

This will be an ongoing program that is tied in closely with activities of the Home and Garden Education Center. Key aspects of this program will be to establish and promote guidelines for environmentally friendly management in residential locations, urban garden development in the state's three urban sectors, and horticultural therapy efforts with key groups across the state.

Audiences will be primarily consumers - residential properties, urban gardeners, and challenged individuals. Methods will include short courses, presentations at NGO, agency/government, and industry meetings, listings on HG Ed Ctr. web page, Master Gardener programs, train-the-trainer courses. Attendees will vary depending upon educational techniques, but ultimately will reach over 10,000 consumers. Research strategy will include collaboration with CANR faculty in research design development, literature research, and professional conference attendance.

Target audiences consist of residential consumers, NGO and agency/government staff, urban gardeners and residential landscape service providers.

Evaluation techniques include: one short term (6 month) and mid term (12 month) survey of Master Gardener knowledge, partnering agencies, and train-the-trainer activities through the Coastal Residential Water Quality efforts.

### Team Approach to Mastitis and Milk Quality Education and Research

Cooperative Extension System Focus: The issues involved in this program are two-fold. Assuring human food safety is of utmost importance to the dairy industry in order to provide a high quality food and maintain consumer confidence in the quality of dairy products. Also, improving milk quality and reducing mastitis results in increased profitability on the farm. A concerted effort to conduct research in these areas and to provide educational materials and information will provide dairy producers and those associated with the dairy industry the tools needed to improve and continuously monitor milk quality at the farm level.

The first measure of success is an increased knowledge of management practices that support the production of high quality milk and control mastitis by those associated with the Connecticut dairy industry; including dairy farmers and farm personnel, dairy manufacturers, and state health inspectors. The next measure is a reduction in measurable factors associated with low milk quality, such as; somatic cell counts, bacterial levels and pathogens in milk from individual cows, farms and the general milk supply. Another measure of success is a reduction in loads of milk rejected due to antibiotic residues. Other measures include: an increase use of good management techniques such as record-keeping to improve milk quality; the publication and presentation of

research results in peer reviewed journals and popular press publications; and grant awards to conduct research in mastitis control and antibiotic residue avoidance. Two grants have been awarded in this area.

Desired outcome products include: a handbook for producing quality milk, which is updated annually; fact sheets explaining mastitis control practices; and research results that will be presented locally and nationally to provide practical information for dairy farmers to utilize for improving milk quality.

There are both internal and external linkages that are associated with the program effort. Internal linkages are located at the University of Connecticut. They are: Ms. Lynn Hinckley, Connecticut Mastitis Laboratory; Mr. Arnold Nieminen, Dairy Farm Manager; Ms. Joyce Meader, Dairy/Livestock Extension Educator; Mr. Richard Meinert, Dairy/Livestock Extension Educator; and graduate students. External linkages consist of veterinarians and Massachusetts's dairy manufacturing groups. The veterinarians are Dr. George Saperstein, Tufts University School of Veterinary Medicine State Regulatory Personnel, and Dr. Bruce Sherman, Dairy Agribusiness personnel. Lastly, Mr. Lenny Petersen, IBA, is from MA Dairy Manufacturing Groups.

Key components in this area is to disseminate information to dairy producers and provide a means of developing programs and research areas that utilize the expertise within the College of Agriculture and Natural Resources. The forum for this cooperative work is the College of Agriculture and Natural Resources Dairy/Livestock Team.

The mastitis and milk quality education and research program involves a combination of education and research. Initially, a needs assessment was established for this area. The education component is being developed to efficiently transfer presently available information on good management practices that will assure and/or improve milk quality. The areas of concentration include; antibiotic residue prevention, preventative herd health to control mastitis, review and utilize Pathogen Risk Reduction Programs such as HACCP, the Dairy and the Dairy Beef Quality Assurance Program and other quality assurance programs. The research is designed to identify and provide new methods to monitor milk quality and to identify the critical aspects of producing quality milk and assuring pre-harvest food safety.

This work will result in: a) Articles in Dairy/Livestock Newsletter concerning mastitis and milk quality. The target audiences are the dairy and livestock producers within the state and key personnel at the various land grant universities. The readership is 2,000. b) Workshops for dairy farmers on milk quality. To date, four annual Milk Quality Workshops have been conducted averaging approximately 35 in attendance at each, participants were dairy farmers and milk processing and state milk inspectors. This workshop will be continued; c) Develop a producer notebook for milk quality. A milk quality handbook was prepared with approximately 120 pages of materials. This was disseminated to farmers, dairy manufacturers and state dairy inspectors. Total handbooks provided are approximately 40 per year. The handbook will continually be updated. It was completely revised in 1999. d) Research: The methodology for research areas are as follows - 1) One area is to define the limitations of the antibiotic residue screening tests that are currently available to dairy producers and either design an improved test or identify the optimum tests available and 2) The other focus is on mastitis control research. Presently, the focus is on evaluating the success of a current mastitis control program, identify the limitations, and develop research methods to improve mastitis control based on the results of this present program. e) This faculty member has joined the regional project NE 112 which is involved in mastitis research. It is anticipated that joint projects will be developed with other researchers to broaden the scope of the mastitis research.

Target audiences are: dairy farmers in Connecticut and New England; University Extension Personnel at the Land Grant Colleges in the U.S.A.; milk quality inspectors; and Connecticut Department of Agriculture Personnel.

Prior to Connecticut Milk Quality Workshops, participants are surveyed to determine what they expect from the program. Following the workshop, an evaluation of the program is given by the participants and then after an extended period of time (four months) the participants are polled to determine if management practices have been changed as a result of the workshop. Using DHIA records, changes in milk quality indicators will be monitored for the state and for the workshop participants. Feedback from NE112 meetings will be used to determine future research and Extension directions. Monitor residue violation data collected by the State Department of Agriculture. Determine from a needs assessment survey if there is an increase use of good management techniques such as record-keeping to improve milk quality.

### Horticulture and Plant Biotechnology

The research focus is on new plant development and plant improvement through traditional breeding and biotechnological techniques. This area of research is one in which the University of Connecticut has traditionally been very strong and productive. New and improved plants have been introduced and have demonstrated world-class research and scholarship as a result. The research conducted has focused in a unique area that has attained us

national and international distinction. This research focus has also been able to improve the education of students, particularly the graduate students.

One of the measures of success has been the number of refereed, non-refereed, and textbook publications that have been produced. In addition, in over 15 years the program has attracted over \$600,000 in research grants from various private and government sources. Graduates have also been a measure of success for programs. Many of the graduate students have productive and leadership roles in private, state and national businesses or have received their Ph.D.s and have gone on to work at universities or industry.

Refereed articles and other peer reviewed articles, Extension publications, book chapters, and awards have been the primary outcome product. These include, but are not limited to, a recent Fulbright Fellowship, the CANRAA Excellence in Teaching Award, the University Outstanding Adviser Award, and several other awards.

There are several partners of the research effort. Dr. George Elliott, UConn, continues to work with the *Alstroemeria* research projects. Dr. Yi Li, UConn, collaborates on research projects pertaining to new plant development and improvement. Professor Flavia Schiapacasse, University of Talca, Talca, Chile, plays a vital role in the research of Chilean bulb species. Mr. Kent Kratz, Just-for-Starters, Eastford, CT, works collaboratively with micropropagation research. Finally, Mr. Marc Laviana, Sunny Border Nursery, Inc., Kensington, CT, works collaboratively with micropropagation research.

The research program is involved with new plant development and plant improvement through the use of traditional breeding and biotechnological procedures. In vitro procedures such as embryo culture, somaclonal variation, meristem culture for the production of pathogen-free plants, fertility restoration, somatic embryogenesis and micropropagation are all used to accomplish goals. Recent research programs have also been focusing on economic development initiatives with plant tissue culture in cooperation with state government agencies.

The audiences vary from undergraduate and graduate students, to consumer horticulturists, academics and horticultural professionals. The research strategy is to be at the forefront of new plant development, particularly as it applies to Connecticut, and to conduct world-class research of national and international distinction.

The target audience is made up of undergraduate and graduate students, Connecticut horticultural and biotechnological enterprises, and ultimately, consumers.

The students' success serves as an evaluation technique in order to assess if learning occurred.

#### Nutrient Management for Dairy Farmers

Many dairy farmers have excess nitrogen and phosphorus in their soils from long-term applications of manure. Excess nutrients can cause pollution of nearby water supplies. Improved management of the manure would reduce the excess amounts of nutrients in some fields and increase the nutrients in fields that are deficient in nutrients. Nutrient Management Plans can educate dairy farmers about the amount of nutrients on their farm and direct them to make better use of the nutrients.

Success is measured in two ways. First, soil test values, nitrate soil samples and routine samples for phosphorus, will stabilize or decrease. Second, farmers will become more knowledgeable about the amount of nutrients on their farm.

Desired outcomes include: 20 nutrient management plans, one for each of 20 farms in the state; a peer-reviewed article about cost of implementation of nutrient management plans; and Extension publications about how to complete a nutrient management plan and the benefits of a nutrient management plan.

An important partner is Joe Neafsey, a state water quality specialist from the Natural Resources Conservation Service. A valuable resource is the \$25,000 per year received for four years from the Natural Resources Conservation Service in order to implement Nutrient Management Plans.

A key component of the project is to develop nutrient management plans for dairy farmers for four years.

An important strategy is working one-on-one with farmers to implement nutrient management plans.

The target audience for the program effort is made up of dairy farmers who make successful bids in the EQIP program sponsored by the NRCS.

Results will have occurred if there are changes in the distribution of manure by the farmers. More manure should be applied to fields with low soil test values and less manure to fields with high soil test values.

#### Ornamental Nursery Plant Biotechnology

An applied research and Extension program is being developed which focuses on providing commercial nurseries in Connecticut and elsewhere with alternatives to the current cultural management strategies for control of a pathogen (*Phytophthora cinnamomi*) responsible for an important disease (root rot) on a major woody ornamental crop (rhododendron). Protocols are being developed for the efficient transformation of commercial rhododendron cultivars, and genes are being identified which encode proteins, which upon expression in transformed plants, will

provide resistance to the pathogen. A diagnostic screening assay is being developed which will allow commercial nurseries to monitor the presence of this water-borne pathogen during the culture of woody ornamentals prior to evidence of plant infection.

Measures of success include obtaining CII/Yankee Ingenuity competitive grant funds to support this research/Extension program. It is expected that within five years, transgenic commercial rhododendron cultivars will be developed which display adequate resistance to root rot, and also a system for monitoring the presence of the pathogen will be provided to the commercial nursery industry in the state.

One particular desired outcome is the publication of the research results in peer reviewed articles in scholarly journals, and disseminated to stakeholders through Extension publications.

Partners of the research effort are: Connecticut Innovations, Inc./Yankee Ingenuity Grant Program; Imperial Nursery (Granby, CT; collaborator); and the Connecticut Nurserymen's Association.

The program will involve using CII grant funds to support a postdoctoral research associate to develop transformation protocols for woody ornamentals, and exploit the expertise (primarily Dr. Brand) in the Dept. of Plant Science in the area of tissue culture/propagation of woody ornamentals to develop commercially acceptable cultivars of transgenic rhododendrons which display resistance to root rot, and to develop diagnostic assays for monitoring the presence of the pathogen in commercial nursery operations using either ELISA (antibody)-based, or PCR-based strategies.

An important research strategy is the use of biolistic transformation in order to generate transgenic plants.

Target audiences of the research project include the horticulture/plant physiology research community. Also included are commercial nursery operations in Connecticut and across the country.

Efficacy of diagnostic system will be tested under commercial nursery conditions, in collaboration with CT operations. Transgenic plant development should result in both refereed journal articles, and in the generation of acceptable germplasm, which will be evaluated by the industry.

#### Sustainable Ornamental Horticulture

The ornamental horticulture industry in Connecticut is far and away the largest and most significant agricultural sector. Estimates for the value of nursery production, greenhouse production, landscape installation and maintenance and turf vary between \$300 million and \$500 million annually. To keep this critical component of Connecticut's economy viable, it must receive current and useful information in an efficient manner.

Anticipated measures of success or impact are based upon the change in knowledge and/or behavior of the target audiences.

Desired outcomes include published Extension articles in Yankee Grower, demonstration plantings at the Perennial Plant Conference, presentations at grower meetings and a landscape plant web site.

Partners are: the Office of Communications and Information Technology (provide help with design and production of outreach materials), the Connecticut Nurserymen's Association (will provide input on topics for which information is desired), the Plant Science Research Farm Crew (develop and maintain demonstration plantings about the ornamental characteristics, potential problem and appropriate use of landscape plants), and a landscape plant database which will be developed to educate growers, landscapers and homeowners.

Applied research findings in the areas of nursery and greenhouse production, landscaping and turf will be conveyed to the target audiences through the Yankee Grower, the Perennial Plant Conference, presentation, field days and the internet. The Yankee Grower is a bimonthly Extension journal on profitable horticulture and the Perennial Plant Conference or an annual one-day conference held in Storrs, CT.

The program strategies are best described by identifying the program participants, audiences and educational methods. The program participants include approximately 1,000 ornamental horticulture operators. Each year they will receive training and 40% are expected to change practices. This audience consists of commercial nursery and greenhouse operators, landscape installers, maintainers, and groundskeepers. The training and educational methods include the use of the Yankee Grower Magazine, Perennial Plant Conference, grower meetings, and a landscape plant web site.

Target audiences for the program effort include commercial nursery and greenhouse operators, landscape installers and maintainers, groundskeepers, and homeowners.

Program effectiveness will be determined by an annual random survey of industry members to determine adoption of practices.

#### Plant Biotechnology in the Department of Plant Science

A Plant Biotechnology program is essential to create a modern Department of Plant Science within the College of Agriculture to prepare students for the current and future job market. Biotechnology will revolutionize

the agricultural, horticultural and forestry industries. Even the small growers will benefit from this technology. Accordingly, graduates should all have a basic understanding of biotechnology application.

As part of a Biotechnology concentration within the department courses will be taught in this area. In particular lectures will developed, coordinated and presented in a new Biotechnology survey course (3 credits). It will be proposed to give this course a "Writing" designation. The idea of this course is to reach undergraduate, graduate, and even professional students to provide them with an understanding of biotechnology so that they can make informed decisions about such issues. The material will give the students a most basic understanding of molecular biology to understand biotechnology examples and applications. Actual examples of successful biotechnology applications related to microbes, plants, animals, and humans will be discussed. It is hoped to enlist faculty members on campus who are experts in these various fields, and who are willing to contribute one or several lectures. For example, Dr. Li and the new faculty hire in Plant Science will likely present lectures on biotechnology issues related to plant improvement. There are several faculty members in Animal Science and Pathobiology who are experts in the field of animal biotechnology. Lectures will be presented on the introductory molecular biology section and cover uses of microbes for biotechnological purposes. In addition, non-science interests will be addressed in biotechnology including economics, intellectual property and ethics. It is possible that Dr. J. D. Foltz, a recent hire in ARE may contribute lectures on economics of biotechnology.

The Plant Science Biotechnology program will benefit from collaborations among the faculty. For example, Drs. Von Bodman, Li, McAvoy and Bridgen will cooperatively develop a program to introduce plant disease resistance traits into plants of importance to Connecticut Horticulture and Floriculture.

Anticipated measures of success are based upon grant dollars received, the attraction of more students to the program and publications. Specifically, the group effort will lead to patentable and marketable plant products and increase the potential for extramural funding as a group. The academic component of this Biotechnology concentration should attract more undergraduate and graduate students. Joint publications in journals such as Nature Biotechnology are to be anticipated.

Outcome products desired include publications, national recognition and a web page. For instance, UConn will gain national recognition for the plant biotech program through joint publications and patents. Useful applications should be the focus of Extension publications to inform the growers of Connecticut about the UConn generated gene transfer-based plant improvement efforts. Lastly, developing a suitable web page for the biotechnology program is also highly desired.

An excellent example of interdepartmental linkages is the already initiated collaboration between researchers in pathobiology and Dr. Li's group in order to generate plant-based vaccines. A well-established plant biotechnology program will lead to additional meaningful associations among different departments. Moreover, a strong plant biotechnology group will attract the attention of the crop-based industries within the state and nationally.

### Plant Biotechnology

Plant biotechnology will change the agricultural industry dramatically within the next 10-20 years. Plant gene transfer techniques will be widely and effectively used for crop improvement in agriculture, horticulture and forestry, and for production of cost-effective pharmaceuticals, industrial materials and enzymes.

Some of the goals for the plant biotech group in the Department of Plant Science are to: develop a strong and cohesive research program; develop and offer several core courses for the plant biotech undergraduate and graduate programs; develop a plant biotech minor and major; establish research collaborations with agricultural, pharmaceutical and diagnostic industries and to develop a web site for the biotech program.

Measures of success include a well-funded research and product development program in plant biotech, undergraduate program of plant biotech and significantly more graduate students enrolled in the plant biotech program.

Desired outcome products include a nationally recognized research program in plant biotech and strong undergraduate and graduate programs in plant biotech.

Important resources of the program include current grants from USDA, USDA and DOE and private companies. Proposals will be submitted to federal and state funding agencies, and private industries in the next 5 years.

Gene transfer techniques will be used to improve quality and performance of crop plants economically important to agriculture, horticulture and forestry. Some of the projects are production of seedless fruits, improvement of wood productivity, delay of senescence/Extension of shelf life; compact plants with more branches and flowers, improvement of seed productivity, production of antibodies and vaccines in transgenic plants. Strategies will also be developed for production of pharmaceuticals and industrial materials and enzymes.

Gene transfer techniques will be used to develop strategies for improvement of agriculture, horticulture and forestry and also for production of pharmaceuticals and industrial enzymes.

There are two target audiences for the program or project effort, one with respect to education and the other for research. The target audience for the education aspect of the program consists of undergraduate and graduate students, postdoctoral scientists and other types of research scientists. The target audience for the research aspect of the program consists of industrial partners as well as domestic and international collaborators.

Evaluation techniques, which will be used to assess if learning/results occurred, are: peer reviewed articles, invited scientific presentations, patents, grants, contracts and the number of scientists trained.

#### Poultry Manure Management on Connecticut Farms

Corn growers in Connecticut have provided the primary site of manure disposal for the poultry industry. Potential nuisance complaints arise from odors, insects and runoff from these manure stockpiles in the cornfields. University recommendations' of covering the piles are criticized as being impractical. Research is needed to convince the growers that neighbors' complaints may have justification. Solutions to the problems need to be supported by the dairy and poultry farmers, for adoption of best management practices to take place. The corn growers are currently pleading ignorance when complaints are directed at their management of manure stockpiles. To protect the reputation of the agricultural community, all farmers need to be aware of neighbor friendly practices and to adopt those practices as best they can.

Anticipated measures of success are based upon the change in knowledge or behavior of the program participants. Specifically, the Best management practices for storing and spreading poultry manure will be adopted by the corn and poultry industries.

Desired outcomes from efforts include Extension fact sheets, exhibits with photographs, and conservation awards for progressive farmers.

Some of the partners include the Connecticut Poultryman's Association, Eastern Connecticut Dairy Committee, CT Department of Agriculture, CT Farm Bureau, Regional Health Departments and individual farm demonstration sites.

Key components of the project description include: farm demonstration sites of poultry manure; best management practices; Extension fact sheets describing recommended practices; distributed to farmers and nutrient management plans completed by poultry manure recipients.

Dairy/corn growers will provide demonstration sites for poultry manure Best management practices. Research on effectiveness of fly control will use fly monitoring devices upwind from manure piles. Soil nitrate levels will be measured below manure stockpiles, with and without recommended plastic liner. Farm tours will discuss the successes and failures of these demonstrations - 30 attendees. Summary fact sheets to 300 corn/dairy/poultry producers in eastern Connecticut.

The target audience for this effort includes corn growers receiving poultry manure to meet corn nutrient needs.

Evaluation techniques consist of surveys and personal visits. For example, volunteer demonstrators will be surveyed before and after the project on their farms regarding attitude of poultry manure management. Tour participants will fill out evaluation after workshop on farms. The number of Best management practices on farms receiving poultry manure will be determined by personal visits to farms by volunteers from Poultry and Dairy Committees. The number of Nutrient Management Plans completed by corn growers using poultry manure due to efforts of this program.

#### Reproductive Physiology and Biotechnology

The group project, involving Drs. Jerry Yang, Tom Hoagland, John Riesen and Tom Chen has been and will continue to focus on developing technologies for efficient production of transgenic pigs as a potential model for human organ transplantation (xenotransplantation). Tens of thousands of Americans die each year from terminal organ failure and could be treated by organ transfer. Unfortunately, organ shortage is a severe limitation to this practice. Should the research succeed, the human health benefits would be invaluable. It also permits Connecticut to compete in a multi-billion dollar worldwide market.

The measure of success for the group project of creating transgenic pigs for xenotransplantation includes contract and grant supports, and progress in assisting business development

The outcome products of the research efforts are peer-reviewed scientific publications, invitations for guest/keynote lectures and conference/symposium chairs, awards and breakthrough news, etc.

Internal partners are located at the University of Connecticut's main campus at Storrs. The collaboration involves Dr. Thomas Chen on developing improved transgenic technology and Dr. Martin Fox on developing advanced ultrasound technology for biological applications.

External partners include UC Davis, Illinois, Wisconsin, Colorado, Louisiana, Utah and Iowa etc. the group is also participating a region project on improving embryo development and advanced biotechnologies such as cloning and transgenesis.

The group also has collaboration and funding from companies both within Connecticut (e.g. Alexion Pharmaceutical, CABA Inc., and Fairvue Farms) and other states (e.g. Genzyme Transgenics, MA; Genex Inc., NY; PPL Therapeutics, UK).

Other external resources that provide funding are the USDA and the Genzyme Corporation. The USDA has provided a \$179,877 grant entitled, Maximize Viable Embryo Production from Pre- and Peri-Puberal Calves, which runs from 9/1/96 to 8/31/99.

In addition, there is a pending \$327,448 grant with the USDA entitled, Cloning Cows: Effects of Cell Types and Long-term Culture, which would run from 7/1/99 to 6/30/02.

The Genzyme Corporation has provided two grants. The first is entitled, Developing Effective Protocols for Collecting Competent Oocytes from Heifers, which is in the amount of \$346,080 and runs from 5/1/97 to 9/30/99. The second is entitled, Production of Transgenic Dutch-Belted Rabbits, which is in the amount of \$313,500 and runs from 7/1/96 to 12/31/99. CII - Novel Approach to Produce Transgenic Pigs as Animal Model Xenogenic Transplant - 7/15/98-7/15/00. CII - Cloning Pigs - An Ideal Approach to Generate Organs for Transplantation - 12/31/98-12/31/00.

Research strategies include contemporal molecular and cellular biology techniques as well as classical embryology and reproductive biology techniques. These strategies place UConn Transgenic Animal Facility and this group among leaders in the areas of cloning and other genetic manipulations of embryos. Project efforts are to maintain high research standard and continue to lead in research areas.

The evaluation techniques are based on standard peer-review. These include peer-reviewed publications, grant supports and various forms of recognition such as awards, invited scientific presentations and chairmanships.

#### Association of Fertility with Temporal Changes in Ovarian Function in Domestic Ruminants

In this cooperative regional project, the aim of the research is to determine the pattern of follicular development in cows and heifers and use these ultrasonographic data to determine if fertility is associated with 2- or 3-wave pattern of follicular development.

It has been determined that heifers and cows having 3 waves of follicular development in the estrous cycle preceding breeding have significantly higher rates of fertility when compared to those animals having 2 waves.

This project will be a success if it results in two high quality, peer reviewed research publications.

A desirable outcome of research efforts is the publication of peer reviewed journals. This program is funded through USDA Regional Research.

At each research station, scientists will perform ultrasonography on a large number of Holstein heifers and cows. After determining whether these animals have 2 or 3 waves of follicular development, insemination will be done. Subsequently, it will be determined if there is an association between patterns of follicular development and fertility. This project is approved for the period of 1996-2001.

Each research station will utilize the same research methods. Data from each station will be grouped as a whole allowing us to have large numbers of animals in the data pool. This experiment could not be conducted at any one station.

The target audience for this work is primarily reproductive physiologists, artificial insemination firms and veterinarians.

This project would be improved with additional research technical support, additional animals and updated facilities.

#### Interaction of the Somatotrophic Axis and Oocyte Competence

Due to similarities in critical events during oocyte development, cattle serve as an excellent model for the study of human oocyte competence. The manipulation of ovarian dynamics in cattle can lead to improvements in ovum fertilization, rates of pregnancy and ability to harvest oocytes for development of transgenic cattle and cloning. Increased rates of genetic improvement through a reduction in generation interval and increased ova availability are now more routine with the advancement of non-surgical oocyte retrieval techniques.

One of the ways to potentially improve ovarian dynamics is through manipulation of the somatotrophic axis. The somatotrophic axis includes the hypothalamus, the anterior pituitary gland and various target tissues, including

the liver and the reproductive organs. Somatotropin, has been reported to influence ovarian dynamics and to improve superovulatory rates in heifers. It also has been shown to improve fertilization rates of oocytes matured in vitro. The goal is to evaluate the effects of exogenous somatotropin on ovarian dynamics and oocyte competence in beef cattle, using a non-surgical system to retrieve follicles and an in vitro system to evaluate oocyte competence.

The primary measure of success will be completed experiments in which follicles are retrieved and grow to the blastocyst stage, in vitro. A goal would be to complete experiments that investigate the effect of somatotropin on dairy cattle and beef cattle, under a variety of physiological conditions, especially growth rate and level of milk production. A very nice measure would be to secure outside funding from USDA.

Desired outcomes include peer-reviewed publications and quality recommendations for beef producers and dairy producers on the use of exogenous ST.

There are five individual partners associated with the project. Mark Tripp helps with cattle management, oocyte retrieval and in-vitro oocyte maturation. Dave Schreiber assists with cattle management and animal handling. Kristen Govoni handles sample collection and data analysis. Jerry Yang takes care of oocyte retrieval and maturation. Martin Praisner helps with cattle management.

In addition to the individual partners, there are four possible sources of external funding. The University of Connecticut Research Foundation (UCRF), the United States Department of Agriculture (USDA), Hatch and Pfizer are all possible sources of external funding.

A key component of the project is empirical data collection from well-designed experiments in beef cattle and dairy cattle. The duration of each experiment will vary from one month to one year.

The primary strategy will be to design quality experiments with a well-trained group of technicians, graduate students and undergraduates to collect, prepare, assay and analyze the results.

The target audiences for the research effort are fellow scientists interested in the somatotropic axis and outreach programs that target beef cattle and dairy cattle producers that might use exogenous ST.

The peer-review process will be the major evaluation tool. If a manuscript is accepted for publication in a peer-reviewed journal that will be considered a successful experiment.

### Turf/Agronomy

During the last 18 months the Department of Plant Science has instituted a Turf Initiative. This has resulted in the development of a turf curriculum that is being followed by undergraduate students (baccalaureate). The next 5 years should see an expansion of this program to include (1) an approved major (baccalaureate) and (2) a major in the Ratcliffe Hicks School of Agriculture. This will require the development of additional courses and, to provide them, additional faculty and staff.

Anticipated measures of success include increases in approvals of programs of study and in student numbers (majors) in both programs (PLSC and SAPL). Ideally, more programs of study with respect to Agronomy will be developed. In addition, more students majoring in Agronomy are also desirable.

Internal partners include K. Guillard (teaching and workshop development), S. Rackliffe (adjunct lecturer) and S. Singha (program development).

The project duration is from the years 2000 through 2005.

An important strategy is the development of turf workshops, which will target undergraduate students and possibly non-degree. These workshops would also be directed to golf course superintendents and grounds keepers.

The target audiences for the program or project effort include undergraduate students, non-degree students, golf course superintendents and grounds keepers.

Evaluation techniques consist of formal evaluations and the monitoring of enrollment numbers. Development of turf programs should be reflected by increased students numbers (majors), enrollments, and increased enrollments in courses feeding the turf curricula. Workshop development can be evaluated by enrollment numbers and evaluation assessments.

### Turfgrass Management

Development and evaluation of best management practices for turfgrass. Proper management of turfgrasses is critical for turf performance and quality in addition to preventing losses of nutrients and turf chemicals offsite. Research in this area will benefit professional grounds keepers, golf course superintendents, managers of athletic fields and parks, homeowners, and others who desire information on turfgrass management.

It is anticipated that best management practices will be developed and evaluated for various turf systems. As results are released, many of these practices should be adopted by those interested in quality turf without compromising environmental quality. As the turfgrass science program develops in the College, it is expected that grant funding of the program will increase as well as student enrollment in the Agronomy major.

A particular desirable outcome is the publishing of peer-review journal articles. It is expected that Extension personnel will also use the results for Extension publications.

Important resources of the research project include the United States Golf Course Association, Golf Course Superintendents Association, the Connecticut Department of Environmental Protection and the New England Turfgrass Foundation, all of which are potential funding sources. Another important resource is the United States Environmental Protection Agency.

Key components of the project include turfgrass nutrient management and alternative pest control methods for turf.

Strategies include field, greenhouse, and laboratory experiments utilizing standard designs and analyses. Moreover, demonstration-style studies on various watershed sites will be performed.

Research in this area will benefit the target audiences of professional grounds keepers, golf course superintendents, managers of athletic fields and parks, homeowners, and others who desire information on turfgrass management. Regulatory agencies such as EPA and DEP will also be targeted.

Evaluation techniques consist of statistical analyses of data, which will determine treatment effects of experiments.

### Vaccine Research

*Mycoplasma gallisepticum* infection is the major cause of reduced egg production, hatchability, and downgrading of carcasses. Losses to the broiler and layer chicken industries are estimated at \$588 million and \$132 million respectively in the United States annually.

The goal of this research project is to assess the utility of an attenuated strain of *M. gallisepticum* both as a modified live vaccine for the prevention of *M. gallisepticum* disease and as a vector for the delivery of genes encoding protective antigens from other bacterial and viral avian pathogens. The capacity of *M. gallisepticum* to adhere to, and be taken up by, the surface epithelial cells make it an ideal candidate vaccine and potentially useful vector for the delivery of heterologous antigens. The avian influenza virus (AIV) H5 hemagglutinin (HA) was chosen as the heterologous vectored antigen for initial trials. A study by the University of Connecticut Cooperative Extension System estimated the economic loss to Connecticut if an outbreak of avian influenza occurred would generate total losses in the range of \$12 to \$166 million depending upon the extent and duration of the outbreak. The stimulation of chicken INF by the vaccine may enhance the immune response, thus making it unique among avian vaccines. The capacity of the *M. gallisepticum*/AIV HA construct to protect birds from challenge with virulent *M. gallisepticum* and to induce a serological response to the AIV H5 will be sufficiently compelling to warrant marketing the attenuated strain of *M. gallisepticum* as both a modified live vaccine and as an expression vector.

Anticipated measures of success include publications, grant funding and the development of an efficacious vaccine.

Desired outcomes are the same as the measures of success: publications, grant funding and the development of an efficacious vaccine.

Some of the partners associated with the research efforts are Dr. Lawrence Silbart, Dr. Philip Marcus and Dr. Margaret Sekellick. An important resource is the funding agency, Connecticut Innovations, Inc., Critical Technologies, S.J. Geary, Principal Investigator. Title: "Development of a *Mycoplasma gallisepticum* Strain as a Live Attenuated Vaccine and Vector for the Protection of Chickens and Turkeys from Respiratory Disease" - Amount: \$300,000, Dates: 1/1/99-12/31/01.

There are a number of important strategies that will be utilized. First, assess the efficacy of *M. gallisepticum* R high as a modified live vaccine strain for poultry. Second, utilize a Tn4001-AIV H5HA shuttle vector for the insertion and expression of AIV HA gene in *M. gallisepticum* strain R high. Third, assess the immune responses (Ab & HI) to *M. gallisepticum* and AIV HA. Lastly, assess the capacity of interferon to serve as an adjuvant.

The target audience consists of researchers interested in microbial virulence and vaccine development.

### Vegetable Integrated Crop Management (ICM)

The general public is demanding safe food and water, and an environment protected from contamination. Methods are needed to minimize dependence on pesticide by commercial agriculture, government and communities while maintaining the economic viability of Connecticut agriculture and green industries and the quality of life of the citizens.

The Connecticut Non Point Source Pollution Assessment and Management Plan indicates that pesticides and nitrate accounted for the highest percentage of contaminated wells between 1979-1988. In addition, pesticides

were detected in 66% of DEP monitoring wells after "normal applications, as outlined in the Report to the Legislature on Pesticides in Ground Water (DEP, 1991)

Anticipated measures of success are based upon changes in knowledge and/or behavior of target audiences.

Desirable outcomes include Extension articles published in Yankee Grower, an IPM Web site and distance learning products.

A valuable internal resource is the Storrs Agricultural Experiment Station, which supports the development of components at the IPM program. External resources consist of the NE-92 Regional Technical Committee and the University of New Hampshire Cooperative Extension, both of which cooperate, in the development of Nitrogen management systems for vegetables (MS).

Herbicides, nitrate nitrogen and phosphorous are among the most often found contaminants of ground and surface water. All are widely used in vegetable production. This five-year long program will promote the use of non-herbicide base weed management programs and the use of efficient nutrient management systems in vegetable production.

An important strategy is to target commercial vegetable producers using educational methods such as the Yankee Grower Newsletter, IPM web site and grower meetings. Approximately 500 vegetable growers per year will receive training and 100 per year are expected to change practices.

Targeted audiences for the program include commercial vegetable producers.

Program effectiveness will be evaluated by an annual random survey of commercial vegetable producers to determine adoption of practices.

#### Connecticut Veterinary Diagnostic Laboratory

The Connecticut Veterinary Diagnostic Laboratory (CVDL) provides service in the form of necropsy, histopathology, biopsy, serology, microbiology, and mastitis testing to the veterinarians, farmers and animal owners of Connecticut and southern New England. The laboratory participates in both state and federally mandated testing programs as well as private testing for veterinarians. Particular emphasis has been placed on testing for diseases of particular importance in Connecticut (Lyme disease, Salmonella enteritidis) and educational materials are developed for veterinary and client use. The laboratory also provides an important surveillance and diagnostic function as relates to introduction of foreign animal diseases, animal disaster response, and response to bioterrorism.

Success is measured by laboratory usage, as well as presentation and publication of case materials generated from the diagnostic laboratory at national meetings and in peer reviewed publications.

Desired outcomes include an increase in laboratory usage (and generated income), more participation in national disease surveillance programs, presentations at national meetings, peer reviewed publications, collaborations and granting with collaborators.

The Connecticut Department of Agriculture is the most important partner, providing some financial support as well as programmatic input (one example: the CVDL is represented [Bushmich] on the Connecticut Animal Emergency Planning Committee, charged with developing a comprehensive emergency preparedness plan for livestock and pet animals). Other important contributors include related federal agencies, APHIS (Animal Plant Health Inspection Service) Veterinarians and NVSL (National Veterinary Services Laboratory), as well as the AAVLD (American Association of Veterinary Laboratory Diagnosticians) UConn's laboratory accrediting agency.

Key components of the program include: the diagnosis of animal diseases by multiple methodologies; participation in federal and state animal disease programs; production of educational materials and consultation for clientele; and the investigation, presentation and publication of appropriate case material. The duration of the program is at least five years, from the years 2000 to 2005 and possibly beyond.

Strategies include the analysis of necropsy specimens and samples submitted to the laboratory, the investigation of interesting case presentations or emerging problems, co-operation with other state agencies in areas where services and expertise are needed and direct consultation with veterinarians regarding individual cases.

Target audiences include veterinarians in Connecticut and southern New England.

Evaluation techniques include a clientele survey that was recently sent out. Other measurable products of collaborative efforts include increased surveillance of animal diseases, development of animal emergency preparedness plan in addition results of accreditation inspection.

#### Department of Pathobiology

The primary mission of the Connecticut Veterinary Diagnostic Laboratory is to provide animal health and disease diagnostic service to citizens of the State of Connecticut and New England region in cooperation with the veterinary medical profession. This involves agricultural, companion, wildlife, aquatic, marine and exotic species. The second important mission of the diagnostic laboratory is that of a teaching laboratory for veterinarians in the

combined residency/Ph.D. program. Thirdly, the laboratory provides faculty, graduate students and undergraduate students access to spontaneous animal diseases for investigation and study.

Measures of success include the identification of the disease process in individual and populations of animals with recommendations for treatment, prevention or prognosis. Another measure is the increase in the accession and income. Undoubtedly, accreditation as a full service laboratory by the American Association of Veterinary Laboratory Diagnosticians would be considered a success.

Desired outcomes include peer reviewed publications, providing an environment conducive to learning and maintaining accreditation. For example, peer reviewed articles and development of new research projects derived from spontaneous diseases of all species are desired. It is hoped to help veterinarians with the successful treatment and diagnosis of infectious, metabolic, neoplastic and toxic diseases. In addition, providing a good learning environment for the graduate program in morphologic pathology is important. Lastly, maintaining accreditation from the American Association of Veterinary Laboratory Diagnosticians is a mandatory outcome.

The partners of the project are the Connecticut Department of Agriculture, state, regional and national veterinarians, the animal owning public, the University of Connecticut, Pfizer, Bayer and the United State Department of Agriculture - Animal Plant Health Inspection Service APHIS.

Targeted audiences include veterinarians, the animal owning public, state and national animal health officials as well as the partners listed above.

### Viral Pathogenesis and Immunology/Vaccine Research and Development

Genetic Vaccines/Liposomes/Cytokines - Testing of liposomes in the delivery of DNA vaccines is being done in collaboration with Dr. Diane Burgess (School of Pharmacy). Dr. Marvin Grubman (Plum Island, USDA) is collaborating with us with the application of cytokines with DNA vaccines. Thus far the liposome DNA vaccine delivery and co-administration of IL-2 have both yielded promising results. These two approaches are of significance in the field of vaccinology in general that can be applied to swine or other species.

Porcine Respiratory Reproductive Syndrome (PRRS) - A PCR test is being calibrated to evaluate the prevalence of PRRS in New England States. This work is in collaboration with personnel of USDA (Sutton, Ma). This study will contribute to better understand the impact of PRRS in the region.

Research on Llama Medicine- Collaboration with Drs. Richard French (Department of Pathobiology) and Isaac Ortega (Department of Natural Resources Management and Engineering). Development of a diagnostic test for meningeal worm (*Parelaphostrongylus tenuis*) infection in llamas is one of the goals of this collaboration. An ante-mortem test to differentiate this infection from other processes affecting the CNS will be of significant clinical value.

Transgenic Plant Vaccines - Collaboration with Dr. Yi Li (Department of Plant Science). The plan is to develop a transgenic plant with a gene (ORF-5) derived from PRRSV and test this as a vaccine. This will advance the understanding on the applicability and efficacy of transgenic plants as animal vaccines.

Role of Torovirus in Neonatal Calf Diarrhea - In collaboration with Dr. Herbert Van Kruiningen (Department of Pathobiology) an effort has been initiated to determine the role of toroviruses (breda virus) in calfhood diarrhea. This will contribute to the understanding of the impact of this virus in calf diarrhea.

Measures of success are based upon the anticipated research results and grant dollars received. Contributions in the general area of vaccinology, diagnosis of meningeal worm in llamas and assessment of the impact of PRRS and torovirus (Breda virus) in the region are anticipated. Research proposals have been submitted to the USDA, NIH and UCRF.

Ideally, this work will continue to generate peer reviewed publications, and presentations in national and international scientific events.

Internal resources are located at the University of Connecticut. They include Dr. Diane Burgess (School of Pharmacy), Dr. Yi Li (Department of Plant Science (CANR)), Dr. Herbert Van Kruiningen, Dr. Richard French (Department of Pathobiology CANR) and Dr. Isaac Ortega (Department of Natural Resources Management and Engineering). External resources include Dr. William Smith/Mr. Fred Launer (USDA, Sutton, Ma) and Dr. Marvin Grubman (Plum Island, USDA-ARS, Greenport, New York).

Standard methods and techniques, which are tailored to specific research needs, will be applied.

Targeted audiences include students, scientific community and the public at large.

The research results are evaluated as they are generated, papers are prepared and submitted for publication and these in turn are peer-reviewed prior to acceptance.

## INDIVIDUAL PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

### Business Planning Using Risk Management Tools

While farmers have traditionally done a good job of producing, they have often neglected to develop a business plan. This is especially important when undergoing change - whether expanding the current enterprise or developing a new market or product. Dr. Steve Ford, Penn State University, in his paper, "Financial Analysis for Various Expansion Strategies", demonstrates the inability of a farm to meet its debt service obligations after choosing an expansion strategy. This educational program will improve the ability of farm business owners to evaluate alternative strategies for reaching their farm goals. Strategies for reducing risk will be evaluated during the business planning.

Success is measured by farm owners investing in order to change and improve their cash flow and profitability, while adopting strategies to reduce the potential losses.

Desired outcomes include case studies of farms undergoing change that will be discussed in an Extension Publication and in Extension newsletters.

Partners of the program include the Connecticut Farm Bureau, Eastern Connecticut Resource Conservation and Development, CT Department of Agriculture, and USDA Risk Management Agency.

Key components of the program description involve workshops that will allow farm owners to put ideas and goals into writing. Homework between sessions will require research into potential income and expenses of enterprise change. A personal session with a financial advisor will provide an outside view on the completed business plan.

Farmers applying for loans will be targeted through their bank contacts, as well as the CT Dept of Agriculture's Farm Viability Program's participants. Extension business planning workbooks will be utilized, as well as marketing and financial specialists invited as speakers.

Target audiences consist of farmers already in business and considering change in their enterprise.

Evaluations of the understanding of the concepts of business planning will be conducted before and after workshop sessions. Cash margins of the business will be compared before and 2 years after the program.

### Agricultural Waste Management Planning

Cooperative Extension System Focus: Modern livestock management practices involve housing increasing numbers of animals in ever larger roofed structures. Manure and other wastes generated accumulate, usually just outside the barn having been removed from the building through some mechanical process. Large volumes of material need to be stored until such time as field conditions allow the manure to be spread on cropland. Past practice has been to basically dig large holes in the ground and allow the wastes to accumulate. Research has shown that this practice should no longer be allowed to continue in Connecticut. Due to the lack of clay particles in most Connecticut soil these unlined storage structures never seal and continually leak water contaminated with nutrients, bacteria and other pollutants into ground water. Most of these existing storage structures are also undersized. The USDA-EPA Unified National Strategy for Animal Feeding Operations requires that waste storage facilities be constructed to contain all runoff from a 25 year 24-Hour storm event (7 inches of rain in 24-hours for CT) without runoff. This CES educator is a member of an interagency team that conducts on site assessments of the potential and actual pollution sources on farms and recommends a plan of action to clean up existing pollution and reduce the risk of future environmental contamination.

Measures of success are based upon the number of storage structures constructed or upgraded, the number of pollution sources eliminated and changes in the attitudes of producers as evidenced by the numbers of operations applying for cost share assistance.

Outcome products desired include agricultural waste management plans and Extension publications. Specifically desired is an Extension publication on the rationale behind environmental stewardship and the potential hazards to public health that can come from manure entering drinking water supplies.

Partners of the project include USDA NRCS, USDA FSA, Connecticut DEP and Connecticut farmers.

This is an ongoing project with an open ended MOU between agencies to cooperate. This project involves a risk assessment of the farmstead by representatives of each agency and the farm. All existing or potential risks to the environment are identified. A plan is developed to clean up existing pollution, and to minimize risk of future contamination. Government cost share is applied for if possible from federal and state sources. Farmers agree to implement the plan in a timely manner - usually within 3-5 years.

Due to the individual nature of farm operations individual farm visits are the preferred method for educational efforts. Some meetings or workshops are conducted at least semiannually to raise awareness of cost sharing opportunities and the consequences of environmental contamination. These meetings are not well attended

if the focus is on environmental issues - so including environmental topics in PAT programs, and other meetings also generates some interest.

Target audiences consist of livestock producers of all sizes.

Evaluation techniques include: Ongoing monitoring of the number of producers signing up for cost sharing with NRCS and FSA; Neighbor complaint reduction/satisfaction after team response to a farm that has been named in a complaint to DEP; Number of structures/practices planned; Number of pollution problems cleaned up with an estimate of environmental impact; and the number of structures built.

### Farm Safety Training

Cooperative Extension System Focus: Convene an advisory committee to assess the current status of farm safety needs in Connecticut. Develop educational program as appropriate to educate producers to the health hazards identified in the assessment. Evaluate the success or failure of the educational program.

The most desirable measure of success would be if the needs assessment identifies no significant risks to the farm population. If an issue is identified as "risky," an educational program is developed. The measure of success will be to realize a downward trend in the number of incidents of the injury caused by the identified risk.

Desirable outcome products can not be identified until the exact problem is specified.

Potential partners of the project might include: CT Health care providers (UConn Medical Center?); Medical insurance companies; CT Department of Labor; Commodity groups; CES Forestry Team; CT State foresters; and Shellfish industry representatives.

Assessment of risks through worker injury records will probably take at least 1 year. Development and implementation of an educational intervention program will occur during the remaining 4 years of this plan. Evaluation of the program will occur in the final year of this plan.

One project strategy is to network in order to obtain participation on an advisory committee. Another strategy is to conduct an assessment using input from advisory committee representatives and other sources of data. Audience identification and methods cannot be delineated until risks are identified.

Target audiences can not be identified until the risks are specified.

Evaluation techniques can not be identified until the risks are specified.

### Greenhouse Integrated Crop Management (ICM)

Integrated crop management (ICM) is the use of a variety of pest control methods designed to protect the environment and to produce high quality crops with the most judicious use of pesticides and fertilizers. Some of the risks associated with pesticide use include pollution of ground and surface waters, resistance of pests to pesticides and pesticide applicator safety. For greenhouse crops grown for their aesthetic value, there is a low tolerance for pests making the implementation of ICM strategies more challenging for the grower (Parrella and Jones 1987). The greenhouse/nursery industry is the largest segment of CT agriculture, generating 26% of the total cash value of receipts.

The adoption of ICM practices will foster the use of pesticide alternatives including biorational pesticides, cultural controls and biological control. This ICM adoption will result in the increased use of less toxic pesticides and those with lower leaching and runoff potential, and reduction in pesticide active ingredient among the participating growers. Growers will also participate in educational programs leading to private pesticide applicator recertification and will learn about the pesticide safety, risk management and the proper application of pesticides.

Desired outcome products will include peer-reviewed articles, articles for national magazines such as Northeast Update for GrowerTalks magazine, Extension publications and fact sheets and use of electronic media for dissemination of information via the UConn IPM web site.

Partners of the project include the Connecticut Greenhouse Growers Association, CT Department of Environmental Protection, CT Agricultural Experiment Station, University of Massachusetts (MS) and New England Floriculture, Inc. (MS).

The goals of the Greenhouse ICM program are to provide pesticide users with the knowledge, skills, methods, experience and confidence needed to produce high quality crops with the safest and least amount of pesticides. Up-to-date research results (based upon review of the literature and consultation with colleagues) will be incorporated into educational programs and publications over this five-year period.

A key educational component will be ICM full-season field training programs for growers consisting of hands-on intensive training in the field. The goal is to provide pesticide users with the knowledge and skills to begin adoption of ICM practices and techniques. Some of the topics covered on these educational site visits include ICM goals and benefits, monitoring for key pests, use of cultural and biological controls, resistance management, and proper nutrient management. Additional growers will be reached via site visits, and educational programs and

publications. 5 growers will be reached via full season training per year. 150 growers will attend educational programs. 50 growers will attend educational programs to receive private pesticide applicator recertification credits.

The target audience for the Greenhouse IPM program is wholesale and retail growers of bedding plants, hanging baskets, flowering pot crops and herbaceous perennials. In 1997, 231 wholesale growers produced floriculture crops with a wholesale value of 45,272,000 dollars on 6,362,000 square feet of production. (NASS Survey)

The evaluation techniques used consist of Greenhouse ICM/IPM standards, which will soon be developed. In addition, a random sample of clients will be surveyed annually to determine the use of ICM/IPM methods and to assess if learning occurred.

#### Introduction to Horticulture Course

Focus: The interest in horticulture and gardening is at an all time high in the United States. Various surveys (National Geographic, 1995) rank gardening and horticulture as the number one leisure time activity in the United States, with approximately 90 million households involved in some type of gardening. Introduction to horticulture presents the fundamental concepts of plants structure, growth and development using horticultural plants as models. As such it is an academic and well as a practical course that will teach participants about horticulture with a particular emphasis on a more sustainable approach with reduced energy inputs and practices. Thus actions that are taken at the individual level can have positive environmental and community consequences.

The academic program focus is for the West Hartford campus with a statewide draw of two major audiences, students (consumers) and commercial horticultural practitioners.

The overall impact in teaching a course will be the change in knowledge base of the participant and how much knowledge they have gained due to this course. Additionally any changes in behavior such as changing to a career or going back to school (as was the case this semester with a number of students) are measures of success and or impact.

The most desirable outcome is an increase in the number of students participation in the course.

Partners of the program include one internal linkage and two external linkages. The internal linkage is with the Department of Plant Science. The external linkages are the Connecticut Nurserymen's Association and the Connecticut Groundskeepers Association.

This will be an ongoing program with a course offered each spring. The unique feature of this course is that participants can take the course for credit or non-credit. Introduction to Horticulture is a 3 credit hour course with one weekly class meeting, including lecture and lab discussion sessions.

Introduction to horticulture presents the fundamental concepts of plant structure growth and development using horticultural plants as models. An introduction to the basics of plant biology, physiology, reproduction and genetics and how these functions are affected by environmental, chemical and mechanical manipulation will be presented. Specifically the course will: Familiarize students with basic terminology and the structure/function relationships of horticultural plants; Acquaint students with the basic physiological and genetic mechanisms involved in plant growth and development throughout the entire life cycle from seed germination to plant maturity; Explore the ways man has manipulated growth and development of horticultural plants for food production and landscapes; and Discuss contemporary issues that impact horticulture such as biotechnology, world food problems, natural resource conservation, global warming and sustainable production systems (particularly landscape systems).

Methods will include announcing the course in the University catalog and through industry newsletters. The research strategy will include a yearly update of course. Both will be targeted to audiences that will include students (consumers) and commercial horticultural practitioners.

Target audiences for the program effort includes students (consumers) and commercial horticultural practitioners.

Evaluation techniques consist of University instructor evaluations and personal evaluations.

#### Connecticut Shellfish Hatchery - Aid to Public/Private Aquaculture and Resource Enhancement

Cooperative Extension System Focus: The Connecticut Interagency Coordinating Committee has listed priority concerns for legislative action and improved industry organization. The issues will redraft the goals of the fifteen-year old Connecticut Aquaculture Findings and Recommendations document, that allowed a very successful shellfish development program 1982-98. Local shellfish commissions, private companies, the state Department of Agriculture - Bureau of Aquaculture, the National Marine Fisheries Service, and University of Connecticut CES will address current production problems: breeding of MSX and dermo resistant oyster seed, hatchery and nursery techniques for improved vigor strains, and expanded program on fish and algae culture. The University Marine Research Laboratory facility in foreseen as an "Aquaculture Experiment Field Station" in Noank. Interaction with

all potential organizations and the community will enable funding and the participation of research faculty, technicians, graduate and vocational aquaculture students in shellfish husbandry programs for Connecticut. Related research proposals (Sea Grant) have been developed with first nation (Mashantucket) interests in converting their aquaculture facilities to marine applications.

Measures of success will include: State bonding to renovate and establish a shellfish hatchery at Noank; public/private stock enhancement in the field with new grow-out methodology; new mechanism for disease resistance and the number and procedures changed within the aquaculture industry; information articles/brochures on the knowledge and practical advancement in this field.

This work will result in the presentation and expertise exchange at national shellfish meetings; peer reviewed publications and implementation via Extension bulletins; successful genetic selection of superior oyster, scallop and clam stocks; improved resource economic ratio for the industry.

Partners are: Industry (shellfish producers and N.E. hatcheries), Connecticut Department of Agriculture/Bureau of Aquaculture, National Marine Fisheries Service, Connecticut legislature, local town shellfish commissions.

The organizational team will continue to plan hatchery construction and apply funding to the restoration of the Marine Research Laboratory as an industry/community asset. Opportunities for faculty, student and vo-aqua intern projects on shellfish biology and field ecology will be expanded. Special town activities on public shellfish bed enhancement will be enabled and annual shellfish production values will increase. Important scientific techniques to reduce the increasing spread of oyster diseases will be pursued to help revitalize a severely impacted Connecticut resource.

Strategies include: 1) The shore-based, high-quality seawater laboratory is essential for all plans outlined. 2) The evaluation of improvement needs and implementation in local coastal waters will create new management guidelines. 3) Involvement of local schools and the vo-aquaculture students will provide unique education and work experience models.

Target audiences are shellfish industry producers, hatchery technicians, shellfish scientists (genetics); Connecticut Department of Agriculture, Department of Environmental Protection (fisheries management and environmental impact), National Marine Fish Service (researchers and field ecologists), the Connecticut Legislature, Town Shellfish, Harbor Management Commissions and the local community.

Evaluation techniques are project accomplishment, research, teaching and field application of shellfish studies concentrated in a coastal laboratory within Eastern Long Island Sound (MRL at Noank) and the direct ties with educational programming of the S.E. Connecticut Regional Vocational Aquaculture school undergoing site review selection.

### Turfgrass Integrated Pest Management

Cooperative Extension System Focus: To educate, train, and assist commercial and non-commercial individuals, companies and governments on IPM principles. The purpose is to increase awareness and adoption of IPM methodology. For information on significance of this issue see: State of Connecticut Integrated Pest Management Program 1990-1999 Annual Reports to the Legislature.

The plan is to work with the turfgrass service industry conducting applied research through full-season field training. Work with turfgrass industry disseminating applied research results through educational Extension or College credit courses, twilight meetings, state and regional conferences, and other events. Consulting activities with the turfgrass service industry, golf course superintendents, municipalities, schools, and state and government agencies.

Pesticide and fertilizer impacts will be measured through surveys to assess use and obtain reductions as a result of training and education. Individuals and businesses will change nutrient and pesticide management strategies after training to be documented by surveys and record review.

Outcome products desired include the Turfgrass Integrated Pest Management Manual, new and updated Extension fact sheets, an insect collection, turfgrass pathology collection and possibly development of a turfgrass training video.

Resources of the program include the Connecticut Department of Environmental Protection, which is a source of external funding. Two grants are provided by the CT DEP. The first is the DEP 319 grant: Development of A Turfgrass Integrated Pest Management Manual, collaboration with industry groups including the Connecticut Grounds Keepers Association and the Environmental Industry Council for manual input. The second is the DEP 319 Quinnipiac River Grant Project, collaboration with lawn care operators, municipalities, CT DEP, Quinnipiac working groups and homeowners.

Partners of the program include the Department of Plant Science, Department of Natural and renewable resources, CSREES Water Quality and the Northeast IPM program (MS).

Key components of the program description involve a plan to conduct applied research through full-season field training in the Quinnipiac River Watershed, CSREES Water Quality program and possible other future watershed projects. The plan is also to disseminate applied research results from the DEP 319 Turfgrass Manual and Quinnipiac River Watershed, Department of Plant Science turfgrass program, Water Quality Sustainable Landscape program and NE IPM programs. In addition, educational Extension or College credit courses, twilight meetings, state and regional conferences, and other events will be held. Consulting activities with the turfgrass service industry, golf course superintendents, municipalities, schools, and state and government agencies is also part of the plan.

Other key components of the program involve a plan to work with the turfgrass service industry conducting applied research through full-season field training in the Quinnipiac River Watershed, CSREES Water Quality program and possible other future watershed projects. Work with turfgrass industry disseminating applied research results from the DEP 319 Turfgrass Manual and Quinnipiac River Watershed, Department of Plant Science turfgrass program, Water Quality Sustainable Landscape program and NE IPM programs. Educational methods to be used include educational Extension or College credit courses, twilight meetings, state and regional conferences, homeowner demonstrations and other events. Consulting activities with the turfgrass service industry, golf course superintendents, municipalities, schools, and state and government agencies. The total number of approximate program participants to be 13,000 to 15,000 people.

The target audience includes the turfgrass service industry (lawn care operators), golf course superintendents, municipalities, schools, master gardeners, homeowners and state and government agencies.

Pesticide and fertilizer impacts will be measured through surveys to assess use and obtain reductions as a result of training and education. Individuals and businesses will change nutrient and pesticide management strategies after IPM training, to be documented by surveys and record review.

#### Agriculture/Home Horticulture

Cooperative Extension System Focus: Home Horticulture and how it impacts the environment is a critical issue in Connecticut as well as in Hartford County. People are very interested in learning about the environmental impacts of the chemicals and pesticides used around the home lawns and landscape plants. People are also concerned about the food value of the gardening by the individual home owners or the community gardens in an urban area like Hartford. The Cooperative Extension provides research based, practical, useful information in the areas of Environmental impacts of the chemicals used in gardening as well as the importance of food production for low income communities through community gardening. This information is extended to the residents through the educational programs, educational leaflets and volunteers trained through the Extension Master Gardener program.

An anticipated measure of impact is based upon the successful completion of the following plan. Fifty individuals will be recruited from the Hartford area to be enrolled in the Extension Master Gardeners training program each year. These individuals will go through the thirteen week, intensive training in gardening and home horticulture. Before the training the individuals enrolled will be asked to take a pre-test to measure the level of gardening knowledge individuals have. At the end of training the post test will be given to find out the information gained, skills learned and attitudes changed as a result of this training. Volunteers will be provided with the opportunity to go through the 60 hours of in-service supervised training with some outreach education opportunities in the area of community gardening and urban gardening. It is expected that total of 3000 volunteer hours will be donated as a volunteer time per year resulting in the saving of approximately \$30,000 Dollars.

Based on the information gained through the experience of working in urban gardening and community gardening, two Extension publications will be written- one in Basics of Community gardening and the second in the area of Urban gardening.

Partners of the program include Master Gardeners, Extension council members, Extension educators, the City of Hartford and community volunteers.

Key components of the program description involve the recruitment of volunteer Master Gardeners, the recruitment of volunteers for community gardening, 12-week Master Gardeners training and evening educational workshops in gardening/home horticulture for people who can not attend classes in the daytime.

The strategy is to provide Master Gardeners' training through evening gardening workshops. Approximately seventy individuals will participate. In order to evaluate this particular strategy, data will be collected on the process involved in starting and sustaining a community garden.

The target audience for the program consists of Hartford area residents.

Evaluation techniques include pre and post tests and surveys. Volunteers will be surveyed after one year on the skills learned, knowledge gained, and money saved as a direct result of the educational and training efforts of this faculty member.

#### Molecular Aspects of Genetic Improvement in Dairy Cattle

Focus: With the advent of modern techniques in quantitative genetics, improvement in selection accuracy over the last 30 years has fostered rapid gains in genetic merit of dairy cattle. However, little is known about molecular mechanisms involved in genetic superiority for production traits in dairy cattle. This program is aimed at investigating the potential involvement of genes involved in regulation of growth hormone secretion, as growth hormone is the major galactopoietic hormone in cattle.

Measures of success will be these studies resulting in improved understanding or genetic mechanisms regulating growth hormone secretion in dairy cattle.

This work will result in discovering novel information, publication would then be likely.

Partner will be Linda Strausbaugh, MCB faculty at UConn, who is providing lab space and collaboration in these studies.

A key component of the program is polymorphisms in genes regulating growth hormone concentrations will be associated with genetic merit for milk production traits in dairy sires (duration: 3 years).

Strategies include: isolate, clone and sequence CDS and promoter regions of genes involved in regulating growth hormone concentrations, including growth hormone-releasing factor, somatostatin, growth hormone-releasing factor receptor and the five somatostatin receptor types.

Target audiences will be anyone interested in molecular mechanisms regulating genetic merit for milk production in dairy cattle.

#### Dairy Science Teaching Activities

Focus: There are students who are interested in learning about Dairy Science. This teaching program is structured to meet those needs.

Measures of success will be an increase in knowledge for the students who enroll in the courses.

Outcome products desired would include stimulating student thinking in the subject area.

Key components of the program are available at <http://www.sp.uconn.edu/~ansc/courses/275/275.html> and [.../277/277.html](http://www.sp.uconn.edu/~ansc/courses/277/277.html).

Educational methods would include traditional lecture approach coupled with hands-on lab exercises.

Target audiences will be interested students.

#### Physiology of the Corpus Luteum

In cattle and other species, the corpus luteum plays a vital role in the regulation of the estrous cycle, fertility and maintenance of pregnancy and hence in subsequent milk production. Abnormal CL function has been implicated as a cause for early spontaneous abortions in cattle. Embryonic mortality accounts for the majority (40%) of reproductive failure in all domestic species and is therefore a major constraint to productivity. To comprehend and rationally alleviate reproductive wastage in livestock of economic importance, a more complete understanding of luteal function and particularly luteal regression, is mandated. The basic data obtained in this research program maybe be applied on the farm to reduce the estimated annual losses of at least \$400 million to the U.S. beef industry, \$280 million to the U.S. dairy industry and \$100 million to the U.S. sheep industry.

Measures of success include an average of three peer reviewed scientific manuscripts published annually and the generation of external research support. Current support from the USDA includes a grant to study bovine corpus luteum function (\$140,000) and another to study sheep CL function (\$195,482).

This work will result in a minimum of two peer reviewed scientific manuscripts should be published annually.

Partners will be: Research partner, John McCracken, UConn, Co-Principal investigator on a USDA grant entitled "Oxytocin and molecular mediators of luteolysis in sheep" and USDA: Principal investigator on a grant entitled "Endothelin-1 and bovine luteolysis."

a) Bovine grant: The long term goal of this research plan is to gain a clearer understanding of the processes controlling regression of the bovine corpus luteum (CL). Premature cessation of luteal function is a significant cause of reproductive insufficiency in cattle. Rational intervention to alleviate this wastage is difficult due to a lack of understanding of luteolysis. The immediate objective is to test the hypothesis that endothelial cells and their biosynthetic product, endothelin-1 (ET-1), play an important luteolytic role in bovine CL function, at least in part, by mediating the effects of PGF-2 $\alpha$ . To achieve this objective, the specific aims of the program are (1) to determine

number of endothelial cells, luteal content and synthesis of ET-1, expression of ET-1 and regulation of ETA receptors in luteal cells; (2) to clarify the cellular mechanisms by which ET-1 inhibits progesterone production; (3) to determine if ET-1 injected directly into the CL induces luteolysis; and (4) to determine luteal secretion of ET-1 and progesterone during spontaneous and PGF-2 $\alpha$  induced luteolysis.

Sheep grant: The first aim of this project is to determine the essential role of oxytocin by selectively reducing luteal oxytocin during the mid luteal phase in intact sheep by repetitive systemic infusions of sublyuteolytic levels of PGF-2 $\alpha$ . The second aim is to investigate molecular mechanisms involved in the antisteroidogenic and structural effects of PGF-2 $\alpha$  during luteolysis in sheep. Luteal tissue will be harvested and analyzed for steroidogenic acute regulatory protein, ET-1, heat shock protein 70, and monocyte chemoattractant protein. The third aim is to employ the ovarian autotransplant model to investigate the mediating role of ET-1 in PGF2 $\alpha$ -induced luteolysis.

Strategies will include utilizing a wide range of experimental techniques from molecular biological to whole animal studies.

Target audiences are reproductive physiology scientists, College students.

Evaluation techniques will be publication in well respected scientific journals.

### Field Corn and Forage Crop Integrated Weed Management

Production of field and forage crops are vital to the dairy industry in the region. With cash sales of 659 million dollars in 1997, milk continues to be the top contributor to overall agricultural marketing in New England. 215,000 acres of field corn grown in the six New England States are valued at 103 million dollars. In Connecticut, the dairy industry produced over 500 million pounds of milk valued at 77 million dollars. 38,000 acres of field corn valued at 18 million dollars, and 72,000 acres of hay valued at 15 million dollars are currently grown in Connecticut. Farmers feeding 68,000 head of cattle in Connecticut valued at 50 million dollars depend heavily on production of high quality forage.

Nationwide studies continue to show the potential for groundwater contamination by herbicides may be much greater than was commonly believed a decade ago. This problem particularly raises public concern in New England where agricultural and suburban areas are situated in close proximity to one another. Alternative weed management practices that reduce the use of herbicides with moderate and severe risk potential for soil leaching in watershed areas will likely reduce the potential for future contamination of groundwater. Use of herbicides with lower leaching potential, reducing dosage rates of existing treatments and increasing grower adoption of new weed control alternatives are needed to achieve effective and environmentally sound weed management in field and forage crops and is an important step in maintaining groundwater and environmental quality. Extension IPM programs typically center upon insect management. Because of these programs, insecticide use has declined. The Connecticut Integrated Weed Management (IWM) Field and Forage Crop Program is primarily focused on weed control and herbicide use. This program is the only IWM program for field and forage crops in the New England States.

Special ACT 86-44 of the Connecticut General Assembly ordered the Connecticut Department of Environmental Protection (DEP) and others to investigate the occurrence of pesticides in ground water in the state. The study tested ground water at 59 sites, including croplands, golf courses, and residential areas. Studies were initiated in response to the detection of widespread contamination of wells in Connecticut by EDB previously thought to pose little risk of ground water contamination. Results from this study submitted to the legislature in 1991 detected 24 pesticides in ground water wells in Connecticut. Pesticide concentrations exceeded federal health advisories at seven of the sites. Atrazine, the most widely used corn herbicide, was found in 79% of the test wells in Connecticut where atrazine was applied. Metolachlor, alachlor, and cyanazine, three frequently used corn herbicides were found in 36%, 20%, and 33% of the test wells respectively, where these materials were applied. Owing to those materials having found their way into a high percentage of ground water wells tested in Connecticut, programs, which emphasize reduced herbicide loading into watershed areas, should pose a significant positive impact on the water quality of Connecticut and the other New England States.

Ground water supplies about 28% of all water used in Connecticut. Approximately 33% of the State's population rely on ground water for domestic use. Therefore, contamination of ground water is of great concern to the residents of Connecticut. The DEP study showed that the ground water in a large percentage of test wells in Connecticut was contaminated with pesticides. Such contamination opens to question the safety of the water for drinking and other domestic uses. Contamination may pose health risks to certain individuals. In such cases, alternate water sources must be found or filtration systems must be used. Property values will decline when domestic water sources are contaminated with pesticides. Elimination of the use or significant reductions in the use of herbicides with the greatest likelihood of causing water contamination by using an IWM approach is a viable corrective approach.

Cooperation Extension Focus: The potential for groundwater contamination by pesticides may be much greater than was commonly believed a decade ago. Concerns involving herbicides in groundwater, particularly the most frequently used field corn herbicides have substantially heightened public awareness regarding the safety of the water. The effect of herbicides on water quality will continue to be a major public issue. Reducing herbicide use and managing needed treatments on field corn and other forage crops will be an important step in maintaining groundwater and environmental quality. With the large acreage of field and forage crops in the New England region, and the national goal of having IPM programs in place on 75 percent of the nation's farmland acreage, reduction in pesticide use is of national as well as local importance.

Control of triazine resistant and other problem weeds in field corn has resulted in increased herbicide use on many farms. These problems have also placed additional burdens on production costs and agricultural viability. Financial hardships currently facing many farmers have led to considerations that farm profitability might be increased by reducing the rate or use of pesticides, if effective less costly alternatives were available. IWM strategies provide growers with effective weed control yet reduce the amount of herbicides required to provide this control. Alternative weed management practices that significantly reduce the use of herbicides with moderate and severe risk potential for soil leaching or runoff in watershed areas will likely reduce the potential for future contamination of ground and surface waters. The problem of increased weed pressure, coupled with the groundwater concerns of field corn herbicides, has increased the demand for greater utilization of IWM practices for weed management in field corn.

Measures of success are defined as the change of knowledge or behavior with respect to farmers. Farmers will increase use of recommended integrated weed management practices for field corn and other forage crops to maintain or increase crop yields. Farmers will reduce the amount of herbicides used to achieve needed weed control for field and forage crop production as shown in Extension demonstrations and maintain or increase agricultural viability. Farmers will decrease the use of those herbicides classified as having severe potential for soil leaching in order to reduce and prevent water degradation from pesticides.

Desirable outcomes include: Journal articles, abstracts, conference presentations and papers for professional audiences, growers meetings at on-farm demonstration plot sites during the growing season and winter meetings, grower meetings for farmers in other New England States, impact sheets to legislators, USDA. Extension publications, fact sheets. Experiment Station bulletins, and articles in trade publications.

Resources of the program include: The Consolidated Farm Service Agency, The National Resource Conservation Service, The Connecticut Department of Environmental Protection, The Connecticut Department of Agriculture, The Connecticut Farm Bureau, and the Soil Conservation Districts.

The Connecticut Integrated Weed Management (IWM) Field and Forage Crop Program is a research-based program which addresses herbicide use by farmers growing field corn and other forage crops. The objectives of this program are to use an IWM approach to reduce the rate and number of herbicides used in field corn and other forage crops through field-scale applied research and on-farm demonstration plots. IWM training and education to field and forage crop growers, and delivery of new techniques through educational materials such as the existing New England Guide to Weed Control in Field Corn and other widely read publications are also important aspects of the program. Individual farm educational programs and group meetings are held throughout the year to deliver the results of the IWM recommendations for field corn and other forage crops. On-farm research and demonstration sites are established across the State to demonstrate alternative management strategies on weed control and yields of field corn. Farmers implementing demonstration trial results are primarily responsible for the success of the program. Farmers can use the knowledge gained from this program to resolve problem weed infestations; lower crop production costs, and address environmental concerns including the potential threat of agricultural chemicals on water quality.

To achieve program goals, individual grower and group meetings are organized throughout the season. Meetings at on-farm research trial sites allow growers to view the results of new technological advances. These research trials provide the basis for improved IWM practices and recommendations for weed control in field and forage crops. Grower training in proper weed identification and weed scouting is a high priority. Successful growers in the program integrate cultural, mechanical, biological, and chemical control strategies into a systematic approach to optimize crop yields while minimizing the environmental impact associated with agricultural chemicals. Field-scale applied research and on-farm site demonstration plots evaluating the effectiveness of reduced dosage rates of currently available and recently developed preemergence and postemergence herbicides on weed control and crop yields allow growers to make sound weed management decisions. New herbicide-tolerant corn hybrid variety trials introduce farmers to weed management alternatives. Narrow row corn plantings and competitive crop varieties, two cultural practices that could reduce herbicide use, will be included in demonstration projects. The studies will evaluate losses due to weeds, and the potential environmental and economic benefits resulting from

different weed management practices. The research trials serve as valuable educational demonstration plots that provide growers with the knowledge, experience, alternatives, and confidence needed to produce optimum yields of field corn with the safest and least amount of pesticides.

Target audiences of the program consist of field and forage crop producers.

The impact of the program on participating clientele is evaluated by written and oral surveys to help determine the success and effectiveness of the IWM program. Producer satisfaction with knowledge gained and weed control is assessed in addition to the number of acres impacted, and adoption rate of new practices. Review of pesticide application records and grower interviews document the reduction in the pounds of pesticide active ingredient and change in pesticide use. Pesticide cost is determined and compared with previous years.

### Pesticide Applicator Training

Focus: As put forth in the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), any person who applies pesticides which are classified as restricted-use by the U.S. Environmental Protection Agency (EPA) or the CT Department of Environmental Protection, (DEP), must be certified by the State of Connecticut. FIFRA Sec. 23. states, "The (EPA) Administrator shall in cooperation with the (States) Secretary of Agriculture, use the services of the cooperative State Extension services to inform and educate pesticide users about accepted uses and other regulations made under this Act." Furthermore, the CT Pesticide Control Act of 1975 requires that applicators maintain their competency by participating in continuing education opportunities or re-testing every five years. The importance of such competency is amplified by the extensive areas involved, the quantities of pesticides applied, and the ultimate use of many commodities as food and feed. Practical knowledge is required concerning relevant soil and water problems, preharvest intervals, re-entry intervals, phytotoxicity, potential for human injury, environmental contamination and non-target injury.

Currently, there are 915 private pesticide applicators and 1,084 commercial ornamental and turf applicators certified in the State of Connecticut. Each year approximately 100 individuals seek certification as private applicators and another 300 as commercial ornamental and turf applicators. Consequently, there is a great and consistent demand for pesticide applicator training and recertification programs. Additionally, the safe and effective use of pesticides is a major public concern. Consumers who have questions regarding pesticides and their uses turn to the Extension system for unbiased information. Conversely, pesticides are routinely mishandled and improperly applied by consumers for control of pests in the landscape, garden and home. The need for consumer education about pesticides and pesticide related issues is evident. Currently there are problems and concerns related to the quality of ground and surface water in Connecticut. Pesticides have been identified as a contributing non-point source of pollution to these resources. Pesticide users can reduce the impact of pesticides on these water resources by using proper pesticide storage practices and by properly rinsing and disposing of empty pesticide containers.]

Measures of success include: 1,500 individuals will participate in educational programs leading to private pesticide applicator recertification; 450 individuals will participate in short courses to prepare for commercial ornamental and turf pesticide applicator certification; 800 commercial ornamental and turf professionals will participate in continuing education programs leading to pesticide applicator recertification.

This work will result in: 1) Agricultural producers, ornamental and turf maintenance professionals and consumers will learn about proper pest identification and control options. 2) Agricultural producers, ornamental and turf maintenance professionals and consumers will learn about the potential of pesticides to become point and non-point source pollutants and hazardous waste and how to properly store and dispose of pesticides. 3) Agricultural producers and ornamental and turf professionals and consumers will learn about pesticide safety (selection, handling, mixing, loading, application, etc.). 4) Agricultural producers, ornamental and turf maintenance professionals will learn about the importance of properly and frequently calibrating application equipment. 5) Agricultural producers, ornamental and turf maintenance professionals and consumers will improve their use of personal protective equipment when handling pesticides. 6) Agricultural producers, ornamental and turf maintenance professionals and consumers will learn the importance of reading, understanding and following pesticide labels.

The University of Connecticut Cooperative Extension System Pesticide Coordinator maintains linkages with the following agencies: University of Connecticut faculty and staff; Connecticut Department of Environmental Protection; Connecticut Agricultural Experiment Station; grower and clientele groups; USDA Cooperative States Research Education and Extension Service; USDA Natural Resource and Conservation Service; USDA Farm Service Agency; US Environmental Protection Agency; Environmental Industry Council; New England States Cooperative Extension Services; Connecticut Farm Bureau; Connecticut Department of Agriculture. The results of these collaborations are improved program communication, and meeting coordination. The most significant

collaboration is with CT Department of Environmental Protection, Pesticide Management Division. Regular dialogue allows for quick response to various issues regarding pesticides.

The pesticide education program provides opportunities for both private and commercial pesticide applicators to maintain their competence through participating in continuing education (recertification) programs. Programs are offered in each county on an annual basis and as part of commodity meetings which are held throughout the year across the state and across the region.

Extension offers short courses for individuals interested in becoming certified as commercial supervisory ornamental and turf applicators. Courses consist of 25 contact hours and are team taught. Extension also offers a series of twilight (evening) meetings offering hands on training for ornamental and turf applicators and provides recertification credit. Additionally, the Extension System co-sponsors an annual Turf Conference with the CT Grounds Keepers Association reaching an average of 1,400 individuals and providing recertification credit.

Strategies will include: Consumers will be reached directly through response to individual requests, invited presentations and through the volunteer Master Gardener Program. Additionally, as part of the Integrated Pest Management program growers and ornamental and turf applicators receive intensive one-on-one training from Extension on many pesticide applicator topics. The following materials and technologies will be used: Extension publications, fact sheets supporting various health, environmental and pesticide safety related topics; conference presentations; newsletter articles; updated ornamental and turf training manual; impact sheets to legislators, local government officials, Extension educators, USDA agencies; updated private applicator training manuals and materials; workshops, seminars, presentations for client groups; use of electronic media for dissemination of information.

The Cooperative Extension System will provide continuing education opportunities to private and commercial ornamental and turf pesticide applicators. Meetings will be held in each county at the Extension centers on an annual basis. Presentations will be made at commodity meetings on an as requested basis. Fact sheets, slides, videos etc. will be used as supporting materials. The CES will also provide initial certification training for ornamental and turf commercial applicators. An ornamental and turf short course will be offered twice a year, providing training for initial certification. A training manual for this course will be updated. Hands on turf and landscape ornamentals hands on workshops will be presented. Training will be provided to volunteer Master Gardeners who in turn will provide information to consumers calling the Extension System seeking related information. The CES will provide pesticide education to consumers as a result of direct inquiries, in response to requests for presentations.

Program evaluations will be conducted at county level general recertification meetings to evaluate impact of recertification programs on participating clientele and assess their training needs. Numbers of private applicators attending for recertification will also be used to determine demand for programming. Pre and post tests will be used to assess knowledge gained by participants in the ornamental and turf short course. Numbers of individuals successfully completing the state certification process will indicate a measure of success of the Extension training effort compared to the pass rate of non-participants. A written evaluation will be conducted at the conclusion of the Master Gardener training session on health, environment and pesticide safety. Where presentations to community groups have been made, informal evaluation of impact will be made through feed-back from organizing individuals.

### Equine Teaching

Academic Program: There are approximately seven million horses in the United States at the present time. This number is rapidly growing from a low of approximately 3 million reported in 1959. The 1959 numbers showed a rapid decrease from the 1915 report of approximately 26 million equine. The initial decrease of horse numbers resulted from the rapid mechanization of farms and the development of gas driven tractors etc. The remarkable increase in horse interest and horse numbers is thought to be the result of increasing leisure time and spendable income. Whatever the reason there is an explosion in the interest in horses. Connecticut, with its 50,000 horses, is the nation's most densely populated horse state. There are approximately 1,500 4-H youth horse projects in Connecticut, more than all the other livestock projects combined!

The large and increasing interest in horses provides a great opportunity for the University of Connecticut to attract new students. The equine program at the University of Connecticut has grown steadily over the last 30 years. The number of classes taught and the number of students in Horse Practicums is at an all time high. National recognition has been achieved in polo (six National Championships), Horse Judging (National Championship), Equestrian Team (National Championship riders) and Morgan Horses (many National Championships).

This work will result in producing well rounded students who will be able to compete successfully in the job market upon graduation.

Partners will be other colleges and universities at the local and national levels.

The Equine Program has been in existence since 1931 and has been continuous. The program includes educational, research and Extension components.

The UConn Horse Barn is one of the main tourist attractions on campus. During the year, bus loads of children and adults visit the barn. It has been estimated that over 2,000 individuals visit barns each month! Other attractions such as Holiday Barn, Spring Horse Sale, FAA Judging Contest, Intercollegiate Equestrian Shows, Intercollegiate Polo Matches, etc. attract many additional visitors to the UConn Horse Facilities.

Target audiences are: Potential College Students; Horse Enthusiasts; 4-H Members and Leaders; FFA Member and Leaders; and the General Public.

Evaluations will be: Academic - teacher evaluations, research published, awards; Public Support - attendance at events, donation of horses, donation of money, sale of horses.

### Urban Horticulture

Cooperative Extension Focus: Personal gardening and landscape management are key elements of the lifestyle for Connecticut residents. Many questions and problems (disease, insect, cultural) arise throughout the course of the year for both novice and veteran gardeners and matter-of-fact explanations and discussion of these issues is of broad general interest to the gardening public. The readership of The Chronicle newspaper (Willimantic, CT, daily circulation ~11,000) will be the people that benefit directly from this information.

Measures of success will be based on: a) continued acceptance of the weekly articles by the management of the newspaper, and b) written and oral feedback received directly from the readership.

This work will result in weekly article in "The Chronicle" newspaper.

Partners will be: UConn Home and Garden Education Center - a literature resource; UConn Home and Garden Education Center and Extension Centers in Brooklyn and Norwich - Master Gardener resource personnel.

Educational methods include weekly newspaper articles on timely topics for gardeners and home owners 52 weeks per year.

Target audiences are readership of The Chronicle newspaper and homeowners/gardeners/landscape managers in northeastern CT.

Evaluations will be feedback received regularly (often weekly) from the readership and newspaper editorial staff.

### Nutritional Programs for Dairy and Livestock Producers

Cooperative Extension System Focus: Feeding costs make up at least fifty percent of the costs of producing milk. The importance of proper nutritional programs cannot be understated. Proper ration formulation and nutritional management is important economically and is essential for maintaining the health and producing ability of the dairy herd. Providing current information on an individual farm basis and through producer meetings can result in significant improvements in profitability for dairy farmers. The Cooperative Extension focus in this area is to disseminate information on nutritional topics to dairy producers and feed company technical support personnel. Another focus of this program is to provide nutritional information to dairy/livestock producers on an individual basis and discussion of significant nutritional aspects during Dairy/Livestock team meetings.

There have been fewer reductions in Connecticut dairy farm numbers in the last 6 months. There has been a 2% reduction in Connecticut dairy farm numbers over the previous 6 months versus a 7.4% decrease for the previous 12 months, indicating that farms may be more profitable.

Measures of success include: increased knowledge of current nutritional practices by dairy producers, with the anticipated results of an increase in milk production and profitability; continue and improve attendance at nutritional workshops and conferences; research results on energy metabolism of dairy cattle and feeding value of by-products will be published in peer-reviewed publications; research results will be published as Extension articles for dairy producers; three grants have been awarded in this area; additional grant proposals will be submitted to commercial and government organizations in order to continue this work; continue with Extension presentations in this area.

Outcome products desired are: research results on energy metabolism of dairy cattle and feeding value of by-products will be published in peer-reviewed publications; Extension articles for dairy producers published in the College of Agriculture and Natural Resources Dairy/Livestock Newsletter; a dairy nutrition computer module was created. Additional computer modules will be produced; presentations, both in state, New England and National will be presented on this topic; workshop for utilizing nutritional technologies. Provide written materials to facilitate the use of computer feed programs.

Internal partners are UConn Personnel: Mr. Arnold Nieminen, Dairy Farm Manager; Ms. Joyce Meader, Dairy/Livestock Extension Educator; Mr. Richard Meinert, Dairy/Livestock Extension Educator, graduate students and undergraduate students. External partners: State veterinarians; Dairy Producer Groups; Feed company technical support and sales force.

Research efforts will be continuing. Currently, there are two master's level graduate students working on projects that will both be published in peer-reviewed publications and Extension publications and programs. The current research areas are energy metabolism of Jersey dairy cattle. This will be complete by May 2000. Another research area on evaluating grazing practices in CT will be complete by January 2001. New research areas to pursue include nutritional management of milk composition in light of changing federal milk markets.

One educational method is to meet with individual dairy farmers to assist with specific nutritional problems.

Continue bringing in national speakers to provide information on current and upcoming nutritional issues. Previously, a national speaker was brought to Connecticut to speak on dairy nutrition and included a dairy producer panel discussion.

Continue cooperation with Cornell University. In 1998, one faculty member participated in teaching dairy nutrition to 35 feed company representatives from the northeast. This will be continued in 1999.

Continue publishing Extension articles through the College of Agriculture and Natural Resources Dairy/Livestock Newsletter.

Educational methods include: Workshops - Small group size to permit discussion and hands-on demonstrations. Yearly, with 25 participants (dairy farmers and feed personnel); Conferences - New England Dairy Conference series. Yearly. Audience, dairy farmers, feed personnel. Approximately 110 participants in Connecticut and approximately 700 participants throughout New England. New England Dairy Feed Conference: This has been conducted for 41 years. Continue as a committee member and will be chairperson for 2,000 meeting, approximately 150 participants; Newsletter Articles; New England Regional Dairy Program Extension newsletter. Mailing list of 2,000; College of Agriculture and Natural Resources Dairy/Livestock Newsletter (mailing list of approximately 3,000); Research - Conduct research on nutritional issues. The research focus is to address issues that are of prime importance to dairy producers in Connecticut, New England and the Northeast. Currently, there are two master's level graduate students working on projects that will both be published in peer-reviewed publications and Extension publications and programs. The current research areas are energy metabolism of Jersey dairy cattle and evaluation of grazing practices in Connecticut. The end product will be to publish research in American Dairy Science Association for a national audience.

Target audiences include dairy farmers in Connecticut and New England, university researchers, and feed industry personnel.

Evaluation and assessment are provided by: program evaluations for workshops, pre-evaluation and post-evaluation followed by a six-month follow-up evaluation; evaluate milk program record systems - DHIA records; peer-reviewed publications.

#### Youth Poultry Projects and Non-Commercial Poultry Rearing

The number of poultry being reared for non-commercial use is increasing in Connecticut and New England. This became evident during 1998-99 when a shortage of meat-type chickens resulted in a barrage of phone calls looking for birds. A 15% increase in the number of phone contacts with small flock owners increased during that time period. The Connecticut 4-H Poultry Show and Showmanship contest participation increased by 36% and 22% in 1998 and 1999 respectively. Small flock owners are less experienced in the management of poultry and are more likely to mismanage the birds under their care, relative to proper nutrition, health care, humane treatment, breeding, transporting, and other vital areas and thus need the expertise that Extension can provide. The program will benefit small flock owners, poultry feed suppliers and small flock supply companies as well as the public in general who enjoy visiting small flocks and poultry shows. Cooperative Extension Focus will be to educate poultry owners about the proper management and rearing of their poultry.

Success will be measured by an increased awareness and knowledge of the best management practices for the rearing of non-commercial poultry flocks.

A desirable outcome would be the improved management of non-commercial poultry flocks.

Some of the resources and/or partners associated with this program are: Connecticut Department of Agriculture, Farm Bureau (MS), Connecticut Poultry Association, New England Poultry Association (MS), Agricultural Engineers, Poultry Specialists from other states, 4-H-Development, and VO-AG and FFA leaders.

This program is designed to provide educational assistance to small poultry flock owners.

Program will focus on youth (4-H groups as well as school groups) and adults interested in poultry ownership. Technical bulletins, Extension fact sheets, newsletter articles, videotapes and other sources of

information will be used to disseminate information about proper management and rearing practices. Group meetings, and individual consultations, generally via telephone, will also be available to flock owners seeking information.

The main target audiences of this program are youth (4-H groups as well as school groups) and adults interested in poultry ownership.

Two evaluation techniques will be used to assess if learning occurred. One technique is used to assess knowledge changes and the other technique assesses attitude changes. Educational success will be measured by determining the actual use/implementation of information by the poultry owner to improve or change existing management and rearing practices by individual communication (written or telephone). Attitude changes will be determined by surveys given out at group meetings and by individual assessment.

### Poultry Waste Management

The disposal and use of poultry waste products, including cracked and broken eggs, carcasses and manure, currently is and will become even more challenging and expensive in the future, as agricultural land decreases and historical forms of disposal and use become more heavily regulated. As improved management and handling techniques and new uses for poultry waste products become available, poultry producers need to learn and apply them to their particular situations. Cooperative Extension Focus: Extension is and will continue to play a major role in educating poultry producers about proper manure and poultry waste management.

Success will be measured by poultry farmers improving waste management techniques to reduce odors and waste associated pests, and increasing the fertilizer value of land-applied manure by keeping manure dry. They will learn the concepts of nutrient management and apply them in waste disposal. Other waste products will be composted to make soil amendments.

The desired outcome of the program will be to improve the quality of the waste products being produced on poultry facilities in New England. Fact sheets and newsletter articles related to waste management will also be produced. Research into high-rise poultry house manure management and nutrient management of poultry manure will be initiated and published.

Resources and/or partners of the program include: Connecticut Department of Agriculture, Farm Bureau, Connecticut Poultry Association, New England Poultry Association, Agricultural Engineers, and IPM Poultry Specialists from other states.

Provide educational assistance to poultry farmers on the subject of waste management. This is accomplished by meeting with groups and individuals to ascertain where assistance is needed and then provide them with information on where and how to gain further information/assistance to implement their waste management plan. The use of technical bulletins, Extension fact sheets, Extension newsletters and computer programs or other management tools will be emphasized.

The intended audience is commercial poultry producers. Methods include technical bulletins, Extension fact sheets, newsletter articles, computer software, video tapes and other sources of information. Group meetings, (New England Poultry Health Conference, New England Pest Management Workshop, New England Turkey Growers Conference), and individual consultations will be available to producers seeking information.

Target Audiences of the program include commercial and non-commercial poultry producers as well as end users of poultry manure.

Two evaluation techniques will be used to assess if learning occurred. One technique is used to assess knowledge changes and the other technique assesses attitude changes. Educational success will be measured by determining the actual use/implementation of information on the farm to improve or change existing waste management practices through site visits/surveys (written or telephone). Attitude changes will be determined by surveys given out at group meetings and by individual assessment.

### Poultry Pest Management

Poultry pests increase the risk of disease in poultry and thus need to be controlled. Flies and rodents from farms may enter neighboring properties and cause nuisance or health problems for the non-farm community. Poultry pests reduce profitability by contamination of feed, spreading of disease and destruction of property, and are therefore necessary to control. As insecticides and pesticides are added and removed from the marketplace producers need to know about the products and how to safely use them. Cooperative Extension Focus: The focus will be to educate poultry farmers about proper pest management. The integrated pest management approach is used. This includes natural, social, physical and chemical pest control methodologies.

Poultry farmers will improve pest management techniques to reduce the populations of poultry pests on the farm and also to reduce the spread of these pests to neighboring properties. Success will be measured by fewer complaints from neighbors about flies, rodents and other pests.

Desired outcomes of the program include reduced pest populations on poultry farms and surrounding areas increased knowledge and awareness of poultry pest management techniques and strategies.

Resources and/or partners of the program include: Connecticut Department of Agriculture, Farm Bureau, Connecticut Poultry Association, New England Poultry Association, Agricultural Engineers, Poultry Specialists from other states, Soil Conservation Service, People in Integrated Pest Management, pest management publications from New England, New York and North Carolina.

This program is designed to provide educational assistance to poultry farmers on the subject of pest control and management. This is accomplished by meeting with groups and individuals to ascertain where assistance is needed and then provide them with information on where and how to gain further information/assistance about poultry pests. The use of technical bulletins, Extension fact sheets, Extension newsletters and computer programs or other management tools will be emphasized. A New England - New York Poultry Pest Management Workshop is held each year to provide information and to provide credits toward re-certification for pesticide applicator licenses.

Program strategies include the use of technical bulletins, Extension fact sheets, newsletter articles, computer software, videotapes and other sources of information will be used to disseminate information about pest management practices. Group meetings, (New England Poultry Health Conference, New England Pest Management Workshop, New England Turkey Growers Conference), and individual consultations will be available to producers seeking information.

Target audiences include commercial and non-commercial poultry producers and others with private pesticide applicator licenses.

Two evaluation techniques will be used to assess if learning occurred. One technique is used to assess knowledge changes and the other technique assesses attitude changes. Educational success will be measured by determining the actual use/implementation of information on the farm to improve or change existing pest management practices through site visits/surveys (written or telephone). Attitude changes will be determined by surveys given out at group meetings and by individual assessment.

#### Environmental Management of Poultry Facilities

Reduced energy usage on poultry production units will ultimately result in less strain on the environment in terms of energy production. Poultry producers use a lot of electrical energy to run lights, fans, processing equipment, etc., and they need to keep up with the latest in energy saving products as well as new management techniques utilizing modern, energy efficient equipment. They also need to be aware of the impact of their facilities and practices on the environment. Cooperative Extension Focus will be to educate poultry farmers about the environmental impacts of raising poultry and to provide information on the installation and use of energy efficient equipment in their facilities to manage the micro environment of the birds, including lighting, ventilation, manure management and processing.

Poultry farmers will have increased knowledge of the environmental impacts of poultry farming and also become more aware of environmental factors that impact poultry management. Success will be measured by results that are improvements in the environment surrounding poultry farms and better environmental control for growing poultry.

Desirable outcomes include an increased use of energy efficient lights, motors, and other electronic equipment used on poultry farms. Also desired is an increased use of more energy-saving and cost-effective lighting, ventilation, feeding, processing and manure management systems being used on poultry farms. Lastly, an increased awareness of the impact of poultry production on air, soil and water quality would be a highly desirable outcome.

Program resources and/or partners include the Connecticut Department of Agriculture, Farm Bureau, Connecticut Poultry Association, New England Poultry Association, Agricultural Engineers, and Poultry Specialists from other states.

This program is designed to provide educational assistance to poultry farmers on the subject of environmental management. This is accomplished by meeting with groups and individuals to ascertain where assistance is needed and then provide them with information or direct them to where and how they might gain further information/assistance about environmental management.

Program strategies include the use of technical bulletins, Extension fact sheets, newsletter articles, computer software, videotapes and other sources of information that will be used to disseminate information about environmental management practices. Group meetings, (New England Poultry Health Conference, New England

Pest Management Workshop, New England Turkey Growers Conference), and individual consultations will be available to producers seeking information.

Target audiences include commercial poultry producers and some non-commercial poultry producers with larger scale farms.

Two evaluation techniques will be used to assess if learning occurred. One technique is used to assess knowledge changes and the other technique assesses attitude changes. Educational success will be measured by determining the actual use/implementation of information on the farm to improve or change existing environmental management and energy management practices through site visits/surveys (written or telephone). Attitude changes will be determined by surveys given out at group meetings and by individual assessment.

#### Animal Welfare/Animal Rights Issues Affecting Animal Use

The animal rights movement has gained momentum and notoriety in the last twenty years and has been successful in making in-roads into the elementary schools to indoctrinate youth into believing that farm animals are generally mistreated and abused by farmers. They mislead the general public into believing that eating meat is bad for humans and akin to cannibalism. The animal rights movement has money to spend on lobbyists who promote legislation to stop the use of animals for the production of food and fiber, or for pleasure. They are trying to legislate food animal production out of existence, through manipulation of the general public and legislators, both at the state and national level. They also attend local 4-H fairs and harass the youth exhibiting animals at the fair, asking them about "raising an animal just to be killed to satisfy some human desire for flesh". The people raising poultry need to know how to properly raise their birds in a humane manner and how to respond to the attacks on them by the animal rights activists. Cooperative Extension Focus: The focus will be to educate poultry farmers, 4-H youth and leaders, Extension educators and the general public about the animal welfare/rights issue.

Success will be measured when poultry farmers, 4-H youth, and the public in general have increased awareness/ knowledge of the issues surrounding the animal welfare/ animal rights debate. The poultry owners will practice best management practices to provide for the welfare of their birds and ensure humane treatment of their birds.

The welfare of poultry will be improved due to increased awareness of the proper humane treatment of the birds by their owners. The 4-H youth, volunteer leaders and Extension personnel will increase their awareness and knowledge of the issues surrounding the debate over animal welfare/animal rights, and will then help to educate the general public about the issues and why poultry is reared in the manner they are for the production of food and fiber as well as for pleasure.

Partners include: the Connecticut Department of Agriculture, Farm Bureau, Connecticut Poultry Association, New England Poultry Association, Poultry Specialists from other states, Animal Industries Foundation, putting people first, Animal Welfare Information Center of the National Agricultural Library, Library of Congress.

This program is designed to educate poultry farmers, 4-H youth and leaders, Extension educators and the general public on the subject of animal welfare/ animal rights. This is accomplished by meeting with groups and individuals to ascertain their current level of knowledge and to provide them with information and assistance where needed to help them understand the proper and humane management of poultry and to deal with the animal rights movement.

Educational methods include using informational bulletins, Extension fact sheets, newsletter articles, videotapes and other sources of information to disseminate information about the animal rights movement and the humane management and rearing of poultry. Another method is to utilize group meetings such as the New England Poultry Health Conference, the New England Pest Management Workshop, and the New England Turkey Growers Conference, in order to reach the commercial poultry producers. In addition, meetings with 4-H clubs and leaders, FFA/VO-AG classes and leaders and teachers, and individual consultations will be available to people seeking information.

The target audiences of this program contain all consumers of animal food products and all users or owners of animals, be they for food, pets, recreation, etc.

Two evaluation techniques will be used to assess if learning occurred. One technique is used to assess knowledge changes and the other technique assesses attitude changes. Educational success will be measured by determining the actual use/implementation of information in dealing with the issues and monitoring the general welfare of poultry on the farm and reared by the non-commercial sector. Attitude changes will be determined by surveys given out at group meetings and by individual assessment.

## Livestock Production

Research efforts will center on production of transgenic swine. A group project to produce transgenic swine for xenogenic transplantation has been coordinated. This project is a joint effort between Drs. Riesen, Yang and Hoagland and Dr. William Fodor from Alexion Pharmaceuticals in New Haven, CT. There is a serious shortage of organs for organ transplantation in people will end-stage organ failure. This shortage of organs has kindled interest in the field of cross-species transplantation.

Pigs have become the species of choice for xenogenic transplantation in humans for many reasons. The major barrier to clinically successful xenogenic transplantation is the lack of effective therapies to eliminate antibody and complement-dependent hyper-acute rejection (HAR). Specific proteins are necessary for both recognition and rejection to occur. The carbohydrate component of membrane proteins has been determined to be important in cellular recognition and subsequent rejection. Human and swine proteins have different carbohydrate complexes. Specific enzymes are required for these differences to be realized. If a pig could possess the gene that codes for the human enzymes then the pig's cells would have the human carbohydrate complexes. If a pig could have the human genes that code for the major histo-compatibility proteins then that pig would express the human histo-compatibility proteins. Combined the pig that possesses both of these genes would make cells that were more like human cells. Consequently these cells would not be as quickly rejected and the organs could be used in humans.

In January 1996 there were 44,000 people on the waiting list for organ transplants. For many reasons, these people will or will not get a new organ before they die. If swine organs could function in these people while they wait for a perfect organ of human origin, there could be hundreds of people saved each year. Besides this obvious value for organ transplantation, the swine that possess these human genes need to be produced and raised in highly diseased free and clean environment. People to produce these animals will be necessary. Units could be built and swine produced in areas that require traditionally greater funds as the products would be worth more. New England and other areas that are traditionally too costly to produce swine for pork could again be competitive and successfully make a profit in animal agriculture.

An important measure of success relies on anticipated research results. It is anticipated that a pig with three human genes will be born. An in-vitro development, fertilization and maturation techniques for swine ova will be functional. Embryo transplantation surgery procedures for swine will be developed and functional. In-vitro techniques for cloning swine will be started.

As stated above, an important desirable outcome is that a pig with three human genes will be born. In addition, two peer reviewed journal articles will be submitted.

This work will be a joint effort between Drs. Hoagland, Riesen, Yang and Fodor. The first three are from the ANSC department and the fourth is from Alexion Pharmaceutical Inc. located in New Haven, CT. This project will be funded in part by a grant (\$190,000) from Connecticut Ingenuity Inc. and in part by per diems (\$50,000) paid by Alexion Pharmaceutical Inc. Novel approaches to produce transgenic pigs as animal models for xenogenic transplantation. Hoagland, Riesen, Yang, Fodor; \$199,728; 7/1/98 to 8/30/00; funded by CII.

The goal of this collaborative research is to genetically engineer porcine tissues to express a human terminal complement inhibitor, hCD59 and an enzyme to the expression of the epigenic Gal $\alpha$ -1,3-Gal epitope. Expression of hCD59 and H-transferase on porcine cells will protect the cell against the destructive effects of the human humoral immune system, specifically the lytic effects of human complement. The working hypothesis is that the expression of the human complement inhibitor, hCD59 along with the expression of H-transferase (to express H-epitope in place of the Gal $\alpha$ -1,3-Gal epitope) in a large domesticated animal will facilitate the development of primate xenogenic transplantation models. This series of experiments will provide insight into preventing the complement-mediated hyper-acute rejection response that occurs in these xenogenic transplantation models. Specific aims are the following: Aim #1 - To provide transgenic founder pigs that express both hCD59 and H-transferase genes using in vitro produced embryos. Aim #2 - To establish H2Kb-CD59-H-transferase transgenic founder animals by introducing the H-transferase gene into embryos derived from the positively expressed homozygous hCD59 transgenic pigs.

The experimental procedures to accomplish aims will focus on producing pigs homozygous for the hCD59 gene by traditional breeding methods. These animals will be sacrificed and their ovaries removed and as many ova recovered as possible. The recovered ova will be matured in-vitro with a procedure under development. These ova will then be fertilized in-vitro, injected with a gene (various genes will be used as discussed previously) and allowed to grow and be transferred into recipient gilts to carry out the remainder of gestation. A screening technique to identify embryos that have the transgenes in their genome and perhaps expressing it will be developed. This would allow the screening of potentially positive embryos only to be transfer into recipient gilts.

Transgenic research community will be the main audience of interest. Also, the livestock research community will be interested and portions of the data will be published in Journal of Animal Science.

If pigs are produced with multiple genes and they express the proteins in question, the project will have succeeded. The development of in-vitro techniques to mature, fertilize and grow swine embryos would also be considered a success.

### Livestock Production

Teaching and Extension Effort: Efficient management of livestock is critical to a continued supply of meat products. Agricultural students need a course in modern livestock husbandry techniques. The producers in the State are entitled to a source of acceptable management procedures when they need advise. This work will generate environmentally sound management techniques for the production of beef cattle, swine and sheep. The presentation of these practices will be through Power Point presentations, short articles and Extension Bulletins. The topics will be applicable to livestock producers in New England and perhaps the entire Northeast.

Success is measured by an increase the knowledge of the people that are presented the material. The audiences will leave the sessions with a better understanding of environmental sound and efficient livestock systems and procedures.

There are a number of strategies and methods associated with the program. For instance, it is anticipated many PowerPoint presentations will be created. Several articles will be prepared and sent to region newspapers (Country Folks) for publication. These articles will be archived for future update and additional publications. The Extension Fact Sheets will be submitted for publication through the Extension review system.

Resource and/or partners of the program are Thomas A. Hoagland, Paul Stake, John Riesen, Steve Zinn, Ian Hart, Joyce Meader, and Rich Meinert.

This program will be ongoing for critical updates; however, the major effort to generate the initial material will take three years. Funds are not available to defray any of the cost to produce this material. An application for funds will be submitted to the Teaching Institute after the initial (first year) work is in hand to show preliminary efforts.

Strategies and methods include the use of materials in two classrooms, ANSC 283 and SAAS 070. Also, four articles per year will be sent to Country Folks. The Fact Sheets will be available to all interested parties.

The target audiences will be the students that enroll in my courses and the livestock producers in the State and region.

Students will have a chance to evaluate the PowerPoint presentations through their teacher evaluation forms. Continuous input from students will be encouraged and anticipated throughout the semesters. The publication of the newspaper articles will denote some level of positive evaluation as well as the letters to the editor. The peer review system of the Extension service will evaluate all the Fact Sheets.

### Equine Science and Environmental Education for Best Management Practices: Keeping Horses on a Small Acreage

Cooperative Extension Focus: There are an estimated 6.9 million horses in the United States today (AHC, 1998). The horse industry in the United States produces \$25.3 billion in goods and services and has a \$112 billion impact on the gross domestic product. Furthermore, the horse industry pays \$1.9 billion in taxes to state, federal and local governments. The horse provides a positive experience for many people: youthfulness for adults, responsibility for youth, mental therapy for troubled individuals and important physical therapy for those physically challenged. In Connecticut, there are an estimated 48,000 to 50,000 horses, or one for every 65 people, a greater per capita concentration than in any other state. There are approximately 1,500 4-H youth horse projects in Connecticut at present, more than dairy, beef, sheep, hogs and poultry combined. If an extrapolation using the national data holds true, then the Connecticut horse industry pays an estimated \$13 million in taxes. The enhanced interest and use of the horse has increased demands for education regarding proper care and management. There were 36,000 tons of horse concentrates (excluding pasture and hay) sold in Connecticut by five major feed formulators in 1997 alone. Those tons of feed add up to tons of horse manure, approximately 9 tons per horse per year. Thus, educational information regarding facilities and waste management, pasture management and water quality is in high demand. As rural communities become more populated, and as the horse moves to the suburbs, education regarding horse-keeping on a small acreage, for both the horse owner and non-horse neighbor, becomes a necessity. The interest in the horse and the economic impact of the Connecticut horse industry justify a need for this type of equine educational program in the state.

Success will be measured by program participants gaining knowledge about the importance of properly managing a horse on a small acreage, understanding that the quality of life for both the horse and humans in the area may be affected through pasture management, manure management and water quality. With this knowledge, it is hoped that behavior will change to better the health of horses maintained in Connecticut while moderating their impact on the environment.

Desired outcomes include: Videotape: "Good Horse Keeping: Managing Manure to Protect the Environment"; Horse Farm of Environmental Distinction Award (presented on an annual basis to honor horse owners who are especially effective, though their horse management, at protecting soil and water resources); Educational Workshops (presented throughout the state); Extension Publications Working Horse Farm Exhibit/Demonstration.

Partners of the program include: The Horse Environmental Awareness Program (HEAP) is a coalition of federal (USDA-NRCS), state (UConn Cooperative Extension, CT Horse Council), and local agencies (Soil and Water Conservation Districts, King's Mark Resource Conservation and Development), groups and individuals concerned with equine environmental awareness. To date, USDA-NRCS teamed with EQIP (Environmental Quality Incentive Program) awarded HEAP a \$15,000 grant to form the program and inseminate equine environmental awareness information throughout the state. King's Mark Resource Conservation and Development was a key agency in the group, working with HEAP members to coordinate the formation of the video tape listed above, thus getting the program underway. It is anticipated that more funds from USDA-NRCS and EQUIP will be available in the future, awarded on an annual basis, with \$17,500 already slated for the year 1999-2000.

The key component of the program is to educate horse owners about proper management of horses kept on a small acreage, which, given the horse density in Connecticut, is the most common method of keeping horses in the state. In keeping horses, the owner should keep in mind the health of the horse and the stewardship of the land.

The methods of education will proceed in three to five phases: 1) a video is available that shows why proper horse management is important for water quality and horse health; 2) the Horse Farm of Environmental Distinction Award provides an incentive for horse owners to take pride in being good stewards of the land; 3) workshops will be available around the state to provide information regarding best management practices; 4) Extension briefs will be published to further provide pertinent information; and 5) funds providing, a demonstration farm will be used to show horse owners possible management practices that may apply to their own situation.

The target audience includes primarily adult horse owners in the industry: horse owners who can make an impact immediately. The other audience is youth horse owners and youth horse-interested individuals, so that the program may continue with people who have already been influenced by this education.

The number of videotapes distributed will be monitored to assess interest in the issue. All applicants for the Horse Farm of Environmental Distinction award will be visited, and their horse farm management practices will be assessed. Top applicants will be presented with an award sign to hang on their barn to exhibit to neighbors and town officers that they qualify as good stewards of the land. All other non-awarded applicants will be presented with an assessment, scored on a numerical basis, and notations regarding what should be improved. From year to year, the number of winners and the scores of the winners will give some indication of program impact. In addition, the scores of the non-winning farms can be ranked, linked to repeat applicants, and evaluated for improvement. The attendance at the workshops as well as workshop evaluations will also provide assessment of impact.

#### Equine Science Education for Youth, College Students and Adults

Cooperative Extension Focus: There are an estimated 6.9 million horses in the United States today (AHC, 1998). Years ago, the horse was a necessity as a work animal. The horse population in the United States reached a peak at 26.6 million in 1915, and then suffered an enormous decline as the perceived usefulness of the horse was replaced by machine. In 1959, the horse population in the United States sunk to a low of 3 million, and unfortunately, as a result, much knowledge in regard to care and use of the horse was lost. Since the early 1960s, an increase in the leisure time of Americans has enhanced interest in the use of the horse for recreation. With the increasing economy, it is more and more common for the horse to be a companion animal for middle class families, rather than limited to horse business or the lifestyle of the rich. The horse provides a positive experience for many people: youthfulness for adults, responsibility for youth, mental therapy for troubled individuals and important physical therapy for those physically challenged. In Connecticut, there are an estimated 48,000 to 50,000 horses (CECA, 1996), or one for every 65 people, a greater per capita concentration than in any other state. There are approximately 1,500 4-H youth horse projects in Connecticut at present, more than dairy, beef, sheep, hogs and poultry combined. In some cases, these youth are continuing a family tradition, but more often these youth stem from backyard horse owners-from a generation of parents who have purchased the horse as a family companion without the knowledge base of optimal care and management. Thus, the enhanced interest and use of the horse has increased demands for education regarding facilities and waste management, pasture management, nutrition, reproduction, exercise and conditioning, first aid and veterinary care.

Overall, horses will benefit from informed individuals, and the horse industry will continue to be sustained by an influx of new and knowledgeable owners. The suggested program also provides an opportunity for the University of Connecticut to attract new students. The Department of Animal Science has been growing steadily for

many years, and the number of horse-interested students is at an all-time high. National recognition has been attained in the Polo Teams, the Equestrian Team, the Horse Judging Team, and many individuals riding University-bred Morgan horses. Additionally, providing a public service through Extension helps to get people involved in programs, and as people become involved, the potential for donations to the program increases.

Optimally, the program participants will gain knowledge about the importance of properly managing a horse, with the care and welfare of the animal first in mind. As youth learn more about proper horse care, a foundation of knowledge will be built and will provide the tools needed to compete successfully in the horse industry. Adult backyard owners and parents of horse-interested youth will also gain knowledge to enhance the care and welfare of their horses.

The UConn Horse Unit comprises the small group of individuals associated with this program. The Cooperative Extension System at the University of Connecticut provides resources related to facilities, advertising, and an umbrella for possible funding and liability for related events. The Connecticut 4-H Horse Advisory Board, the American Youth Horse Council, and the Connecticut Horse Council all provide external input and a source of information for program advisement.

The Equine Program in the Department of Animal Science has been in existence since 1931 and includes Extension, research and educational components. The Extension components in which the Extension Specialist is involved include Horse Science Community Lectures and Workshops, the Horse Science Symposium, Safety Clinic for Camp Horsemanship Instructors, Teen Connection, FFA State Horse Contest, 4-H State Horse Contest, New England Regional 4-H Contest, Eastern National 4-H Round-up, and Eastern States 4-H Selection and Horse Show.

The Horse Science Community Lectures and Workshops are designed to reach all people in the state through changing location. The Extension centers and private facilities have been used as resources in which to hold the programs. The Horse Science Symposium is central to UConn but is designed to provide a wide range of exposure to horse industry components by centralizing nationally recognized horse industry leaders and combining their strengths to provide a well-rounded weekend program. The Safety Clinic for Camp Horsemanship Instructors is designed to teach proper horse safety to all horse instructors in Connecticut summer camps. In this manner, information is dissipated to a small number of individuals who in turn teach safety to youth and also teach their programs more safely. Teen Connection, as well as the Horse Science Symposium and the Safety Clinic, are designed to teach youth and adults about the horse while also familiarizing them to UConn's horse program, thus potentially attracting students. The FFA and 4-H State Horse Contests, as well as the New England Regional 4-H Contest, Eastern National 4-H Round-up, and Eastern States 4-H Selection and Horse Show provide a fun method of reinforcing what has been learned by youth in the programs.

The target audience includes youth, aged 7-18; 4-H and FFA members and leaders, potential College students, College students and adults, both in the horse industry and the general public.

Evaluation techniques include evaluations of all components of the program, attendance at events, records of scores achieved at 4-H and FFA contests, numbers of students entering the UConn Equine Program, and perhaps, donation of money and horses to the program.

### Teaching Technology

Academic Program Focus: Teaching technologies are developing at a breakneck pace and agricultural faculty members are falling behind. The early adopters of teaching technology have shown that it can be efficient and effective in the correct circumstances. Teaching databases in Animal Physiology (including Reproductive physiology), Animal Nutrition, and Animal Genetics have been established as a result of a grant to enhance cooperation among schools of the mid-Atlantic and northeast regions of the country. These databases make a variety of teaching resources available, often via the World Wide Web, making it even more important for agricultural faculty to be technology literate. While these databases and a myriad of commercial and institutional workshops are currently available, many faculty have not incorporated any of the computer-based teaching technologies into their teaching programs.

A current grant proposal is outstanding for \$117,476, if this is successful, it would give one measure of success. If the grant is successful, the criteria for evaluation of the success of the grant are: Evaluation plans - A measure of success to be used in evaluating this project will be the success of recruiting faculty to attend the workshop. Did a greater percent of faculty attend these workshops taught by peers and focused on a specific department compared to others offered at the school or university level? Also the percentage of faculty which complete the projects started at the workshop will provide a measure of success. A comparison of number of successfully completed projects will be made between the three faculty members receiving \$500 awards at each school and the next three runners up to assess the value of this use of resources. In addition, the use of the funding (for student labor, software, purchase of computer support services) will give an indication of what resources faculty

members feel are most limiting. The number of faculty actually incorporating new or additional computer-based technology into their classes will also be tracked. Perhaps the most difficult goal to evaluate is that of increasing faculty technology literacy and comfort with computer-based technology. This is an attitudinal change and faculty will be surveyed in an attempt to document any changes brought about by this project. To insure valid and appropriate evaluation methods are used, a Ph.D. student working in the area of educational evaluation will be engaged to develop one or more survey instruments to be used for evaluation of this project. The same student will also conduct the data analysis and summarization.

The tangible products from this project will be the lecture enhancing presentations, course web pages, and other computer-based teaching items produced as faculty projects. If only three faculty at each school complete their project during the duration of this project, this would be 42 items. In addition to the projects, this project will leave a legacy of faculty more computer literate and involved in the appropriate use of computer-based teaching technologies.

Partnerships and collaborative efforts: The primary level collaboration of the three schools conducting this project will allow economies of scale and a reduction in duplication of effort. Each school will develop one presentation to be used as a portion of the workshops saving time and money. In addition, the general portions of the workshops will be discussed and while each team will have their own approach, all will benefit from ideas and experiences shared. This is especially true because both faculty and technology support personnel will be involved in the two planning sessions. Responsibilities of the cooperating teams are as follows.

UConn - (John Riesen, Kim Chambers, Tom Corso) Develop a presentation highlighting the resources available in physiology. Co-ordinate project, schedule planning-meetings, develop and implement the evaluation survey. Present workshops at the sights listed below and maintain contact with faculty actively working on projects from workshops they presented.

Plan second year program in conjunction with other teams. Turn in a written report of progress after the first year and a summary report at the end of the project. Write first draft of article for NACTA Journal.

Rutgers - Develop a presentation highlighting the resources available in nutrition. Make host arrangements (Rooms, meal etc.) for the second year combined workshop. Present workshops at the sights listed below and maintain contact with faculty actively working on projects from workshops they presented. Distribute and tract the use of awards to faculty from their workshops. Turn in a written report of their progress after the first year and a summary report at the end of the project. Help edit and review the NACTA article.

Cornell - Develop a presentation highlighting the resources available in genetics. Aid in program planning of second year combined workshop. Present workshops at the sights listed below and maintain contact with faculty actively working on project from the workshops they presented. Distribute and tract the use of awards to faculty from their workshops. Turn in a written report of progress after the first year and a summary report at the end of the project. Help edit and review NACTA article.

Cooperating Institutions (Sight of workshops). First name in each group is team responsible to hold workshops at school in the group.

University of Connecticut  
University of Maine  
University of Vermont  
University of Massachusetts  
University of New Hampshire

Rutgers University  
University of Delaware  
University of Maryland - College Park  
University of Maryland - Eastern Shore  
Sussex County Community College

Cornell University  
Delaware State University  
Delaware Valley College  
West Virginia University

This project proposes to test a model to teach animal science faculty the use of available computer-based regional teaching resources. The three cooperating institutions of this grant would each conduct four or five 1-day

workshops, one at each of the 14 institutions participating in the original project. There are four goals for these sessions: 1) to increase faculty comfort level in developing and using computer-based teaching technologies 2) to acquaint instructors with local and regional technological and human resources related to computer-based teaching technologies 3) to help faculty develop specific computer-based teaching projects and 4) to recruit submissions to the regional teaching databases. The presentation at each of the 14 workshops will include a session to highlight each of the three databases. Each of the 3 presentation teams will develop one of the presentations: Cornell - Genetics, Rutgers - Nutrition and UConn - Physiology. Each of the workshops would be conducted in cooperation with whatever local support mechanisms exists at that particular school, thus promoting better interaction between faculty and their local computer resources. There will be a hands-on period during the workshops when faculty would work on their own projects. The three faculty members at each school having the most promising projects would be awarded \$500 to be used toward student labor or computer software or hardware to aid them in completing their projects. In the second year of this grant, participants from all 14 institutions will be invited to a 1-day workshop held at Rutgers University. Presentation of selected faculty projects from the previous year as well as formal presentations on computer-based teaching technologies will be featured. This session will allow additional feedback and evaluation of the first year workshops as well as providing further exchange of ideas and experiences among the faculties of the different schools.

The direct audience for this project is the faculty at each of the 14 schools involved in the project. The indirect audience is all their students that will be impacted by improved teaching. Evaluation plans: A measure of success to be used in evaluating this project will be the success of recruiting faculty to attend the workshop. Did a greater percent of faculty attend these workshops taught by peers and focused on a specific department compared to others offered at the school or university level? Also the percentage of faculty which complete the projects started at the workshop will provide a measure of success. A comparison of number of successfully completed projects will be made between the three faculty members receiving \$500 awards at each school and the next three runners up to assess the value of this use of resources. In addition, the use of the funding ( for student labor, software, purchase of computer support services) will give an indication of what resources faculty members feel are most limiting. The number of faculty actually incorporating new or additional computer-based technology into their classes will also be tracked. Perhaps the most difficult goal to evaluate is that of increasing faculty technology literacy and comfort with computer-based technology. This is an attitudinal change and faculty will be surveyed in an attempt to document any changes brought about by this project. To insure valid and appropriate evaluation methods are used, a Ph.D. student working in the area of educational evaluation will be engaged to develop one or more survey instruments to be used for evaluation of this project. The same student will also conduct the data analysis and summarization.

### Environmental Health

Research Focus: The development of effective animal and human vaccines is a high priority and the basis of a multi-billion dollar industry. It is intended to continue efforts in this area, working on vaccines to protect animals against *Mycoplasma gallisepticum*, foot and mouth disease virus and aflatoxins. In addition, methods will continue to be developed that increase the efficacy of DNA vaccines administered at mucosal surfaces.

Success will be measured by conducting challenge studies that indicate that the intervention (vaccination) results in a statistically significant decrease in incidence or severity of the disease. Other intermediate end-points may also be useful in this regard, such as viral neutralization assays (in vitro) or antibody titers. The advancement of knowledge, reflected by manuscripts accepted in peer-reviewed journals, and the receipt of grant support for these studies are also measures of success and scientific impact.

The desired scientific output from these research efforts is the publication of manuscripts in highly esteemed scientific journals, invitations to speak at conferences and symposia, the receipt of extramural grant support, and the training and graduation of graduate students.

On campus, partners will be Drs. Geary, Garmendia, Marcus, Sekellick, Darre, Van Kruiningen and Lynes. Most of this effort center's around the development of a mucosal vaccine for *Mycoplasma gallisepticum*. Off campus, partners will be Drs. Edith Mathiowitz(MS) (Brown University); Yong Jong (MS) working on encapsulated DNA vaccines and particle uptake across the Peyer's patch; Dr. Fred Brown(MS) at the USDA ARS laboratories at Plum Island developing approaches to induce upper respiratory tract immunity to foot and mouth disease virus using retro-inverso-peptides; Dr. Marian Neutra (MS) (Harvard University) on mucosal uptake and expression of DNA vaccines.

Active: Development of a mucosal *Mycoplasma gallisepticum* vaccine for Poultry. USDA Hatch Act. 10/1/98 - 9/30/01. \$26,946; Vaccine Trials for Avian Influenza Virus, Protein Sciences Inc. 6/1/97 - 5/31/99 \$23,143; FACSCalibur Fluorescence Activated Cell Sorting Core Facility - UConn major equipment Competition, 1/1/98 - 12/31/99 \$72,665; Development of *Mycoplasma gallisepticum* strain as a live attenuatee vaccine and

vector for the protection of chickens and turkeys from respiratory disease. 1/1/99 – 12/31/00. \$300,000. (Co-P.I. with Drs. Geary, Marcus and Sekellick). Pending: Bioadhesive Microspheres for oral DNA vaccination. NIH, Subcontract with Spherics, Inc. \$30,000.

The research strategy revolves around the development of mucosal vaccines that can induce local, cellular and humoral immunity to a variety of infectious organisms and toxins. This approach requires the use of biochemical approaches (i.e. coupling of immunogens to mucosal adjuvants) and molecular biology (developing mammalian expression plasmids for use as DNA vaccines).

The target audience is the readers of scientific journals relating to vaccine development and specific diseases.

Learning will be assessed by the publication of peer-reviewed scientific articles and citations to these articles in other people's papers.

### Reproductive Physiology and Biotechnology

Two-Fold Research Focus: The first is to improve the understanding of the mechanisms of mammalian oocyte maturation, activation and early embryonic development; the second is to apply the knowledge from the basic research to improve various reproductive biotechnologies such as cloning and transgenic technology. These research areas will not only advance the understanding in fundamental reproductive biology, but also create business opportunities in the State of Connecticut and the nation.

The measures of success for the basic research are the advancement of knowledge of the critical events in biology, particularly early development and the recruitment of extramural supports to such research. For the applied research, the success should be reflected by contract and grant supports as well as by assistance to business development in Connecticut.

The outcome products of the research efforts are peer-reviewed scientific publications, invitations for guest/keynote lectures and conference/symposium chairs, awards and breakthrough news etc.

On campus, the collaboration involves Dr. Thomas Chen on developing improved transgenic technology; and Dr. Martin Fox on developing advanced ultrasound technology for biological applications.

UConn is also participating in a region project on improving embryo development and advanced biotechnologies such as cloning and transgenesis. This project involves UC Davis, Illinois, Wisconsin, Colorado, Louisiana, Utah and Iowa etc.

UConn is also collaborating and has received funding from companies both within the State (e.g. Alexion Pharmaceutical, CABA Inc., and Fairvue Farms) and other states (e.g. Genzyme Transgenics, MA; Genex Inc., NY; PPL Therapeutics, UK).

USDA – Maximize Viable Embryo Production from Pre- and Peri-Puberal Calves - 9/1/96-8/31/99, \$179,877; Genzyme Corporation – Developing Effective Protocols for Collecting Competent Oocytes from Heifers - 5/1/97-9/30/99, \$346,080; Genzyme Corporation – Production of Transgenic Dutch-Belted Rabbits - 7/1/96-12/31/99, \$313,500; CII – Novel Approach to Produce Transgenic Pigs as Animal Model Xenogenic Transplant - 7/15/98-7/15/00; CII – Cloning Pigs – An Ideal Approach to Generate Organs for Transplantation - 12/31/98-12/31/00; Pending USDA – Cloning Cows: Effects of Cell Types and Long-term Culture 7/1/99-6/30/02, \$327,448

Research strategies include both contemporal molecular and cellular biology techniques as well as classical embryology and reproductive biology techniques. These strategies place UConn Transgenic Animal Facility and group among leaders in the areas of cloning and other genetic manipulations of embryos.

Project efforts are to maintain high research standard and continue to lead in research areas.

The evaluation techniques are based on standard peer-review. These include peer-reviewed publications, grant supports and recognition (awards, invited scientific presentations and chairmanship).

### Characterization of mRNA for Quantitative Trait Loci Affecting Marek's Disease in Chickens

Marek's disease (MD) is of particular concern to the poultry industry. MD is a lymphoproliferative disease caused by a member of the herpes virus family. Diseased chickens infected by the Marek's disease virus (MDV) commonly exhibit paralysis, blindness, and visible lymphoid tumors that result in condemnation of the birds. The resulting losses of condemnation and reduced egg production are both economically (~ \$1 billion per year worldwide, Purchase. 1985) and psychologically damaging.

Genetic resistance to MD has been known for more than 60 years (Calnek, 1985). Recently, 14 non-MHC genomic regions or quantitative trait loci (QTL), associated with Marek's disease were identified (Yonash et al. 1999). Unfortunately, QTL cannot be resolved below map distance of 10 cM. Therefore, recombination congenic strains (RCS) system, as proposed by Demant and Hart (1986), which genetically dissects a complex trait into series of

single gene traits, is a better way to fine map and characterize each one of the MD QTL. The RCS system has been successfully used to map and characterize genes in mice involving in several traits such as colon and lung tumor susceptibility.

To resolve the location of the location of the MD QTL, chicken RCS are under development by crossing the two Avian Disease and Oncology Laboratory (ADOL) inbred lines 63 and 72 that are MD resistant and susceptible, respectively.

The main objective of this project is to fine map the MD QTL and to identify the actual gene(s) affecting the disease. The plan is to reach this goal by the gene expression comparison using the chicken RCS and the MD resistant line (line 63). The plan is to isolate RNA from lymphocytes of susceptible chickens from one of the RCS, which found to be MD susceptible and from resistant chickens from the resistant line (line 63). Following comparison of the mRNA pattern of between these two lines by using the differential display technique (Liang and Pardee, 1992) eventually, a line specific fragment(s) will be found. Clone and sequence of these fragments will lead us to potential genes affecting MD.

Identifying the major genes conferring resistance to MDV may be useful tool for the poultry industry in breeding programs for selection. Also, these genes may serve as candidate genes for the future transgenic chicken. Moreover, information about genes conferring MD susceptibility may be useful to understand the genetic control of tumor diseases in other species including human.

This project was submitted as a proposal to the University of Connecticut Research Foundation last October, and was funded for this year.

#### Mapping Limb Mutations in the Chicken

The chicken is model organism for the study of limb development and also of other tissues. The chick limb is a well established model system because of the relative ease of experimental manipulation and its precisely staged development. Here, in the University of Connecticut, Storrs poultry facilities, ten chicken groups are maintained each representing a different limb mutant phenotype. All the mutants are of a single locus, inherited as mendelian trait, and all with the exception of one (creeper) are autosomal recessive traits. The aberrant developmental function of several of the mutants proposed to map have been extensively studied by several groups, however their etiology remains elusive. Knowledge of the nature of the molecule which in a mutant state causes a distinct phenotype will provide the missing link into how the interaction of transcription regulators, growth factors, and signaling molecules are translated into a seamless process. The mutant phenotypes proposed to study present with amelia (limbless and wingless: Prahlad et al., 1979; Waters and Bywater, 1943), abnormal limb patterning (wingless, talpid, diplopodias: Abbott et al., 1960; Olympio et al., 1983), and abnormal limb shortening (micromelias, creeper, chondrodystrophy: Landauer et al., 1932; Lamoureux, 1942).

The chicken genome project has been the focus of considerable interest due to obvious commercial applications and as a results a genetic map has been developed. Three genetic maps (East Lansing, Compton and Wageningen) have been generated and at the present time they are being integrated. Approximately 1700 markers of which 700 are microsatellite repeats have been characterized and assigned. The average spacing of microsatellite markers is about 9 cM. With over 200 genes, with homology in other mammals, now mapped in the chicken (Burt and Cheng, 1998; Andersson et al., 1997), therefore, it is now possible to make comparisons between gene maps.

The primary objective of this project is the genetic mapping of the following phenotypes: chondrodystrophy, creeper, diplopodia-3, diplopodia-5, limbless, micromelia-Abbott, micromelia-Hays, talpid<sup>2</sup>, talpid<sup>3</sup>, and wingless. Following the localization of each mutant phenotype one or more candidate genes will be identified as a tool to study the developmental pattern of expression of novel genes. In order to accomplish these broad objectives the following stages are proposed: 1) Gene mapping: DNA extracted from F1 progeny derived from a cross between a carrier male and several female from an inbred line will be genotyped with a panel of informative microsatellite markers. Following linkage analyses, a phase of saturation mapping might be necessary. 2) Gene expression comparison: mRNA from few F1 progeny pairs of carrier and non-carrier of the mutant allele will be compared using the mRNA differential display technique. 3) Identification of candidate genes based on the chromosomal localization of a phenotype and a sequence of mutant specific gene expression product will be compared to the sequence and the databases examined for a candidate gene(s) which might already have been mapped in the critical regions. Alternatively, if the critical region is covered between the chicken and mammalian genomes, the human and mouse databases will be searched for mapped genes or ESTs. This project was submitted as a proposal to the NIH last October. No decision was accepted yet whether it will be funded or not.

## Animal Breeding and Genetics Course (ANSC 217 and SAAS 007)

Introducing the genetic subject for undergraduate students with an Animal Science major includes a wide variety of topics. It includes in general two major parts: 1) Introduction to Genetics, and 2) Breeding.

The first part, introduction to genetics, is an essential part as background for the second part (breeding). It must include the major definitions, which are being used in classical genetics, and also, it must include the simplest examples to demonstrate the nature of heredity. Therefore, the first part program of the course deals with Mendel rules, biochemistry of the nucleic acids, structure of chromosome, the cell cycle, replication, mitosis and meiosis, and finally gene transcription, translation and regulation.

Whereas, the second part of the course, includes the more complex aspect of genetics and its application. This part may be divided into three major sub-topics: a) Population genetics, b) Quantitative genetics, and c) Modern tools for breeding. The first, population genetics, includes the general forces affecting population in wild conditions, allelic and genotypic frequency, and Hardy-Weinberg equilibrium. The second part of the breeding subject, quantitative genetics, discusses the nature of quantitative trait (polygenic trait) as well as introduces the sources of variance in the general population, heritability, and phenotypic selection. The last part of the breeding subject introduces the various molecular markers and discusses the use of molecular tools like DNA markers as part of a breeding program.

Since this is a very extensive program for a single three-credit course, the teaching method must be presented in an efficient way. The main objective of this project is to develop a program which will include the most important subjects as part of Animal Breeding and Genetics course for undergraduate level. Another goal is, to use modern presentation tools in order to gain the teaching efficiency of this large and complex material.

In the last two semesters, as the instructor of the course Animal Breeding and Genetics, a course program was developed by selecting the most important subjects to cover all the material mentioned above. Since the program includes a large amount of complicated material, a PowerPoint presentation was used as the major tool for the frontal lectures. The PowerPoint has many advantages as presentation tool, like the fact that the material is visible in the best way, always in the best logical order. The animation option simplifies complex processes, and the students can follow the material easily as well as can keep the information by getting handouts of the presentation for each subject.

As mentioned before, during the last two semesters most (75%) of the course program was revised including more than 500 PowerPoint presentation slides, and more than 150 problems for practice and exams. As for the future, the plan is to complete the revision of the program. Also, since the field of breeding by molecular tools is becoming more and more popular, and there are many active research worldwide in this field, it will be necessary to update this part of the program (mainly the second part) yearly.

This method of teaching, using the PowerPoint presentation, was impossible without the high-tech classrooms and the great equipment that fortunately are available in most of the campus buildings.

## Growth Physiology

**Research Focus:** The somatotrophic axis includes the hypothalamus, the anterior pituitary gland and various target tissues, including the liver. Once somatotropin (ST) is secreted from the anterior pituitary gland it binds to specific receptors on the liver or other target tissues to stimulate release of insulin-like growth factor I (IGF I). IGF I mediates many of the effects of ST. IGF is transported in the blood stream and to target tissues by a group of six IGF specific binding proteins. These binding proteins can modulate the actions of IGF I and therefore can modulate the overall effects of the somatotrophic axis. Recently, effects of the somatotrophic axis were focused on growth in cattle and rats. It has been determined that exogenous ST stimulates growth rate in cattle over 300 kg, but not under 300 kg of body weight. Since changes in ST and IGF cannot account for all the effects of the somatotrophic axis, a logical step is to determine if there are changes in the IGF binding proteins as well. This research focus will help determine if alterations in the binding proteins are involved in the failure of smaller (and younger) cattle to respond to exogenous ST.

The research will increase knowledge of the somatotrophic axis and the effect of the interaction of exogenous ST and the IGF binding proteins on the growth of beef cattle. This research can then be utilized by beef cattle producers to more effectively use ST as a part of their management system.

The primary measures of success will be completed experiments in which the somatotrophic axis (ST, IGF I and IGF binding proteins), is quantified under a variety of physiological conditions, including response to exogenous ST, under nutrition, slow growth and etiology of changes with age. A very nice measure would be to secure outside funding from USDA!

The work will result in peer reviewed publication and quality recommendations for beef producers on the use of exogenous ST.

Partners will be: Tom Hoagland – Cattle management – possible grants UCRF, USDA, Pfizer; Brian Crooker (MS) GF – possible grants Hatch, USDA; Geoff Dahl (MS) – possible grants Hatch, USDA; Kristen Govoni IGF and IFGBP assays – possible grants UCRF, USDA (sample collection, data analysis); Martin Praisner Cattle management – possible grants UCRF, USDA.

Empirical data collection from well-designed experiments in beef cattle. The duration of each experiment will vary from one month to one year.

The primary strategy will be to design quality experiments with a well-trained group of technicians, graduate students and undergraduates to collect, prepare, assay and analyze the results.

The target audience is fellow scientists interested in the somatotropic axis and outreach programs that target beef cattle producers that might use exogenous ST.

The peer-review process will be the major evaluation tool. If a manuscript is accepted for publication in a peer-reviewed journal that will be considered a successful experiment.

### Analytical Toxicology

Research Focus: Development of new methodologies for the detection and identification of drugs and their metabolites has numerous applications. These analytical innovations could provide efficient and cost effective options for the clinical, pharmaceutical and regulatory industries. Discovery of biotransformation products of drugs is essential to developing methods for drug detection. Exploration of in vitro techniques for the determination of biotransformation products is an attractive alternative to traditional approaches. Enzyme linked immunosorbent assays (ELISA) can be created to detect specific compounds at low concentrations. One future application of this research includes the detection of drug residues in food products.

Measures of success will be acquiring funding to support the research.

Outcome products desired are peer-reviewed articles, new methods applications and production of ELISA kits for specific drugs/drug metabolites.

Partners are: Walter Hyde, PHD, Iowa State University – Collaboration on drug administration studies; Dr. Steve Barker, Univ. of Louisiana – methods development and field testing; Dr. Sylvain De Guise, UConn Pathobiology Dept. – Consultant immunotoxicology. Resources include grants: Association of Racing Chemists, International.

Key components of the program include discussions with colleagues, determination of industry needs from literature and attendance at professional meetings (ongoing).

Strategies include utilizing classic and innovative approaches to study drug metabolism. Modification of proven analytical techniques to discover unique processes.

Target audiences are pharmaceutical companies, regulatory agencies, clinical labs, graduate students.

Evaluation techniques will include field success of new methods of drug detection, successful completion of graduate student research projects, publications and grant funding.

### Pathogenesis of Salmonella Enteritidis (SE)

Research Focus: Pathogenesis of Salmonella enteritidis (SE): Egg-borne Salmonella enteritidis infection has emerged as a major public health problem in the United States and several other countries during the past decade. An essential event in the pathogenesis of SE is the attachment to the host intestinal mucosa through specific receptors on the host cell surface. Identifying and characterization of SE specific attachment proteins (adhesions) would help to design an effective control measures. Currently in process is the molecular characterization of the mechanism of attachment by identifying and studying the adhesion molecules expression during attachment of SE to host cell receptors. Four SE proteins of approximate size 85, 75, 50, and 36 Kda were identified and newly synthesized when incubated with Int-407 cells (human intestinal cells). Also recognized is three SE attachment proteins with approximate size 38, 32, and 6 Kda whose expression were up regulated when incubated with Int-407 cells. Further studies are in progress.

The measure of success will be control of SE food borne infections in humans related to fresh eggs in Connecticut.

This work will result in publications in reviewed journal and Extension publications.

Partners are Connecticut poultry producers, Health Department, Agricultural Department and Pathobiology.

A key component of the program includes characterization of SE attachment proteins during infections – duration 2-3 years.

Strategies include regional and national meetings on Salmonella control (over 1,000 attendees).

Target audiences are the poultry industry and allied industries.

Evaluation techniques will include data on Salmonella outbreak in Connecticut can be monitored monthly, quarterly and annually.

### Crohn's Disease Research

Research Focus: Crohn's disease affects one million Americans. The peak frequency occurs between the ages of 15 and 25. Females are affected slightly more often than males, 1.3 to 1. The disease is chronic, with frequent remission and relapses, followed often by surgery and persists for life. It is characterized by belly cramps, diarrhea, lower abdominal pain, fistulas from segmental intestinal disease, perianal lesions and weight loss. Crohn's disease significantly compromises quality of life, interfering with social activities, sports, education, vacations, sexual relations and self-esteem.

Measures of success will be identifying the environmental sources of Crohn's disease, as well as defining incubation period, means of transmission, portal of entry (to the GI tract) and etiology. Grant dollars up to \$300,000 may or may not be generated.

This work will result in six to eight research articles for peer reviewed journals are anticipated over the next several years.

Currently, studying clusters of Crohn's disease in Mankato, MN, where six cases among 328 members of a 1980 high school class have been identified. Mankato appears to be a hot-bed of CD; a second high school had two cases among 92 graduates in 1969. Control data are readily available from Olmstead County, MN, 90 miles to the east (where the Mayo Clinic is located). Once the initial research paper is published, a larger epidemiology proposal will be defined and funding sought for a five-year study.

Partners in the study of Crohn's disease include Dr. A. B. West of NYU, and Drs. J.F. Colombel and A. Cortot of Lille, France. The latter colleagues in France have identified 30 families with more than four cases each in northern France and Belgium and each will be interviewed, seeking etiological leads.

Key components of the program include: etiology of Crohn's disease (1999-2005); epidemiology of CD in Mankato, MN; epidemiology of CD in northern France and Belgium; role of *E. coli* recovered (in France) from the tissues of patients with Crohn's disease; role of enterococci, group A streptococci and bacteroides in Crohn's disease.

In the study of clusters, investigators will attempt to disclose sources of viruses or bacteria, for example unpasteurized milk, contaminated food products, drinking water. Evidence of participation by viruses or bacteria will be sought by immunostaining tissues, virus isolation, bacterial culture, PCR, and experimental animal inoculation; i.e. inoculation of putative agents into the Peyer's patches of experimental rabbits of young swine.

Target audiences are the medical community, gastroenterologists, scientists with a focus on inflammatory bowel disease and patients with CD.

If the papers cause a change in the way IBD is viewed or causes more individuals to join the search for etiology or to test antimicrobial drugs, some success will have been achieved. If grant monies follow, so much the better. If the cause of CD is discovered, a means of prevention will soon follow.

### Lyme Disease Research

Research Focus: Lyme disease is the most common tick-borne disease in the United States; the disease is endemic in Connecticut. Lyme disease infects domestic animals as well as humans. The disease has been less well studied in cattle and horses compared to humans and dogs. Research priorities include development of improved tools for the diagnosis of Lyme disease in cattle and horses, and application of these tools in studies geared toward improving understanding of the pathogenesis, transmission and economic impact of this disease in these species. Both experimental infection and natural disease will be studied. The expected beneficiaries of this research will include veterinarians (improvement in diagnostic capabilities) and cattle and horse owners (more information on disease characteristics and modes of prevention). Innovative diagnostic tools developed may also prove useful in diagnosis of human Lyme disease.

Measures of success are based upon the anticipated research results. It is anticipated that research results will enhance accurate laboratory diagnosis of Lyme disease in horses and cattle (and perhaps in humans), as well as increase knowledge of disease characteristics and economic impact in these species. Practicing veterinarians will be able to more accurately diagnose this disease, hopefully resulting in improved treatment outcome for the animal patients.

Desirable outcomes include the sharing and publishing of the research results. Results will be disseminated to practicing veterinarians via presentations at professional meetings and peer reviewed publications as well as individual consultation.

Partners of the project include both students and colleagues. Graduate students and diagnostic laboratory personnel are key contributors to this effort. Collaboration with Dr. Hallie Krider in Molecular and Cell Biology and his staff are important in the area of test development. Funding for these efforts has been primarily via CT Ag Experiment Station (CT 06-Animal Health), USDA competitive seed grant, and the University of CT Research Foundation.

Some of the key components of the project are: Equine Lyme Disease: Clinical Characteristics and Diagnostic Test Development in Naturally Infected Horses (2000-2004); Bovine Lyme Disease: Non-tick routes of transmission (2000-2005), Development of Improved Diagnostic Tests (2000-2003); Economic Impact in the Dairy Industry (2004-2005).

Equine Lyme Disease: Equine practitioners will submit blood from Lyme disease suspect horses (other common differential diagnoses ruled out) and healthy herdmate control horses. Clinical and environmental information will be collected also. Routine diagnostic serology will be performed; samples will be frozen for developmental assays. Horses will be treated with one of 5 defined treatments, or not treated. Patients and controls will be resampled 2-3 months later, and post treatment clinical information will be collected. Various diagnostic tests utilized will be compared and contrasted; treatment efficacy will be contrasted using both clinical and laboratory criteria.

Bovine Lyme Disease: Non-tick modes of transmission will be investigated by determining rate of transplacental transmission in calves from a herd with known natural exposure. Urine shedding of *Borrelia burgdorferi* (Bb), causative agent of Lyme disease, will also be assessed in this herd. Possible urine/mucosal transmission of this agent may be investigated by experimental infection of calves if funding is available. Known positive and negative samples from both experimentally and naturally infected cows will be utilized to develop an Elisa assay of improved specificity and sensitivity in cattle. This assay will be utilized to help determine economic impact of this disease in cattle.

Veterinarians are the target audience for the project effort.

Acceptance of publication submissions and abstracts for professional meetings should indicate quality of results. Adoption of similar testing methods by other laboratories would indicate incorporation of knowledge by others in the field. Requests for improved testing modalities should indicate acceptance of the findings by the veterinary practitioners.

#### Nonmammalian, Wildlife, Zoo and Aquatic Animal Pathology

Research Focus: Research focuses on mechanisms of infectious disease in nonmammalian, wildlife, zoo, and aquatic animal species. Principal interests involve identification and characterization of infectious agents of aquaculture-reared Atlantic salmon. To this extent, two diseases are currently being investigated of farmed Atlantic salmon, epizootic myxosporean encephalitis and branchial infection by a chlamydia-like organism. The initiative of my laboratory is to construct DNA probes for the identification of such pathogens in tissues from aquaculture-reared and wild salmon species. Such molecular probes would be essential to the creation of diagnostic tests useful in detecting pathogens at sub-clinical levels in a variety of salmon populations. Low-level detection would provide the aquaculture industry and fish and wildlife agencies with invaluable tools to monitor disease for the long-term management of fish populations for production and re-introduction.

Successful competition for external funding will be the measure of success of this research program, along with publication of research findings in peer-reviewed scientific journals.

The desired outcome products of this research are research findings publishable in peer-reviewed scientific journals and continued funding from external funding agencies.

The partners include: Hydro Seafood Fanad, Co. Donegal, Ireland; Dr. A. Brian West, New York University; Dr. Gregory Tsongalis, Department of Pathology and Laboratory Medicine, Hartford, Hospital; Sylvain De Guise, Richard French, Louis Pierro, University of Connecticut.

Key components of the program – 1) Epizootic myxosporean encephalitis and 2) Chlamydial branchitis.

The research strategy is hypothesis-based scientific experiments, and publication of results in peer-reviewed scientific journals.

The audiences for these research findings are the scientific community, aquaculture industry, fish and wildlife management agencies, with eventual diffusion to general public.

Evaluation of the research program will be based on the success of efforts to procure continued external funding and the ability to publish results in peer-reviewed scientific journals.

## Aquatic Animal Health

Protozoal infections are of great concern in oyster cultivation, because they cause economic losses in commercial production. The surveillance, management and control of these diseases of the oyster require diagnostic aids which are sensitive, rapid, cost effective and convenient. The present study will investigate the development of the multiplex PCR for application in the screening and surveillance of disease agents of the eastern oyster (*Crassostrea virginica*). Multiplex PCR will allow for the simultaneous testing of two or more pathogens in a single test reaction with a total assay time of approximately eight hours. The project design is in 3 phases which are centered about the following questions: 1) Can the protozoan pathogens [*Haplosporidium nelsoni* (MSX), *Haplosporidium costale* (SSO) and *Perkinsus marinus* (Dermo)] of the eastern oyster be detected and differentiated in a multiplex PCR reaction? 2) Can the multiplex PCR be used as a quantitative measure of oyster infection and contamination? 3) Can the multiplex PCR be applied to field samples and provide accurate and meaningful data.

The proposal is focused on the needs of the industry and is justified by: 1) the need of industry to maximize productivity and economically manage shellfish stocks, 2) the need of regulatory agencies to provide industry with meaningful data and recommendations, 3) the requirements for APHIS certification of laboratories for aquatic animal health inspection and diagnostics, and 4) the consumer's expectation for uncontaminated and hardy products.

The measures of success will be a NRAC Grant (\$142,103 - 1998-2000).

The outcome product will be a single, rapid multiplex PCR test for *H. nelsoni*, *H. costale* and *P. marinus* in the eastern oyster (*Crassostrea virginica*). User/Beneficiary: The Product will have potential use in commercial and private industry, research, diagnostics, and in certifying and regulatory laboratories. The products are primarily expected to serve the aquaculture industry in the routine screening of oyster seedstock. In this context, certifying will be possible and the management of disease in the cultivation of oysters can be engineered. Economic benefit: The introduction of multiplex PCR for testing of disease pathogens is expected to increase product availability & quality by increasing disease pathogen monitoring and thus decreasing endemic disease and disease impact.

Principle Investigators – Cooperating, Non-funded Participants: Mazhar Khan – University of Connecticut, Department of Pathobiology; Hillard Bloom – Tallmade Brothers, Inc.; Roxanne Smolowitz – University of Pennsylvania, Laboratory of Aquatic Animal Medicine and Pathology, University of Pennsylvania; Marine Biological Laboratory, Woods Hole, MA; Robert Smith – Rhode Island Clam Co. Inc., North King, RI 02852; John Volk, John Karolus, Inke Sunila – Connecticut Department of Agriculture, Bureau of Aquaculture and Laboratory, Milford, CT; Lynn Hinckley, Marianne Kalbac, Soledad Penna – University of Connecticut, Department of Pathobiology, Storrs, CT; DTS-Diagnostic Testing Services; Steve Fleetwood – Bivalve Packing Company, Inc., Port Norris, NJ 08349. Grants: Development and Application of Multiplex PCR for Screening of Shellfish Pathogens. PI: Richard A. French Funding Agency: NRAC (USDA), Funding Request: \$142,103, Funding Period: 9/98-8/00.

To develop and optimize a multi-species polymerase chain reaction (PCR) (multiplex PCR) for the detection of the eastern oyster (*Crassostrea virginica*) pathogens *Haplosporidium nelsoni* (MSX), *Haplosporidium costale* (SSO) and *Perkinsus marinus* (Dermo). To determine if the multiplex PCR can be used as a specific and quantitative measure of infection by the oyster pathogens *H. nelsoni* (MSX), *H. costale* (SSO) and *P. marinus* (Dermo). To apply the technology (multiplex PCR) to field samples and/or animals at point sources of infection and to evaluate and compare findings with conventional testing procedures. To determine if the specificity and sensitivity of the multiplex PCR method can provide accurate and meaningful data for use as a diagnostic aid in the management of *H. nelsoni* (MSX), *H. costale* (SSO) and *P. marinus* (Dermo) in the eastern oyster. The product to be produced from the proposed research is a potential marketable, single and rapid multiplex PCR test for the detection of *H. nelsoni* (MSX), *H. costale* (SSO) and *P. marinus* (Dermo) in the eastern oyster (*Crassostrea virginica*).

Strategies include original sound research based on established and theoretical science and applied research as determined by funding agency RFPs.

Target audiences are the research efforts and products will have potential use in commercial and private industry, research, diagnostics, and in certifying and regulatory laboratories.

Evaluation techniques will be publications and grant funding.

## Vaccine Research

Research Focus: Pathogenic *Mycoplasma gallisepticum* is the etiologic agent of a respiratory syndrome in poultry known as Chronic Respiratory Disease (CRD) (1). The non-invasive nature of this pathogen necessitates colonization of host respiratory epithelial surfaces as a prerequisite for the initiation of the processes resulting in host cell alterations and pathogenesis. The data suggests that cytoadherence is a multifactorial process mediated in

part by the actions of the specific cytoadhesin molecules, GapA and LP64, interacting with their corresponding host cell receptors as well as cytoadherence related molecules (CRM) whose character and functions are yet to be explored. This is reminiscent of the complex cytoadherence mechanism of the human respiratory pathogen, *Mycoplasma pneumoniae* which involves the coordinate action of the primary cytoadhesin molecule, P1 (2,3,4) in concert with an array of high molecular weight (HMW) accessory proteins. Recent data has demonstrated the requirement for HMW1 in the assembly of the attachment tip and the localization of P1 to that tip. Mutants lacking HMW1 are unable to cluster P1 to the tip structure and their ability to attach is impaired (5& 6). A recent report described the existence of an *M. gallisepticum* gene (*mgc2*) encoding a cytoadhesin-like protein which has 40.9% identity to the *M. pneumoniae* adherence related protein P30 (7). This may be an example of a CRM, and not a cytoadhesin per se.

Investigations into the complex nature of *M. gallisepticum's* cytoadherence process, with the goal of clearly elucidating the CRMs and their specific roles will provide greater insights into the pathogenesis of the organism and ultimately allow for the specific design of a more efficacious vaccine.

Measures of success include publications, grant funding, development of efficacious vaccine.

This work will result in publications, grant funding, development of efficacious vaccine.

Partners will be: Dr. David Ley, NCSU, Funding Agency: U. S. Poultry & Egg Association, David Ley and S. J. Geary, P.I.s Title: "Occurrence and Distribution of *Mycoplasma gallisepticum* Escape Variant Phenotypes Resulting From Vaccination of Chickens" Amount: \$18,760 Dates: 4/1/98-3/31/99, extended through 3/31/2000

Strategies include: 1) Characterize the molecular and biochemical character of p100 and p45 and the genes encoding them. 2) Restore the wild-type phenotype in R high by successive complementations with cloned genes encoding GapA, page 45 and page 100 utilizing Tn 4001 transformations. 3) Assess the localization/presentation of GapA as a consequence of page 45 and/or page 100 expression by immuno-gold EM. 4) Assess the cytoadherence capability of R high after each of the successive complementations with cloned genes encoding GapA, page 45 and page 100.

Target audiences are researchers interested in microbial virulence and vaccine development.

#### Department of Pathobiology

The individual research plan involves collaborative pathology support for structure/function studies in toxicology and immunology.

This includes: a) Mechanisms of protection for hepatotoxicity and renal toxicity with microsomal proliferators. J. Manautou, School of Pharmacy, UConn. J.E. Manautou, V. M. Silva, G. E. Hennig and H. E. Whiteley. Repeated Dosing with Peroxisome Proliferator Clofibrate Decreases the Toxicity of Model Hepatotoxic Agents in Male Mice. *Toxicology* 127:1-10, 1998. b) Mechanisms of colon carcinogenesis. D. Rosenberg, School of Pharmacy. D. A. Delker, Q. S. Wang, A. Papanikolaou, H. E. Whiteley and D. A. Rosenberg. Quantitative Assessment of Azoxymethane Induced Aberrant Crypt Foci in Inbred Mice. *Experimental and Molecular Pathology*. In Press. c) Mechanisms of allergic pulmonary disease. R. Thrall UConn Health Center, School of Medicine. C. M. Schramm, L. Puddington, C. A. Yiamouyiannis, E. G. Lingenheld, H. E. Whiteley and R. S. Thrall. Acute Allergic Airway Inflammation and Responsiveness is Diminished in TCRgd Knockout Mice and abolished in TCRab Knockout Mice. *American Journal of Pathology*, In Press.

The measure of success will be to understand the structure and function relationship of cell, tissue and organ injury.

All the collaborations expect to result in greater understanding of disease mechanisms. They will also serve as the basis of graduate student theses, collaborative publications and grant proposals.

Partners will be the School of Pharmacy, Center for Biochemical Toxicology UConn; Division of Pulmonary Medicine and the UConn Health Center.

Strategies include developing funding from external sources for graduate students.

Target audiences are the research/scientific community

Evaluations will be peer review of grants and publications

#### Immunology and Immunotoxicology of Aquatic Species

Research Focus: One focus of research is the evaluation of immune functions of aquatic species, with emphasis on bivalves and marine mammals. The relationship between exposure to environmental contaminants and immune functions, and between immune functions and the development of disease are my particular areas of interest. This is particularly important in view of the ubiquity of environmental contaminants, the sensitivity of the immune system to exposure to contaminants, and the central role of the immune system in the development of diseases. More specifically, the whole oyster industry will benefit from a better understanding of the relationship between immune functions and the development of economically important diseases, and a better understanding of

the effects of environmental pollutants on immune functions of marine mammals will allow for more successful conservation efforts.

Success will be measured by the success of continuous funding of research efforts and dissemination of the information through peer-reviewed publications.

This work will result in continuous funding of research efforts and dissemination of the information through peer-reviewed publications.

Partners include: David A. Ferrick (MS), Rigel Inc., CA, with collaboration in marine mammal immunology; Michel Fournier (MS), Montreal, Quebec, Canada, with collaboration in marine mammal immunotoxicology; Sal Frasca, Richard French, Louis Pierro (UConn), John Volk, John Karolus and Inke Sulina (CT Bureau of Aquaculture), with collaboration in oyster immunology. Resources include grants from the Morris Animal Foundation and USDA/CREES/

Projects include: Oyster immunology (11/98-present); Marine mammal immunology (8/98-present); Marine mammal immunotoxicology (8/98-present).

Strategies include original sound scientific experiments based on hypothesis-oriented research, according to proposals to granting agencies, and publication of results in peer-reviewed scientific journals.

Target audiences are the scientific community and eventual diffusion to general public.

Evaluation of the success at obtaining grants and at publishing results in peer-reviewed scientific journals.

### Viral Pathogenesis and Immunology/Vaccine Research and Development

Research Focus: The Immune Response to Pseudorabies Virus (PrV).- Data generated in the laboratory suggests that PrV immediate early protein (IE180) activates cellular responses as indicated by the significant blastogenic responses exhibited by lymphocytes of immune animals in response to stimulation with antigens representing IE180. A prospective study has confirmed these results. This finding is significant in the immunobiology of PrV.

Genetic Vaccines - Two DNA vaccines (different promoters) encoding the PrV IE180 protein gene which are functional in mice and swine have been constructed. In vaccination trials in mice with one of the DNA vaccines, specific antibody responses and partial protection in mice were achieved. Cytokine Adjuvants A recent study with IL-2 demonstrates the value of this cytokine as an adjuvant for the IE180 DNA vaccine in mice. This is of significance in the field of vaccinology in general that can be applied to swine or other species. Swine IL-2 Bioassay-A bioassay for functional evaluation of swine IL-2 was developed. This bioassay serves as a complement for immunoassays that are used routinely to measure total IL-2. This bioassay has a direct application in studies on pathogenesis and vaccine development when IL-2 needs to be measured functionally. Porcine Respiratory Reproductive Syndrome (PRRS)- Cloning of PRRS virus ORFs 2-7 in expression plasmids to be used as DNA vaccines is in progress. The adjuvanticity of swIL-2 with these DNA vaccines will be tested in swine. The planned studies will contribute to better understand protective immunity and to the development of more effective vaccines for control of PRRS.

Measures of success are based upon the anticipated research results. The data generated in projects will contribute to the general area of vaccinology specifically in the field of PrV and PRRSV. Resources include funding from USDA (\$ 106,000), and more recently from NSF (\$ 36,000) with one of the collaborators in the School of Pharmacy (Dr. D. Burgess).

This work will result in peer reviewed publications and presentations in national and international scientific events.

Partners will be: Dr. Diane Burgess (School of Pharmacy); Dr. Yi Li (Department of Plant Science, CANR), Dr. Herbert Van Kruiningen (Department of Pathobiology, CANR), Dr. William Smith (USDA, Sutton, Ma), Dr. Marvin Grubman (Plum Island, USDA-ARS, Greenport, New York).

The overall research program is on Viral Pathogenesis and Immunology with a strong vaccine component and a smaller but significant diagnostic component. Specific projects (listed above) two of which (DNA/cytokine and Swine IL-2) are almost completed. Otherwise the program could be considered an open ended type of operation.

Standard methods and techniques which are tailored to specific research needs are applied.

Target audiences are students, the scientific community and public at large make up the target audience for this research effort.

The results are evaluated as they are produced, papers are prepared internally reviewed and submitted for publication which are peer-reviewed.

### Non-Herbicide Weed Management Alternatives for Vegetables

Research Focus: Numerous strategies for herbicide reduction are being researched. These include cultivation, reduced tillage, bio-control and interseeding. One area not widely addressed is the impact of crop

rotation on weed populations. Liebman and Dyck (KS3) compared studies where at least one rotation had no herbicide and found 29 crop x rotation in the literature. Of these rotations with no herbicides, 21 found lower emerged weed densities. Reducing herbicide use would protect ground and surface water and benefit the general population. Developing effective weed management alternative would benefit vegetable producers

This project will be successful if one graduate student is trained, at least \$30,000 in grants are received, and two technical and one peer reviewed article are published.

Desired outcomes include two Extension articles, two technical publications and one peer-reviewed publication.

Partners of the research project include: NE-92 Regional Technical Committee - development of components of rotation research (MS); Storrs Agricultural Experiment Station - support the research necessary to evaluate rotations.

Key components of the research project involve evaluating six crop rotations involving sweet corn, vegetables and cover crops over a five-year period and documenting the change in weed density and species present (MS).

Strategies include using scientifically sound, statistically valid research methods to evaluate changes in weed population makeup and density as a result of various crop rotations.

Target audiences are agricultural researchers, Extension personnel and vegetable producers.

Appropriate statistical methods and experimental design will be used to evaluate results.

### Plant Physiology and Genetics

Research Focus: Plant hormones play a role in almost every aspect of plant growth and development. One type of hormone, the cytokinins, control many fundamental processes including cell division, shoot development, leaf development, flowering, senescence and chloroplast development. Therefore, cytokinin biochemistry, physiology and genetics has broad relevance to plant biotechnology, horticulture and plant biology. Research focuses on understanding the relationship between plant development and cytokinin biochemistry, enzymology and genetics. The results of this work are important for plant biotechnology, as well as improving the understanding of basic plant physiology and development.

Currently, work is being done on characterizing a novel cytokinin metabolism mutant in the model plant *Arabidopsis* (designated as *cym*). The *cym* mutant has abnormal cytokinin and adenine metabolism pathways and displays phenotypic differences from the wild type. The goal is to identify genes involved in cytokinin regulation which can be used to manipulate plant growth and development. This project has been funded by NSF and UCRF, and is currently funded by a USDA-NRI research grant.

Plant genetic engineering generally requires plant regeneration from a single cell using plant tissue culture, and the process of regeneration is partially controlled by exogenous and endogenous cytokinins. At this time, the major focus of the work is to select genetic mutants which are blocked in *de novo* shoot organogenesis while having normal shoot apical meristem development. The long-term goals of this project are to characterize the role of cytokinin in plant regeneration and to identify specific genes which control *de novo* shoot organogenesis. This work has been supported by a grant from the Storrs Agricultural Experiment Station (Hatch Funds).

Measures of success are based upon anticipated research results. These include identifying the gene sequence for adenosine nucleosidase; determining the role of adenosine nucleosidase in cytokinin regulation and plant development; and identifying genes involved in *de novo* shoot organogenesis.

This work will result in peer reviewed publications, abstracts for presentations and posters given at scientific meetings and training of graduate students.

Partners will be: the research described above is primarily supported by a USDA-NRI grant (1998-2000). Other sources of funding for my laboratory and graduate students include the UCRF, Hatch funds (Storrs Agric. Expt. Station), CII and HRI grants; and research collaboration with Dr. Goran Sandberg, Swedish University of Agricultural Science, Umea, Sweden, to quantify cytokinins in *Arabidopsis* genetic lines.

Strategies include a broad range of research approaches including developmental studies, enzymology, genetics, physiology, molecular biology and others.

Target audiences are: research scientists - plant biologists, physiologists, and geneticists; any person or company involved in plant transformation and regeneration.

Evaluations will be peer reviewed publications, abstracts for presentations and posters given at scientific meetings and training of graduate students.

### Molecular/Genetic and Electrophysiological Analysis of Plant Ion Channels

Research Focus: Optimization of crop plant function under adverse environmental conditions can be facilitated by targeting specific gene products that are pathways for ion/nutrient uptake and transport by plants. One research group is cloning genes which encode plant ion transporters. Voltage clamp analysis, along with molecular cloning and mutagenesis will be used to characterize structure/function relationships of these transport proteins.

The best measures of success will be to clone and functionally characterize new plant potassium ion channels and cyclic nucleotide-gated nonspecific channels.

Desired outcomes include peer reviewed journals, grants, and presentation invitations. It is expected that the results of this work will be published in peer reviewed journals, and also lead to renewals of federal competitive grants. It is also expected that this faculty member will continue to be asked to present invited talks to national science meetings reporting the results of this work.

Partners include: National Science Foundation, Cell Biology Grant Program; Department of Energy, Energy Biosciences Grant Program; United States Department of Agriculture, National Research Initiative Grant Program.

Five years duration; during this time, standard cloning procedures will be used and expression of recombinant proteins in heterologous expression systems such as yeast mutants and *Xenopus laevis* frog oocytes along with growth and voltage clamp analysis to characterize gene product function.

The research strategy will be to undertake electrophysiological analysis of currents induced upon expression of recombinant proteins in oocytes.

The target audience for the project effort will consist of plant physiologists in the area of plant mineral nutrition.

Results assessment will be based on acceptance of research papers in peer reviewed journals, and on renewals of competitive grants funding this research.

### Department of Plant Science - Horticulture and Plant Biotechnology

Research Focus: The research focus is on new plant development and plant improvement through traditional breeding and biotechnological techniques. This area of research is one in which the University of Connecticut has traditionally been very strong and productive. The University has been able to introduce new and improved plants and have demonstrated world-class research and scholarship as a result. The research that is conducted has focused in a unique area that has attained us national and international distinction. The University has also been able to improve the education of students, particularly the graduate students, from this research focus.

Measures of success will be the number of refereed, non-refereed and textbook publications produced. The program has attracted over \$600,000 in research grants from various private and government sources over the last 15 years. Graduates have also been a measure of success for the programs. Many of the graduate students have productive and leadership roles in private, state and national businesses or have received their Ph.D.s and have gone on to work at universities or industry.

This work will result in refereed articles and other peer reviewed articles, Extension publications, book chapters and awards. These include, but are not limited to, a recent Fulbright Fellowship, the CANRAA Excellence in Teaching Award, the University Outstanding Adviser Award and several other awards.

Some of the partners of the program are: 1) Professor Flavia Schiapacasse, University of Talca, Talca, Chile - she plays a vital role in research of Chilean bulb species; 2) Dr. George Elliott, UConn - he continues to work with *Alstroemeria* research projects; 3) Mr. Kent Kratz, Just-for-Starters, Eastford, CT - he works collaboratively with micropropagation research; 4) Mr. Marc Laviana, Sunny Border Nursery, Inc., Kensington, CT - he works collaboratively with micropropagation research; and 5) Dr. Yi Li, UConn - who collaborates on research projects pertaining to new plant development and improvement.

The research program is involved with new plant development and plant improvement through the use of traditional breeding and biotechnological procedures. In vitro procedures such as embryo culture, somaclonal variation, meristem culture for the production of pathogen-free plants, fertility restoration, somatic embryogenesis and micropropagation are all used to accomplish goals. Recent research programs have also been focusing on economic development initiatives with plant tissue culture in cooperation with state government agencies.

Audiences vary from undergraduate and graduate students, to consumer horticulturists, academics and horticultural professionals. The research strategy is to be at the forefront of new plant development, particularly as it applies to Connecticut, and to conduct world-class research of national and international distinction.

The target audience for the program effort includes undergraduate and graduate students, Connecticut horticultural and biotechnological enterprises, and ultimately, consumers.

The success of students serves as the primary evaluation technique.

### Integrated Pest Management (IPM)

Research Focus: Applied research and survey projects using Integrated Pest Management (IPM) methods will be conducted for plant pests (e.g., insects, weeds, diseases, nematodes and other invertebrates) and beneficial organisms. Damage to agricultural crops by plant pests may result in serious economic losses, and invasions of non-native plant and animal species into natural areas may cause a significant decline in biological diversity. Whiteflies, for example, are a serious pest of many greenhouse and field crops, causing severe economic damage through crop losses. More than 600 different plants have been identified as hosts of one or more species of whitefly (Whiteflies: their bionomics, pest status and management 1990, Agricultural Research 1992, Texas Agricultural Extension Service 1993). Applied research projects will focus on biological control of weeds, such as purple loosestrife, and other plant pests as part of an integrated approach to pest management that will result in reduced usage of pesticides, sustainability of natural resources and conservation of biological diversity.

Measures of success will be: a) Reductions in pesticide usage from adoption of Integrated Pest Management methods, including biological control practices by growers of agricultural commodities and natural resource managers; b) An increase in biological control agent populations in targeted crop production areas, such as greenhouses, and in natural areas for long-term sustainable management of insects, weeds, diseases and other organisms.

This work will result in 'Starter kits' of biological control agents, including release instructions and standardized monitoring protocols; technical reports, peer reviewed articles on applied research project accomplishments; Extension and trade journal publications; Internet web site development for research results and outreach information; poster display exhibits; color pamphlets and other educational materials.

Internal partners are: a) Commodity Specialists and Extension Educators in CANR; b) Faculty and professional staff in other UConn departments. External partners are: a) Federal agencies: USDA, EPA, NRCS, U.S. Dept. of Interior, U.S. Geological Survey (MS; grants have been received previously from these agencies and are anticipated to continue; b) State agencies: CT Agric. Expt. Station, DEP, CT DOT, SWCD, Dept. of Agriculture; c) Municipal organizations: Inland Wetlands Comms., Conservation Comms., Parks and Rec. Depts.; d) Grower Groups - CT Greenhouse Grower's Assoc., CT Nurserymen's Assoc.; e) Environmental Groups - The Nature Conservancy, Audubon Society, nature centers in Connecticut.

Applied research and survey projects in Integrated Pest Management will be conducted for various plant pests, including insects, weeds and diseases. Emphasis will be placed on biological control of a) pests of greenhouse and other agricultural crops and b) invasive weeds, such as purple loosestrife, in natural habitats. For survey projects, plant pests will be monitored through various survey techniques, including trapping, sweep net collections, and visual observations. Projects will be conducted from 12 months in duration to 5 years or as determined by supporting grant timelines. Long-term monitoring of biological control studies for 3 to 5 years is recommended for scientific documentation.

Applied research projects will be conducted following scientific methods, including experimental design and statistical analysis. Project results will be disseminated to growers, natural area managers, federal and state agencies, non-governmental organizations (NGOs), schools, municipalities and the general public. Educational outreach will occur via presentations, field demonstrations and volunteer training, dissemination of prepared materials, poster displays, Internet web site development, publications and the news media. The number of attendees will vary by event, ranging from several individuals to several hundred.

Target audiences are agricultural commodity growers, natural resource managers, the general public, volunteers and school children.

Evaluation techniques are annual technical reports summarizing program accomplishments for each applied research and survey program, preparation of Extension publications and manuscripts for peer-reviewed journals where applicable, continued development of IPM web site and outreach activities.

### Home and Garden Education Center

Cooperative Extension System Focus: The Home and Garden Education Center is part of the Department of Plant Science at the University of Connecticut College of Agriculture and Natural Resources. Through the use of new technologies, faculty and staff throughout the College and eight Extension Centers are also able to contribute their knowledge and expertise. The Center is open year round. The new UConn Home and Garden Education Center is an outreach program to the citizens of Connecticut. It is designed to meet the needs of an increasingly sophisticated audience by providing accurate, thorough and timely information on a wide variety of issues:

gardening, entomology, food safety, drinking water, soil testing, home horticulture, lead poisoning, indoor air quality, septic system management and family financial management.

Measures of success will be: to educate at least 5,000 consumers annually in entomology - structural and household pests; to process 1,500-2,000 telephone inquiries annually in entomology; to increase distribution of the Home and Garden Newsletter - Year 1999 - 650-1,000, Year 2000 - 3,000-5,000, Year 2001 - 5,000-10,000, Year 2002 - 15,000, Year 2002-2005 - 15,000; to increase insect center specimen diagnostics: Year 1999 - 500, Year 2000 - 1,000, Year 2001 - 1,500, Year 2002 - 2,000, Year 2003 - 2,000, Year 2003-2005 - 2,000.

This work will result in 25 (5/year) new entomology/household insects fact sheets, teaching 150 Master Gardeners in course work annually - course seminars, monthly training workshops for center staff, bimonthly Home & Garden Newsletter publication ('Home and Garden News'), develop new Center calendar annually and support and organize Center Advisory Committee.

Partners include: CAEMG, Schools, Garden Clubs. External partners are support businesses/green industry staff and internal: CANR/Extension/Plant Science staff, Master Gardener volunteers, other university horticulture centers, soil testing lab.

Key components of the program are: revision Master Gardener core manual and course data; new educational program on the web, CD-ROM, distance learning techniques; digital distance diagnostics program to link with Extension Centers and Master Gardener program; applied research/grant opportunities; fund raising mission; core staff support group positions scheduled and overseen to run Center.

Strategies include: annual Master Gardener and advanced Master Gardener courses; updated diagnostics program coupled with computerized technology; FAX on demand to be made on-line at Center; new web sites, information and cooperative linkages; provide plant, home insect, disease and gardening, pest diagnostics and recommendations for problem management; develop an IPM program; demonstration gardens at UConn and Extension Centers for education programs; develop distance learning and diagnostics program.

Target audiences are to reach 5,000-10,000 Connecticut citizens annually.

Evaluation techniques are course surveys and evaluation forms, newsletter surveys and data acquisition forms and advisory committee program review.

### Integrated Crop Management

Academic Program Focuses are: 1) Undergraduate teaching one course per year in Department of Plant Science; 2) Fruit Extension Fruit Specialist - Tree Fruit Small Fruit; 3) Entomologist - Home and Garden Education Center - Diagnostics; 4) Director, Home and Garden Education Center.

Measures of success will be to: educate the commercial fruit growers on insects, pests, disease management and crop production to increase their scientific knowledge via field visits, newsletters, meetings and publications; provide leadership in entomology, fruit production and program staff coordination to Home and Garden Education Center; increase public outreach education audience; increase educational knowledge relating to adopting sustainable IPM agricultural practices via meetings, seminars and newsletter publications; and course statistics/evaluations/number of students, IPM: Plant Science 204.

Outcome products are contribution New England Small Fruit Management Guide; editor - Fruit - Yankee Grower Newsletter; member, Home and Garden Education Center Advisory Committee; member, Plant Science Curriculum Committee; new entomology fact sheets (5/year); Extension Grape Bulletin planned - draft copy; and new applied entomology course - 2000.

Internal partners are: CANR Plant Science, CTAES, NE Vegetable and Small Fruit Team, UMass, Cornell University Fruit Team, University of New Hampshire. External partners are: Connecticut Department of Agriculture, Connecticut Pomological Society, Quinnebaug Fruit Growers Association.

Key components are: Undergraduate (2) courses (IPM and Applied Entomology); Publication (2 newsletters) Yankee Grower and Home and Garden News; New England Small Fruit Pest Management Guide; Administration UConn Home and Garden Education Center; Insect and Pest Diagnostics (500-1,000 specimens/year); Telephone consultation for Home & Garden Education Center - 1,000 calls annually; Teaching 10-15 undergraduate students annually.

Strategies include: Plant Science Undergraduate students 10-15 annually; Master Gardener course students - 165-200 annually; Home and Garden Education Center public contacts - 5,000-10,000 annually; Grower contacts via seminars - 2-3 conferences annually; 200-500 contacts annually; Twilight Meetings - 100-200 annually; New England Fruit meetings and Annual CES (Tolland) Fruit and Vegetable Conference (presentations) - 100 annually.

Target audiences are commercial fruit growers and Connecticut citizens for the Home and Garden Education Center.

Evaluation techniques are annual newsletter survey evaluations and Master Gardener teaching evaluations.

## Turfgrass Management

**Research Focus:** Traditional agricultural crop production in Connecticut has declined rapidly during the last 30 years. As urban and suburban development encroaches into rural landscapes, turf is replacing cropland as the principal managed land cover in the state. This situation is not unique to Connecticut; turf is replacing cropland along the entire Eastern Seaboard of the U.S. Residential and commercial lawns, athletic fields, golf courses, parks, highway medians and shoulders, sod farms, and cemeteries comprise many of the areas seeded to turfgrass. Proper management of turfgrass is critical for turf performance and quality in addition to preventing losses of nutrients and turf chemicals offsite. Research in this area will benefit professional grounds keepers, golf course superintendents, managers of athletic fields and parks, homeowners, and others who desire information on turfgrass management.

Measures of success include possible grants received and the change in knowledge and behavior. Specifically, it is anticipated that best management practices will be developed and evaluated for various turf systems. As results are released, many of these practices should be adopted by those interested in quality turf without compromising environmental quality. As the turfgrass science program develops in the College, it is expected that grant funding of the program will increase as well as student enrollment in the Agronomy major.

Desired outcomes include peer reviewed articles and Extension publications. It is anticipated that peer-review journal articles will be published from the turfgrass research. It is expected that the results will also be used by Extension personnel for Extension publications.

Resources and partners are: United States Golf Course Association (potential funding source), Golf Course Superintendents Association (potential funding source), CT Department of Environmental Protection (potential funding source), New England Turfgrass Foundation (potential funding source), U.S. EPA (potential funding source), Potash and Phosphate Institute (current funding).

Key components are turfgrass nutrient management, alternative pest control methods for turf and evaluation of new turfgrass species.

The research strategy consists of field, greenhouse, and laboratory experiments utilizing standard designs and analyses.

Research in this area will benefit the target audience of professional grounds keepers, golf course superintendents, managers of athletic fields and parks, homeowners, and others who desire information on turfgrass management.

Evaluation techniques utilize statistical analyses of data, which will determine treatment effects of experiments.

## Integrated Pest Management

**Research Focus:** There is a growing need to develop and implement integrated pest management (IPM) systems that are less reliant on agrochemicals and rely more on biologically based tactics. The sole reliance on chemical tactics is troublesome. For instance, more than 500 insect pests, 270 weed species and 150 plant diseases have become resistant to one or more pesticides (EPA, 1996). Moreover, concerns for human and environmental health and the cost of pesticide regulation stress the need for the switch to bio-intensive pest management systems. Such IPM systems rely on tactics such as host-plant resistance, biological control, and cultural controls. To contribute to the development of such IPM systems, my research seeks to understand tritrophic level interactions as they affect insect natural enemies. A good understanding of how plant traits influence natural enemies can lead to ways of improving their control efficacy. In addition, not much is known about how to combine particular host-plant resistance traits with natural enemies to produce additive or synergistic interactions that result in greater pest control. Current work deals with pea morphology and a coccinellid beetle and future work will deal with natural enemies of pest thrips. Another area of interest is the identification of host-plant resistant traits against insects that could be transferred to susceptible ornamental plants for which conventional breeding will take too long or it is not possible. This type of research will rely on the collaboration with colleagues who have the expertise in tissue culture and genetic engineering. All of this work should contribute to IPM systems relying less on chemical insecticides.

The knowledge generated should be useful in order to anticipate how host-plant resistant traits may interact with the application of biological control agents. This should be of benefit to plant breeders, suppliers of beneficial insects and agricultural producers. In addition, success of the research projects should lead to generation of funding.

This work will result in: publications in entomological and horticultural journals; presentations at scientific and trade organization meetings; guidelines for effective combinations of plant species and resistant cultivars with particular beneficial insects; and fact sheets.

Internal partners are: faculty with expertise in tissue culture and plant biotechnology; commodity specialists at the university; and IPM program specialists. External partners are: USDA germplasm collections; contacts will be established with individual growers and with organizations such as greenhouse grower's associations and

nursery/landscape associations. In addition contacts will be established with CT organic growers; CT Department of Agriculture and CT Agricultural Experimental Station; funding will be sought from USDA/NRI, EPA, NSF, and Northeast Regional IPM Grants program, among others.

In general, the research projects will investigate the effect of various plant traits (morphological or chemical) on natural enemies of pests in certain vegetable and ornamental crops. Screening of resistant cultivars will be conducted for plants of economic importance to CT. Research will also be conducted on the behavior and ecology of natural enemies that could be useful in greenhouse/nursery production systems. Key components include laboratory and field experiments, experiments on insect behavior, access to germplasm collections, and technical assistance. Duration of projects will depend on funding and personnel allocation.

Target audiences for the program are greenhouse and nursery managers as well as vegetable growers.

Evaluation techniques are comments by grant proposal and journal reviewers, comments and discussion at scientific/trade meetings and feedback from growers/producers and Extension personnel.

### Plant Biotechnology

Significance of the Program: Plant biotechnology will change the agricultural industry dramatically within the next 10-20 years. Plant gene transfer techniques will be widely and effectively used for crop improvement in agriculture, horticulture and forestry, and for production of cost-effective pharmaceuticals, industrial materials and enzymes.

Academic Program Focus: 1) Develop a strong research program in plant biotechnology; 2) Establish research collaborations with and provide fee-based service to agricultural, pharmaceutical and diagnostic industries; 3) Establish research collaborations with and provide technical service to UConn faculty scientists (potential collaborators at UConn including Dr. S. VonBodman, R. McAvoy, M. Bridgen, T. Chen, A. Garmendia, and S. Geary); 4) Establish international collaborations in plant biotech research with an emphasis on developing countries; 5) Develop and teach the following courses - Plant Biotechnology (lecture course, 3-credits) Plant Gene Transfer Techniques (a lab course, 3-credits, if funds are available and enough students enrolled), and Seminar for Plant Biotechnology (1-credit, for incoming freshmen to UConn), and Biotechnology Survey Course (3-credits, Dr. Von Bodman will be the coordinator of the course); 6) Train undergraduate students, graduate students and postdocs and other types of scientists.

Measures of success will be a well-funded research program in plant biotechnology; quality, numerous scientific publications; strong collaborations with private companies and with scientists at UConn and elsewhere (USA and developing countries); numerous undergraduate students, graduate students, postdoctoral scientists, and visiting professors from developing countries trained.

This work will result in multiple peer reviewed articles per year; multiple presentations (including invited) in national and international scientific meetings per year; multiple patents in the five years.

Resources include current grants from USDA, USDA and DOE and private companies. Proposals will be submitted to federal and state funding agencies, and private industries in the next 5 years.

Gene transfer techniques will be used to improve quality and performance of crop plants economically important to agriculture, horticulture and forestry. Some of the projects are production of seedless fruits, improvement of wood productivity, delay of senescence/Extension of shelf life; compact plants with more branches and flowers, improvement of seed productivity, production of antibodies and vaccines in transgenic plants. Strategies will also be developed for production of pharmaceuticals and industrial materials and enzymes.

Strategies include: Gene transfer techniques will be used to develop strategies for improvement of agriculture, horticulture and forestry and also for production of pharmaceuticals and industrial enzymes.

Target audiences are: Education/Teaching - undergraduate student, students and postdoctoral scientists and other types of research scientists; Research/product development - industrial partners, domestic and international collaborators.

Evaluations will be: peer reviewed articles; invited scientific presentations; patents; grants; contracts; scientists trained.

### Integrated Pest Management (IPM)

Research Focus: There are many problems and concerns related to the use of pesticides in agricultural and non-agricultural areas. Some of the concerns include overuse and misuse of pesticides, pollution of ground and surface waters, unwanted residues on food and feed, drift to non-target areas, hazards to beneficial and other non-target organisms, resistance of pests to pesticides, and public and pesticide applicator safety. One applied research will focus on pests of fruit crops in order to develop pest management techniques to address the issues mentioned

above. With the recent passage of the Food Quality Protection Act (FQPA), alternatives to managing pests without traditional pesticides are particularly important. Examples of research topics include usage of biological control organisms to control fruit pests, monitoring methods for fruit pests, particularly minor crops (e.g. peaches) and usage of weather data to predict pest occurrence.

Measures of success include reductions in pesticide usage from increased adoption of the IPM methods developed from applied research, reduction in pesticide risk by IPM program participants due to usage of less toxic pesticides and usage of biological control organisms and funding from submitted grants will allow research in fruit IPM to continue.

Outcome products desired are: 1) state and regional Extension bulletins and fact sheets; 2) presentations of research results at grower/clientele meetings, 3) on-farm applied research demonstrations; 4) quarterly and annual reports written for granting agencies (depending on contracts); 5) use of electronic media for dissemination of research results, e.g. web sites, e-mail, etc.; 6) recorded pest messages.

Internal partners will be commodity specialists and Extension Educators in the College of Agriculture and Natural Resources. External partners and resources will be grower and clientele groups (e.g. CT Pomological Society) – Stakeholder input, Connecticut Department of Environmental Protection – source of grant funding, Connecticut Agricultural Experiment Station – collaboration with scientists on applied research projects, IPM Specialists from other Universities – expect continued involvement with multi-state grants (MS).

Applied research in Integrated Pest Management will be conducted for pests which occur in tree fruit crops (e.g. apples, peaches, pears) and in small fruits (e.g. strawberries, and possibly grapes). In particular, research will be conducted on several pests for which currently have no established IPM guidelines, including plant bugs and stink bugs on peaches. Also, with the anticipated loss of pesticides due to the Food Quality Protection Act (FQPA), there will be an increased need for pesticide alternative research. Other research emphases will continue to be on alternatives such as biological control of pests and usage of newer, less-toxic pesticides. Projects will be conducted from one to five years in duration or as determined by grant funding.

Due to the loss of the University Research Orchard, applied research projects will be conducted primarily on commercial fruit farms. Grower input is needed to ensure that the research is carried out with the least disruption to the agricultural operation, while still achieving meaningful research results. These on-farm demonstration areas will be used for grower meetings to disseminate research results to other growers.

Target audiences are producers of tree fruit and small fruit in Connecticut and other Northeastern states (MS).

Evaluation of adoption of new IPM techniques are included in post-season survey results with cooperating IPM growers. See small group and ICM team plan for discussion of Extension programming and evaluation.

#### Pedology - Parent Material of the Soils of Southern New England

Research Focus: The goal of this research is to develop a better understanding of the genesis or origin of the soils of southern New England by focusing on the relationship between soil taxonomic units and the regional glacial stratigraphy. A model has been developed which relates selected glacial till soils derived from specific bedrock types (primarily granitic gneiss and micaeous schist) to till types and the thickness of an eolian mantle that overlies the tills. One manuscript has been accepted with revision. A second manuscript was rejected and is being revised. A third manuscript is in preparation.

The findings of this research has lead to the conclusion that soil previously thought to be formed entirely in glacial till are actually formed in a two-storied parent material consisting of eolian sediments over glacial till. An abrupt change in the particle size distribution of soils with depth can be used as evidence of a lithological discontinuity. Abrupt shifts in the ratio of the coarse sand to the coarse silt were found to coincide with field identified discontinuities in previous studies of Connecticut soils.

A cursory look at published data for other southern New England soils show such "shifts" to be a common feature of the "till" soils of southern New England. The presence of these "shifts" in particle size distribution with depth are typically not noted or commented upon by the authors (Soil Conservation Service or state agricultural experiment station workers) of these publications. Future research will focus on statistically reanalyzing this existing data. This will be followed by site visits to determine if the presence or absence of the "shifts" in particle size ratios with depth can be related to the presence or absence of field identifiable lithological discontinuities.

A second related phase of this research will involve the continued study of six meter thick soil/till profile exposed in a gully in Middlefield, Connecticut. Field description of this soil profile or geological cross section led to the hypothesis that two tills of two different ages were exposed in this profile. A modern day soil, a coarse-loamy mixed, mesic Typic Dystrochept was observed as occurring at the surface of the upper till which was interpreted as being of Wisconsinan in age. A discontinuity was interpreted as occurring at about three meters below the soil

surface. The layer beneath this discontinuity was interpreted as consisting of a series of paleo-argillic horizons which were friable and exhibited subangular blocky structure. These horizons graded with depth to a dense, brittle and fissile (platy structured) till. If a paleosol is present within this soil exposure, it can be inferred that it is formed in and is underlain by a pre-Wisconsinan till.

This soil profile has been sampled. Analysis or measurements of bulk density, particle size, free iron, free manganese, cation exchange capacity, exchangeable cations, exchangeable acidity, base saturation, pH, clay mineralogy, and skeletal mineralogy have been performed at the USDA, Natural Resource Conservation Service Soil Characterization Laboratory, Lincoln, NE. This data is now being analyzed and interpreted.

Future studies will focus on the study of three or more soil profiles which exhibit what appears to be stone lines. Stone lines are usually interpreted as evidence of an erosional surface which separated geological material of different ages.

A measure of the success of this program will be sufficient data or information to affirm or negate the above hypotheses. A more concrete measure will be publications produced. The ultimate measure of success will be an improved understanding of the genesis of Connecticut soils leading to the development or construction of better soil taxonomic units which in turn leads to a better understanding, utilization and conservation of Connecticut soils.

A concrete measure of success will be the acceptance of one or more research papers to refereed soil science or geology journals. A more important contribution will be the development of more accurate and more realistic models of the genesis of New England soils and a subsequent improvement in the criteria used to differentiate New England soils into taxonomic units. One manuscript has been accepted; two others are in preparation.

The primary partners in this effort are the soil survey staff of the Natural Resource Conservation Service (USDA) at the local, regional and national level. A part of this research is being conducted in association with Dr. Douglas Wysocki of USDA/Natural Resource Conservation Service National Soils Characterization Laboratory, Lincoln, NE.

The key component of this project is the reanalysis and reinterpretation of existing data and information that is within the public sector. The expected duration of this project is two years.

The target audiences for this research project are the workers involved in the National Cooperative Soil Survey and all others involved in making and interpreting soil surveys.

Learning has occurred if soil taxonomic units are revised to reflect the findings of these studies.

#### Program Area - Home and Garden Education Center

Cooperative Extension System Focus: Provide information to the people of Connecticut on all phases of horticulture including but not limited to proper cultural conditions, identification of and control measures for insects, disease and cultural problems. This may include cultural and/or approved chemical controls. Such information will include timing for the pesticide application and where applicable, methods to determine timing.

Methods including training/teaching in the Extension Master Gardener Program with monthly diagnostic clinics and teaching four of the classes at four sites. Also is the daily answering of the questions from the public and the training of the four part-time horticultural assistants in the center and material sent in by the regional Extension offices.

An important measure of success is the impact that this program has on pesticide use. Specifically, success indicates the proper use of pesticides and fertilizers with a resultant decrease in the amount used. This should reduce the amount entering non-target areas.

The work will result in a greater use of electronic presentations in teaching and its possible use in WEB pages. The people teaching in the Extension Master Gardener Program should use such tools to improve teaching skills and audience retention. The anticipated use of computer-video hookup of the field offices with the Center should improve diagnostic skills of all the participants.

A continual updating of the current information sheets and the writing of new sheets as demand dictates should be a top priority.

The main resources and/or partners of the program are the members of the master gardener team.

An important program strategy/educational method is to train 200 master gardeners.

The target audience for the program effort are all the people of Connecticut.

Class evaluations are made at the end of each class.

## Molecular Plant Pathology and Plant Biotechnology

A basic molecular understanding of plant disease mechanisms and host-pathogen interactions will ultimately generate feasible and cost-effective approaches to restrict plant diseases.

Academic Program Focus: 1) Train undergraduate, graduate, and postdoctoral fellows in basic research areas related to plant disease mechanisms, and in applied biotechnology research primarily to create disease resistant plants. 2) Teach and improve the Plant Disease course (PLSC 203). Particularly develop a meaningful laboratory section designed to introduce students to the basic biology of disease causing agents, and also incorporate a component of disease diagnosis. The traditional lecture material will be augmented with aspects of modern biotechnology application for disease control. 3) Teaching and coordinating a Biotechnology survey course (3 credits). It would be proposed to give this course a "Writing" designation. The idea of this course is to reach undergraduate, graduate, and even professional students to provide them with an understanding of biotechnology so that they can make informed decisions about such issues. The material will give the students a most basic understanding of molecular biology to prepare adequately to understand biotechnological applications. Actual examples of successful biotechnology applications related to microbes, plants, animals, and humans will be discussed. Faculty members on campus who are experts in these various fields and who are willing will be enlisted to contribute one or several lectures. For example, Dr. Li and the new faculty hire in Plant Science will likely present lectures on biotechnology issues related to plant improvement. There are several faculty members in Animal Science and Pathobiology who are experts in the field of animal biotechnology. Lectures will be presented on the introductory molecular biology section and cover uses of microbes for biotechnological purposes. In addition, non-science interests in biotechnology will be addressed including economics, intellectual property and ethics. For example, Dr. J. D. Foltz, a recent hire in ARE may contribute to the economics of biotechnology section. 4) Opportunities to obtain funds.

Research Focus: The research focus will be two-fold. First, it will maintain a strong basic research program aimed at understanding bacterial processes involved in plant host-pathogen interactions. For example, current research studying the molecular mechanism of quorum-sensing signaling in the plant pathogenic bacterium *Pantoea stewartii* subsp. *stewartii* is recognized by scientists worldwide and has produced publications in the Proceedings of the National Academy of Sciences (USA) and a chapter in a recently edited book published by the American Society for Microbiology. This research area will be maintained and further developed and similar basic research areas will be initiated. The second research focus will include plant gene transfer-based approaches to improve plant species of interest to Connecticut agriculture, horticulture, and forestry with a particular focus on disease resistance. There are several antimicrobial enzymatic activities that lend themselves for gene transfer. Transgenic plants expressing these activities will hydrolyze cell wall components of most bacterial pathogens, thus generating a general antimicrobial strategy with broad application. The specific activities in mind; i.e. muramidase activity that attacks the peptidoglycan component present in most all bacterial cell walls, will create stable disease resistance mechanisms that are unlikely overcome by the pathogen.

Measures of success will be researching leading to several extramural grants, and will continue to generate quality publications in internationally recognized, peer-reviewed journals. In addition, collaborations will be initiated and existing collaborations will be cultivated with colleagues at institutions within the United States, France and Germany. These collaborations will allow students to get international exposure; for example, details are currently being worked on for Tim Minogue, current graduate student, to spend the coming Summer in Berlin, Germany. He is likely to receive a summer stipend from the Institute for Crystallography at the Freie Universitat Berlin. Opportunities will be explored for meaningful collaborations with industry. The DeKalb Genetics research facility in Mystic, CT, has been visited and a seminar presented to their scientists in April 1999. Good contacts have been established at DeKalb that may lead to joint projects.

This work will result in multiple peer-reviewed articles annually, annual presentations at one-two national and one international meeting and patentable products.

Partners and resources include: funding from USDA – new grant requests will be submitted in the fall 1999; grant proposals to NSF; exploring funding opportunities at NIH as the basic research project has important implications for human health; anticipate that collaboration with European scientists may lead to granting opportunities abroad; for the biotechnology program, funding is anticipated through the Yankee Ingenuity Initiative and similar programs.

Program components include: 1) Continuing to develop my current research focus on quorum-sensing signaling in bacteria and its influence on plant pathogenicity. This project will be active for at least five years and should uncover additional research questions worthy of scientific investigation. 2) "Green Fluorescent Protein" tagging will be used to study the progression of Stewart's Wilt disease in sweet corn. This disease derives from bacterial capsular polysaccharide production that eventually clogs the vascular system of the infected plant. One

recent discovery that *P. s. subsp. stewartii* synthesizes the capsular polysaccharide virulence factor only under high bacterial population density, calls into question the orthodox idea that the pathogen requires capsular protection during the early infection process to escape common plant defense mechanisms. The use of modern confocal fluorescent microscopy will allow me to determine at what stage of the infection capsular polysaccharide production benefits the pathogen. 3) Specifics of the Biotechnology component of research are detailed in the Group report.

Target audiences include two types: The basic program will find interest among plant pathologists and molecular biologists interested in host pathogen interactions. The biotechnology research program will generate interest by producers of agricultural and horticultural crops, and industries within the agricultural sector.

Evaluation techniques are peer-reviewed articles, presentations at scientific meetings, invited seminars, extramural funding, patents and contracts and the number of scientists trained.

## ALLOCATED RESOURCES - GOAL 1

Programs listed below reflect funding from all sources including Hatch funds, Smith Lever funds, Offset, University operating, grants and special projects.

Finding resources for new program areas such as turf management and consumer education in horticulture as well as funding ongoing programs as traditional support has vanished is critical. These areas include soil survey and IPM. In some areas, current support is adequate while additional resources would facilitate moving the research and Extension agendas along at a faster rate.

Financial resources needed for the completion of the above activities include the following:

- graduate assistants
- technical support staff for each lab and for diagnostic work to increase efficiency and allow for continuity between graduate students
- clerical support for grant and publication editing and submission
- salary support for resident veterinarians
- new faculty position in turf management
- staff to maintain and develop web sites
- summer salary support in some program areas for nine-month faculty members
- support staff for the development of distance learning opportunities
- support personnel to manage newsletters and conferences
- greenhouse management staff
- Extension plant pathologist
- increase staff for the Home and Garden Education Center
- Extension educator in nutrient management
- teaching assistants for strong laboratory based classes
- student labor for data entry, typing
- support staff to maintain the beef cattle herd
- teaching assistant for Introduction to Horticulture class taught by Extension educator
- increased funding for IPM positions
- research technician to work poultry manure and fly management issues

Additional non-staff support for programs includes:

- conference and annual symposium
- Extension and undergraduate educational material development and distribution
- equipment maintenance and repair support
- renovated lab space
- yearly allocation for supplies, experimental animals and pathology costs
- fully functioning histology lab including a facility for histological image analysis
- research facilities for aquatic animals
- sufficient in-state and out-of-state travel funds
- additional vehicles for on-farm training

- field research space
- greenhouse and growth chamber space in the new agricultural biotech building
- climate control for laboratory space
- funding to conduct economic assessments
- start up funding for new turf management program
- operating dollars for transgenic plant facility
- funding for seminar speakers
- office space for part time staff
- advanced computer technology
- funding for demonstration projects
- new horse arena and an academic classroom in the horse barn
- an inter-departmental College level approach for expanding and developing a food science major
- updated swine research facility and avian research facility
- specific pathogen-free facility
- appropriate protocol for the dispose of beef cattle following completion of an experiment
- additional match dollars for grants
- graphic workstation for GIS work and a printer for map size output located in CIT or at an Extension Center
- Ag engineer to work on pollution control structures for small livestock farms
- turf diagnostic lab

Funds Spent in Support of Goal 1

	1999	2000	2001	2002	2003	2004
Total from all Sources	2,350,930	2,350,930	2,350,930	2,350,930	2,350,930	2,350,930

GOAL 2: A safe and secure food and fiber system. To ensure an adequate food and fiber supply and food safety through improved science based detection, surveillance, prevention, and education. (1862 Research, 1862 Extension)

COLLEGE PROGRAM TEAM PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

FOOD, FOOD SAFETY AND HEALTH TEAM

### Food, Food Safety and Health

Cooperative Extension Focus: Food safety issues and events continue to make the news and focus the attention of regulators, legislators, those in the food business and consumers on the safety of the United States' food supply. In the past year, alone, outbreaks of listeria, cholera, and e.coli have hit the headlines. Nationally, concerns about the safety of food in the last decade have resulted in development of the President's food safety initiative; establishment of Hazard Analysis Critical Control Point (HACCP) regulations in seafood, meat and poultry; development of guidelines for Good Agricultural practices (GAPs) in production of fruit and vegetables; organization of the FightBAC food safety education campaign targeting consumers; and the voluntary efforts of many involved in food related industries, from farm to table, to improve food quality and safety.

In November 1996, the Food Safety Team of the College of Agriculture and Natural Resources held its Food Safety Outlook conference. The conference report noted that all participants along the farm to table continuum need to take responsibility for their role in keeping food safe. In addition, research and training must focus on identifying risks, methodologies for reducing the risk for foodborne illness, and adopting safe food handling practices. Educators will need to continue to address the need for providing processors, and perhaps retailers and distributors, with information on developing HACCP programs in accordance with federal regulations. Connecticut will need to address federal initiatives regarding on-farm food safety and quality programs. This will include training fruit and vegetable producers to adopt Good Agricultural Practices in response to the presence of pathogens in fresh produce. Finally, more emphasis will need to be placed on the need to educate consumers in Connecticut, a new focus for the team.

Measures of success will be: numbers reached, behaviors changed or expected change in behavior, knowledge gained, grant dollars received, food safety programs developed and funded, newsletter articles written, contacts made.

Outcome products desired: newsletter articles, food safety exhibit, Extension publications, workshops, conferences, training programs

Partners will be: Industry (producers, processors, distributors, retailers), Connecticut Dept. of Public Health, Agriculture, Consumer Protection; Commodity or industry organizations; Connecticut Farm Bureau; Northeast Land Grant Institutions, Cooperative Extension Programs; Local and Federal regulators; USDA Food Safety and Quality competitive and Plan of Work funding programs.

Key components of the five year plan for the Food Safety sub-team of the Food, Food Safety and Health Team will include programming in three areas: 1) On-farm - dairy, food animals, fruits and vegetables. Program focus will be on minimizing the contamination of food with pathogens found on-farm and spread via water sources, manure, rodents and other vectors, poor sanitation and farm worker hygiene. 2) Processors/retailers: small/medium sized meat, poultry and seafood processors, specialty food processors, cider processors, restaurants, grocery stores Program will focus on reducing risks for foodborne illness by developing HACCP food safety programs and other training programs addressing plant sanitation, worker hygiene, prevention of cross-contamination, temperature control, and using microbiological testing as one tool for verifying that food safety programs are effective. 3) The consumer program focus will be on conducting needs assessments, developing a comprehensive food safety education program for consumers administered via the home and garden center to include newsletters, correspondence courses, workshops, fact sheets.

Strategies will include: 1) On-farm - dairy (ongoing); food animals (ongoing and new); produce (new) - a) needs assessment activities; b) identify key players/project team; c) program development; d) workshops, manuals, conferences, farm visits, fact sheets, newsletter articles. 2) Processors/retailers: meat, poultry, seafood (ongoing); cider (ongoing); specialty (new); retailers (ongoing and new) - a) needs assessment activities; b) identify key players/project team; c) program development; d) workshops, manuals, manuals, poster sets, curricula, fact sheets. 3) The consumer: including the home and garden education center (new and ongoing): a) needs assessment activities; b) identify key players/project teams; c) program development; d) workshops, curricula, fact sheets, newsletter articles. In addition, a food safety program display board will be developed for use at exhibits, fairs, and

other opportunities for information participants of food safety education, training, and research opportunities provided by the College of Agriculture and Natural Resources and the Food Safety Team.

Target audiences will be: 1) On-farm - farmers, producers, farm-workers, farm organizations and decision makers (regulators, Farm Bureau, commodity groups); 2) Processors/retailers: plant managers/owners, workers, retail managers, regulators; 3) Consumers: teachers, child- and elder-care providers, youth, other consumers.

Evaluation techniques include pre/post-tests, surveys, evidence of food safety plan developed and in-place (HACCP Plan, GAPs).

### HACCP Training

Recently, the Pathogen Reduction and HACCP proposal was passed by Congress in an attempt to provide a safer meat supply in the U.S. A key component of this legislation was the requirement that all federally inspected meat processing plants must have a HACCP plan in place by January of 2000. For the meat industry, this is the most sweeping legislation since the Meat Inspection Act of 1906. As part of the HACCP plan requirement, every plant must have at least one trained/certified individual. Therefore, D. Hirsch and C. Faustman became Certified Lead Instructors and held several workshops to train and certify meat industry personnel in the northeastern U.S. As personnel changes occur, and businesses expand, there will be a continued need for Extension related training in the area of meat safety.

The impact is substantial. Participants who successfully complete the workshop stay in business. Those who do not receive training will be forced out of business. To date, approximately 220 individuals have been trained.

The measures of success will be a workbook to assist meat industry personnel with the development of HACCP plans is being developed.

Partners include Dr. Lori Pivarnik, University of Rhode Island, in delivery of the workshops; Extension specialists in meat science from VPI, the Pennsylvania State University and the University of Wisconsin-Madison; and finally, personnel from industry and USDA-FSIS also have provided assistance in the workshops.

The workshop program consists of 16 hours of instruction and group interaction to cover the 7 steps of HACCP, regulatory considerations, resources for development of HACCP plans, and the actual of writing of a sample HACCP plan. The first participation was in the fall of 1996 and since that time 7 workshops have been delivered associated with HACCP plan development. It is anticipated that processors will require training in areas related to HACCP to include sanitation, verification and microbial testing.

Methods used will be lecture and group interactions will be used to deliver the essential elements of workshops.

The group effort will be aimed at writing specific HACCP plans.

The target audience will be personnel in federally inspected meat plants.

Evaluation forms distributed at the end of each workshop will be used to gain feedback about the program. Follow-up phone calls and informal feedback will also be obtained. USDA FSIS personnel have communicated that plant personnel who have completed the course are doing a fine job in implementing their HACCP plans. The last 3 workshops have grown from 16 to 40 to 60 participants.

### Food, Food Safety and Health/Family and Community Development

These activities coordinate with the Food, Food Safety, and Health as well as the Family and Community Development Teams. Particular joint efforts are the: development and maintenance of a web site; production of consumer materials; the initiation of a statewide conference on iron-deficiency anemia; collaboration on grant submissions; testing of food safety materials for young children.

### Nutritional Sciences

Outreach Focus: The CANR Food Team is a multi-disciplinary team. One of its main focuses is to provide outreach in 1) food safety and 2) nutrition and health. In these efforts there is considerable overlap. The current team evolved in 1998-99 from the previously recognized separate food safety and food and health teams. Audiences for the outreach efforts of the team include industry, small businesses, state and local governmental agencies and the individual consumer. The significance of these efforts are underlined by the recent initiatives nationally focussed on the safety of food and food supply and by the President's Food Safety Initiative; establishment of Hazard Analysis Critical Control Point (HACCP) regulations in seafood, poultry and meat; development of the guidelines for Good Agricultural Practices (GAPs) in production of fruits and vegetables; and organization of the Fightbac food safety education campaign for consumers.

Measures of success is food safety knowledge and behaviors which benefit the target audiences, decreasing the incidence of foodborne illnesses. Nutrition knowledge of the consumer and other health professionals will be positively affected. Grant dollars for the team's efforts will be increased.

Outcome products desired are peer reviewed journal articles, Extension publications, abstracts and presentations at national and international conferences.

Partners include participants of the team include faculty from the College, Nutritional Sciences, Extension, Animal Sciences, Pathobiology; faculty from CLAS, Molecular and Cell Biology; faculty from other institutions, i.e., University of Massachusetts; and industry.

The food safety initiatives will include programming in three areas: farm (food animals, dairy, fruits and vegetables), processors/retailers (small and medium-sized meat, poultry and seafood processors, specialty food processors, cider processors, restaurants, grocery stores) and the consumer. The nutrition and health initiatives are planned to be focused on disseminating nutrition information and knowledge via different media, i.e., newsletters and conferences.

For the food safety initiatives, needs assessment activities will be used to target audiences and knowledge needs. Programs will be developed to address the targeted needs; project leaders will be identified for each of these. Outreach efforts will take the shape of workshops, manuals, conferences, farm visits, fact sheets and newsletters. For nutrition and health initiatives, national and state needs will be prioritized for target of nutrition messages and information.

Target audiences are: Food Safety - 1) on-farm: farmers, producers, farm workers and organizations and regulators, the Farm Bureau, commodity groups; 2) processors/retailers: plant owners and managers, workers, retail managers and regulators; 3) consumers: teachers, child and elder care providers, youth, others. Nutrition and Health - across the lifespan.

Evaluation techniques will include pre/post tests; surveys; evidence of food safety plan developed and in place (HACCP plan and GAPs).

### Food Safety

Focus: Nutrition and Food safety issues and events continue to make the news and focus the attention of regulators, legislators, those in the food business and consumers on the safety of the United States' food supply. In the past year, alone, outbreaks of listeria, cholera, and e. coli have hit the headlines. Nationally, concerns about the safety of food in the last decade have resulted in development of the President's food safety initiative; establishment of Hazard Analysis Critical Control Point (HACCP) regulations in seafood, meat and poultry; development of guidelines for Good Agricultural practices (GAPs) in production of fruit and vegetables; organization of the FightBAC food safety education campaign targeting consumers; and the voluntary efforts of many involved in food related industries, from farm to table, to improve food quality and safety.

In November, 1996, the Food Safety Team of the College of Agriculture and Natural Resources held its, Food Safety Outlook conference. The conference report noted that all participants along the farm to table continuum need to take responsibility for their role in keeping food safe. In addition, research and training must focus on identifying risks, methodologies for reducing the risk for foodborne illness, and adopting safe food handling practices. Educators will need to continue to address the need for providing processors, and perhaps retailers and distributors, with information on developing HACCP programs in accordance with federal regulations. Connecticut will need to address federal initiatives regarding on-farm food safety and quality programs. This will include training fruit and vegetable producers to adopt Good Agricultural Practices in response to the presence of pathogens in fresh produce. Finally, more emphasis will need to be placed on the need to educate consumers in Connecticut, a new focus for the team.

Measures of success include: numbers reached; behaviors changed, or expected change in behavior; knowledge gained; grant dollars received food safety programs developed; newsletter articles and Extension publications written; workshops, conferences and training programs; food safety and nutrition exhibits; and contacts made.

Partners include: industry (producers, processors, distributors, retailers); Connecticut Dept. of Public Health, Agriculture, Consumer Protection; commodity or industry organizations; Connecticut Farm Bureau; Northeast Land Grant Institutions, Cooperative Extension Programs; local and federal regulators USDA Food Safety and Quality competitive; and Plan of Work funding programs.

Key components of the five year plan for the Food Safety sub-team of the Food, Food Safety and Health Team will include programming in three areas: 1) On-farm - dairy, food animals, fruits and vegetables. Program focus will be on minimizing the contamination of food with pathogens found on-farm and spread via water sources, manure, rodents and other vectors, poor sanitation and farm worker hygiene. 2) Processors/retailers -

small/medium sized meat, poultry and seafood processors, specialty food processors, cider processors, restaurants, grocery stores program will focus on reducing risks for foodborne illness by developing HACCP food safety programs and other training programs addressing plant sanitation, worker hygiene, prevention of cross-contamination, temperature control, and using microbiological testing as one tool for verifying that food safety programs are effective. 3) The consumer - program focus will be on conducting needs assessments, developing a comprehensive nutrition and food safety education program for consumers administered directly to consumers and via the home and garden center to include newsletters, web sites, correspondence courses, workshops, fact sheets.

Strategies include: 1) on-farm - dairy (ongoing); food animals (ongoing and new); produce (new) - a) needs assessment activities; b) identify key players/project team; c) program development; d) workshops, manuals, conferences, farm visits, fact sheets, newsletter articles. 2) processors/retailers: meat, poultry, seafood (ongoing); cider (ongoing); specialty (new); retailers (ongoing and new). In addition, a nutrition and food safety program display board will be developed for use at exhibits, fairs, and other opportunities for information participants of food safety education, training, and research opportunities provided by the College of Agriculture and Natural Resources and the Nutrition and Health and Food Safety Teams.

Target audiences: 1) on-farm - farmers, producers, farm-workers, farm organizations and decision makers (regulators, Farm Bureau, commodity groups); 2) processors/retailers - plant managers/owners, workers, retail managers, regulators; 3) consumers - teachers, child- and elder-care providers, youth, other consumers.

Evaluation techniques include pre/post-tests, surveys, evidence of food safety plan developed and in-place (HACCP Plan, GAPs).

### Food Safety and Health

Cooperative Extension System Focus: It is expected that the lead nutrition person in the state will become an integral member of the Food and Health Team through working with 4-H and will reach a number of individuals not only within the state but outside the state. It appears that this has been lacking in the past several years and will be beneficial both in and out of the state.

Measures of success include consistency of materials being used in the state 4-H programs for nutrition. Children involved in 4-H to demonstrate knowledge of nutrition information.

This work will result in developing some information from Connecticut.

Key components of the program will be to continually review educational materials on nutrition for 4-H.

Target audiences are 4-H leaders, children participating in 4-H, and Cooperative Extension System faculty and staff.

Evaluations will be through meetings with 4-H leaders and setting up an advisory committee in the state.

### Food Safety

Focus: Collaborate in conducting HACCP workshops and collaborate in Extension activities related to food safety.

Measures of success include preparing small food processors to implement food safety.

This work will result in manuals.

Partners will be colleagues in academia and USDA.

Key components of the program include provide training to processors in areas related to HACCP such as sanitation, verification and microbial testing.

Educational methods include lectures and group interactions.

Target audiences are meat plants.

Evaluations will include surveys by the participants.

### SMALL GROUP PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

#### Food Microbiology

The food industry is the second largest employer nationwide. There are numerous employment opportunities for College students trained in the food science area, especially in the area of food safety and quality. The focus is to provide courses in food science that will prepare students for employment and/or graduate school.

Success is measured by the enrollment of students in courses that are taught and students who gain employment in the food industry.

Desirable outcomes include students increasing their knowledge of food safety and quality.

Partners will be the Departments of Molecular and Cell biology, Pathobiology, Nutritional Sciences and food industry.

At present the following food science courses are offered in the Department of Animal Science: ANSC 160, The Science of Food; ANSC 224, Food Safety; and ANSC 253W, Animal Food Products.

Dr. Venkitanarayanan is currently in the process of proposing a new Food Microbiology Course for the spring of 2000.

An important strategy is experimental learning through laboratory sessions. Laboratory opportunities that provide for experimental learning are essential for courses in the sciences and this is true for food science courses.

The target audience consists of undergraduate students studying the food sciences.

Student evaluations and peer evaluations comprise the assessment techniques for the program effort.

### Food Safety

Food safety issues and events continue to make the news and focus the attention of regulators, legislators, those in the food business and consumers on the safety of the United States' food supply. In the past year alone, outbreaks of listeria, cholera, and e. coli have hit the headlines. Nationally, concerns about the safety of food in the last decade have resulted in development of the President's food safety initiative; establishment of Hazard Analysis Critical Control Point (HACCP) regulations in seafood, meat and poultry; development of guidelines for Good Agricultural Practices (GAPs) in production of fruit and vegetables; organization of the FightBAC food safety education campaign targeting consumers; and the voluntary efforts of many involved in food related industries, from farm to table, to improve food quality and safety.

In November 1996, the Food Safety Team of the College of Agriculture and Natural Resources held its, Food Safety Outlook conference. The conference report noted that all participants along the farm to table continuum need to take responsibility for their role in keeping food safe. In addition, research and training must focus on identifying risks, methodologies for reducing the risk for foodborne illness, and adopting safe food handling practices. Educators must continue to address the need for providing processors, and perhaps retailers and distributors, with information on developing HACCP programs in accordance with federal regulations. In addition, more emphasis will need to be placed on the need to educate consumers, including youth.

Measures of success are based upon: numbers reached; behaviors changed or expected change in behavior; knowledge gained; grant dollars received; food safety programs developed; and contacts made.

Outcome products desired include: Extension publications; workshops; conferences; training programs; and curricula.

Partners of the program include: industry organizations (CT Food Association, CT Restaurant Association, CT Pomological Society); producers of home replacement meals, meat/poultry processors, cider processors; CT Departments of Public Health and Consumer Protection; and 4-H youth development staff.

Partners will be: Northeast Land Grant Institutions; Cooperative Extension Programs; USDA Food Safety and Quality; and Plan of Work funding programs.

Key components of the program are: 1. Home Replacement Meals (HMR) - Group program with New England Cooperative Extension food safety group (VT, ME, NH, MA and RI); multi-state project focusing on developing food safety education strategies and material for producers and consumers of home replacement meals such as prepared gourmet meals, salad to order, take-out meals. 2. 4-H Youth Curriculum - group program with Vermont Cooperative Extension and 4-H in Vermont and Connecticut; Connecticut and Vermont will pilot 4-H-club curriculum they have developed as part of the National 4-H juried review process, once completed, all New England states will implement the curriculum; 3. HACCP for Small Businesses (Cider, Meat and Poultry) - HACCP for meat, poultry is a group program with Cameron Faustman, Animal Science, and Lori Pivarnik, University of Rhode Island. HACCP for cider is a group program with CT, MA, VT, RI, and VA; Implementation of HACCP training programs for industry personnel will be the initial focus. Following implementation, mini-workshops will be developed that focus on food safety subject areas in need of additional attention, such as microbiological testing.

Strategies include: 1. Home Replacement Meals (HMR) - a) Assess HMR safe food handling knowledge and practice information from consumers and producers, 1999-2000; b) Develop education materials, pilot materials, 2000-2001; c) Distribute materials and evaluate program, 2001-2003. 2. 4-H Youth Curriculum - a) Pilot curriculum in Connecticut and Vermont, Fall 1999; b) Submit to National 4-H for juried review, Spring 2000; c) Edit, print and prepare for administering to New England 4-H clubs, 2000-2001. 3. HACCP for Small Businesses (Cider, Meat and Poultry) - a) Provide HACCP training programs to small and medium sized cider and meat and poultry processors, 1999-2000; b) Develop and pilot follow-up workshops for meat and poultry processors, 2000-2001.

Target audiences are: 1) Home Replacement Meals (HMR): Producers and consumers of home replacement meals. 2) 4-H Youth Curriculum: Middle school youth, 4-H leaders. 3. HACCP for Small Businesses

(Cider, Meat and Poultry): Small and medium sized meat and poultry processors, cider processors, state, local, federal regulators of these industries.

Evaluation techniques are: 1. Home Replacement Meals (HMR): First year - assessment tools, focus group documentation; second year - surveys. 2. 4-H Youth Curriculum: 4-H activity sheets, pre-and post-evaluation at training sessions. 3. HACCP for Small Businesses (Cider, Meat and Poultry): Post-course evaluation, development of HACCP plans or food safety related policies and procedures, follow up surveys.

#### Rapid Molecular Diagnostic Tests for Food-Borne Pathogens

Egg borne Salmonella enteritidis infection has emerged as a public health problem in the USA and several other countries. Besides Salmonella other important pathogens such as Campylobacter and E. coli have been implicated in food-borne illnesses. Conventional bacteriological culture methods for detecting and differentiating Salmonella required several days to diagnosis. Rapid tests such as Polymerase Chain Reaction (PCR) and DNA fingerprinting will detect and differentiate Salmonella in clinical samples in hours. Utilization of molecular tests will help in control measures in time.

Measures of success will be research results anticipated, grant dollars from national agencies, enhance knowledge for controlling the Salmonella infection.

This work will result in publications of manuscript in reviewed journals.

Partners include Pathobiology's Connecticut Veterinary Diagnostic Laboratory-service charges; Department of Agriculture, State of Connecticut, Experiment Station - funds for Secretary; Connecticut Poultry Association--funds

The key component of the project is the development of Salmonella and Campylobacter multiplex PCR (duration two year projects). The rapid molecular test will detect and differentiate simultaneously two food pathogens in contaminated poultry meat.

Strategies include using poultry meat processing plants and diagnostic laboratories.

Target audiences are poultry producers, Connecticut State Department of Health, general consumers (people).

Evaluation techniques include data on Salmonella outbreaks in Connecticut can be monitored monthly, quarterly and annually. No egg related food-borne outbreaks in humans were reported last year.

The target audiences include laboratory technicians; graduate assistantship; and research supplies.

#### Recombinant Vaccine for Infectious Bronchitis Virus

Recombinant vaccine for infectious bronchitis virus (IBV): Infectious bronchitis is an acute, highly contagious respiratory and urogenital disease of chickens. The highly transmissible nature of the disease suggests that use of a vaccine is necessary to prevent outbreaks. Both live attenuated and inactivated vaccines have been used in the vaccination and have greatly reduced the economic losses caused by IBV infections. However, the continued emergence of new variant strains of IBV poses great concerns in the control of IBV infections. Attenuated live IBV vaccines have been used for more than 50 years, despite the evidence that the vaccine is not safe and may play a significant role in the establishment of endemic IBV, especially when multiple strains of IBV live vaccines are used together. Therefore, using the traditional vaccines to control and further eradicate the disease becomes impossible. New concepts for developing novel vaccine are needed. S1 protein has been demonstrated to be the major inducer of protective immunity, although other structural proteins also play a role. The approach to develop IBV recombinant fowl pox vaccine has been taken. S1 subunit of spike protein sequence of IBV Massachusetts serotype has been cloned in the attenuated Fowlpox virus vector for possible vaccine against IBV infection.

The measure of success will be control of IBV infections and prevention of new variant strains of IBV.

This work will result in publications in reviewed journals.

Partners will be the Connecticut Poultry Association, SPAFAS, Inc.

Key components of the program include the development of Recombinant IBV vaccine (2-5 years duration). IBV recombinant vaccine will be used in commercial laying flocks to control IBV field challenges.

Strategies include regional and National meetings (over 1,000 attendees).

Target audiences are poultry producers and allied industries.

Evaluation techniques include challenge studies and egg production records and control of IBV infection in commercial flocks.

#### Multiplex PCR for Shellfish Diseases

Protozoal infections are of great concern in oyster cultivation since they cause economic losses in commercial production. The surveillance, management, and control of these diseases of the oyster require

diagnostic aids which are sensitive, rapid, cost effective, and convenient. The thesis will investigate the development of the multiplex PCR for application in the screening and surveillance of disease agents of the eastern oyster (*Crassostrea virginica*). Multiplex PCR will allow for the simultaneous testing of two or more pathogens in a single test reaction.

New England and specifically Connecticut has seen an increase in oyster production while most of the Atlantic Coast has experienced a decline during the past decades. The decline along the Atlantic Coast has been due mainly to disease, particularly, the protozoal diseases *Haplosporidium nelsoni* (MSX) and *Perkinsus marinus* (Dermo). Presently, the monitoring of oyster populations for pathogens is infrequent and no routine surveillance is performed.

This project proposes the development and optimization of a multiplex PCR approach to detect and differentiate three oyster pathogens (*Haplosporidium nelsoni*, *Haplosporidium costale* and *Perkinsus marinus*) in a single CR reaction mixture. The assay would be a comprehensive, sensitive and a rapid tool for: diagnostic testing, investigation of point sources of contamination, routine screening at seeding, and for research application.

The measure of success will be quicker diagnostic tests for help in control of shellfish diseases.

This work will result in publications, Extension publications.

Partners are the Department of Agriculture, Pathobiology and the Fish and Game Department

A key component of the program includes the development of molecular DNA based PCR test which will simultaneously detect and differentiate 3 species of parasites causing infections in shell fish - the duration is 2-5 years.

Strategies include the development of PCR tests.

Target audiences are shell fish industry in Connecticut.

Evaluation techniques will be regional and national meetings and periodic surveys of screening of shell fish infections.

#### Pathogenesis of Infectious Chicken Anemia Virus

Pathogenesis of infectious chicken anemia virus (ICAV): Chicken infectious anemia virus (ICAV) is an economically important avian pathogen with a worldwide distribution. Infectious Chicken anemia has been reported to be vertically transmitted to progeny from dams infected during egg production. The incidence of transmission is usually low and duration of only a few days early in the course of infection. In earlier experiments, evidence found persistence of infection, demonstrated by apparent viremia, as measured by a CAV-specific PCR on buffy coat samples, as late as 80 days postinfection. In order to determine the significance of these findings as related to vertical transmission SPF birds were infected with CAV- CL-1 strain in drinking water. In comparison, a screening of hatchmate of the experimental birds, incurring a natural infection with ICAV, demonstrated a low incidence of PCR positive livers early in the infection. Further studies are on the way to determine the latency and subsequent infection in birds.

The measure of success will be the control of CAV infections.

This work will result in publication of manuscripts in reviewed journals.

Partners include: SPAFAS, Inc., Pathobiology, Institute for Animal Husbandry and Veterinary Sciences in Beijing, China.

The key component of the 2-5 year-long project is the characterization of pathogenesis of CAV in chickens.

Strategies include chicken infectious studies, molecular characterization of CAV isolates and their pathogenicity.

Target audiences are academia, research fellows, allied and poultry industries.

In order to gather stakeholder input into the College Plan, contact Dr. Herbert E. Whiteley.

#### INDIVIDUAL PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

##### Food Safety Knowledge

Statement of Issue: Improve the dietary intake, money management and food safety knowledge of families with children failing to thrive.

Measures of impact of this process include: Weight gain and less hospital stays for children failing to thrive; Building immune systems and overcoming food issues for both families and the children involved.

Anticipated measures of success consist of improved nutrient intake, less food dollar waste, weight gain and less hospital stays.

Partners of the project include: EFNEP supervisors, EFNEP coordinator, CES Family and Youth Team, health care providers, parents and family.

Key components of the program description include working within the home and providing one-on-one instruction for caregivers of children failing to thrive.

Evaluation techniques consist of food recalls, weight and height charts, which are used to track the progress of individual children.

### Food Marketing Research

The structure and performance of the food system is under going rapid change from the introduction of new technologies, mergers, government reforms and globalization. There is a need for research on these changes to inform and direct stakeholders in the system including government regulators and antitrust agency staff as well as agribusiness firms, farm and consumer organizations. (See, for example, Forum on Cereal Prices, Agribusiness 15:2, Spring 1999).

Anticipated results include a more complete understanding of how firms at all stages of the food system compete horizontally, how retailer-manufacturer relations are changing, and how major shifts in horizontal and vertical competition will effect performance of the food system. Continued funding of FMPC via CSREES Special Grant Program.

Desired outcomes include published research articles, presented papers, seminars and policy advice to agencies, organizations and firms.

The resources and partners associated with this research project include: Henry Bahn (CSREES/USDA) who provides research funding via the Special Grant Program; William Putsis (London Business School – MS), collaborator on research on national brands and private label products; Aviv Nevo (UC-Berkeley) collaborator on Bertrand Oligopoly; Harry Kaiser (Cornell – MS) collaborator on analysis of advertising in the food system; and James Fishkin, FTC analysis and evaluation of mergers.

This research program has three major components: development of new theoretical models, application of these models to new scanner data sets for analysis of demand and competitive interaction, and Extension of research results through publications, and work with government and industry groups.

Clearly, the best evaluation for policy-oriented research is use and impact on policy decisions. Past impacts have been used and were highly visible.

### Agricultural Marketing and Policy

The competitiveness of food product markets at the national and international trade levels. At the international level, the focus will be on the globalization of processed food products. This information can be crucial in articulating arguments for U.S. food processors to gain greater access to foreign markets via trade negotiations. At the national and state level, the focus is on pricing and cost efficiency of industrial concentration in processed food markets. This information can prove useful in improving decision making with regard to antitrust and regulation of targeted industries.

A National Research Initiative grant from USDA and a CRIS project will be requested for the international component. The national component will be funded in part through state and the Food Marketing Policy Center. Success or impact is measured by the results from these efforts, which are of primary interest to policy makers involved in trade negotiations or regulation of and assistance to U.S. and state food industries.

The primary outcome sought is refereed journal articles.

For the international component, one faculty member within the department will be the primary collaborator. For the national component, there are two other collaborators: one professor from the University of Nebraska and another one from Rutgers university. The last component will be funded by the Food Marketing Policy Center.

The international component has an execution horizon of fiscal years 2000 to 2002, beyond which the focus will be revised. The national component seeks a permanent collaboration arrangement among the investigators.

The key research strategy is to apply empirical models developed by one of the investigators to the entire food processing subsectors, utilizing the time of the investigators as well as graduate assistants.

Target audiences include policy makers and academics.

Evaluation and assessment of the project will be derived from the numbers of publications and the quality of scientific journal where research output is published. Also, the number of invited presentations and selected papers presented at professional association meetings help to evaluate the project.

### Meat and Food Science

Research Focus: Quality and safety are critically important characteristics of food products. Specifically, the oxidative status of foods impacts sensory quality, nutritional profile, and safety. As the distances between sites

of food production/processing and marketing continue to grow, and as the U.S. food industry attempts to distribute food on an international level, the shelf-life of foods and food raw materials will also need to be extended. Therefore, applied and fundamental approaches for improving the preservation of food are needed.

It is anticipated that research focused on improving oxidative stability of foods will provide the opportunity for acquisition of grant support and subsequent publication (technical reports, abstracts, journal articles) of results from funded project investigations.

Desired outcomes include peer-reviewed publications, abstracts, and invited presentations at professional meetings.

Naturally, an important resource is funding. Grant funding is currently provided by the Department of Defense, Storrs Agricultural Experiment Station, and Industry. Other partners include colleagues in the College of Agriculture and Natural Resources, Storrs who assist with analysis and statistics; colleagues at the University of Massachusetts, and Florida A&M University who are co-PIs or subcontractees on funded grants; colleagues at Cultor Food Science Inc. in research; colleagues at the U.S. Army Natick RD&E Center who provide access to equipment not available in Storrs (MS).

The research focus is to gain a greater fundamental understanding of the interaction between lipid oxidation and protein oxidation in foods. Specifically, the interaction between aldehyde products and the meat protein, myoglobin, will be studied. This will involve characterization of aldehydes produced during the course of lipid oxidation, their relative reactivity, their influence on metmyoglobin reduction and oxymyoglobin oxidation, their ability to covalently attach to myoglobin, and development of methods to detect aldehyde:protein adducts.

Analytical methods will be used in food and in vitro. It is anticipated that liquid and gas chromatography, mass spectrometry, UV-visible spectrophotometry, circular dichroism, differential scanning calorimetry and fluorimetry will be used.

The target audience consists of the meat and food industry as well as colleagues in academia.

Publication of results in peer-reviewed journals is the benchmark by which research is evaluated.

#### Food Microbiology

Research: The microbiological quality and safety of foods have a major impact on public health. Effective methods for killing pathogenic and spoilage bacteria will greatly improve the safety and shelf-life of foods. Further, methods that can rapidly detect pathogenic bacteria in foods are critical for implementing HACCP programs in the food industry. Both applied and fundamental researches for improving the microbial safety of foods are pursued.

It is anticipated that the aforementioned research will provide the opportunity for acquisition of grant support and publication of results from funded research projects.

This work will result in peer-reviewed publications, abstracts, invited presentations at professional meetings.

Potential sources for grant funding include USDA and food industry. Other partners include colleagues in the College of Agriculture and Natural Resources, Storrs.

Specific projects are to investigate the adaptive mechanisms of Enterohemorrhagic Escherichia coli O157:H7 and Yersinia enterocolitica for survival in reservoir hosts and in foods, rapid methods for detecting Salmonella typhimurium DT 104 in foods, and methods for inactivation of pathogenic and spoilage bacteria in foods.

Analytical methods will be used in food and in vitro. PCR, gel electrophoresis, UV-visible spectrophotometry, water activity meter, HPLC, bacterial identification systems will be used.

Target audiences are the food industry, colleagues in academia and government.

Evaluation techniques will be publication of results in peer-reviewed journals.

#### Food Safety

Food safety issues and events continue to make the news and focus the attention of regulators, legislators, those in the food business and consumers on the safety of the United States' food supply. In the past year alone, outbreaks of listeria, cholera, and e. coli have hit the headlines. Nationally, concerns about the safety of food in the last decade have resulted in development of the President's food safety initiative; establishment of Hazard Analysis Critical Control Point (HACCP) regulations in seafood, meat and poultry; development of guidelines for Good Agricultural practices (GAPs) in the production of fruit and vegetables; organization of the FightBAC food safety education campaign targeting consumers; and the voluntary efforts of many involved in food related industries, from farm to table, to improve food quality and safety. Many state and local public health agencies are targeting the foodservice industry with manager certification and food handling courses. Despite these efforts, the food borne illness problem is not going away. Some speculate that this may be in part because in recent years the concentration

has been on producers, retailers and foodservice--leaving the consumers to face the food borne illness problem without the knowledge and skills they need.

The Connecticut Cooperative Extension System identified the food safety training, research and program needs for audiences from the Connecticut farm to the table of the Connecticut consumer at a 1996 Food Safety Outlook conference. Participants in the outlook conference represented academia (including Extension), the food industry, and regulatory agencies. None of these groups has taken the lead in providing food safety education--not because they do not perceive a need, but because they lack the resources to do so. A coordinated effort could make the best use of limited resources and meet food safety education needs.

Anticipated measures of success are based upon numbers reached; behaviors changed or expected change in behavior; knowledge gained; grant dollars received; food safety programs developed; and contacts made.

Outcome products desired include Extension publications, workshops, conferences and training programs.

Partners of the program include members of industry (producers, processors, distributors, retailers), local health departments, community agencies and organizations, schools, teachers and youth leaders. Also partners are certain state departments. For instance, the CT Departments of Public Health, Agriculture and Consumer Protection are also partners of the program. Other partners include Northeast Land Grant Institutions, Cooperative Extension Programs, USDA Food Safety and Quality competitive and Plan of Work funding programs, the Home and Garden Education Center, the College of Agriculture and Natural Resources and local health departments.

Key components of the program description include SAFE Harbor, the Food Safety Council for Training and Education and the Food Safety Education component of the Home And Garden Education Center. SAFE Harbor provides the implementation of a training program for volunteer food service workers who work at community events including fairs, festivals, dinners, and food booths at events. Food Safety Council for Training and Education provides the development of a council that will coordinate food safety education and training activities in Connecticut, meeting the needs for training and education from farm to table. The Food Safety Education component of the Home and Garden Education Center provides consumer education and train-the-consumer programs that promote and enhance food safety and food handler education for children and youth, older adults, high-risk groups and consumers handling food in the home.

There are strategies particular to each component of the program. The strategies for the SAFE Harbor component are to: organize regional training programs throughout state during late Fall, 1999, identify potential audiences, determine training sites, advertise program; provide training in early Spring 2000 and evaluate training programs.

The strategies for the Food Safety Council for Training and Education component are to: Identify prospective members, call first meeting, Fall, 1999; Develop mission statements, procedures and plans, 2000; Provide the annual conference, perform other activities identified as priorities, Spring 2000 and beyond.

The strategies for the Food Safety Education component of the Home And Garden Education Center are to: Identify consumer food safety education needs in Connecticut; Organize food safety education program in Home and Garden Education Center, including web site, hot line, fact sheet distribution, procedure manual, 1999-2000; Develop outreach program, provide conferences, training programs, 2000-2005.

Target audiences are also particular to each component of the program. The target audiences for the SAFE Harbor component include volunteer food service workers/food handlers at fairs, festivals, church suppers, dinners, and events. For the Food Safety Council for Training and Education, the target audience includes members that will be recruited from all along the farm-to-table continuum, producers, distributors, retailers, institutions, consumers, regulators and academia. The Food Safety Education component of the Home And Garden Education Center has an initial focus that will be on consumers, including youth, adults, caregivers and teachers.

Evaluation techniques consist of pre and post tests, documented behavior changes and follow-ups. The evaluation techniques for the SAFE Harbor component includes a pre- and post- test evaluation tool, which is included in the curriculum. In addition, a follow-up evaluation tool to document behavior changes will be developed. The Food Safety Council for Training and Education component evaluates through documentation of Council activities and evaluation of conferences or other programs. The staff of the Food Safety Education component of the Home and Garden Education Center will assess the effectiveness of the model as well as the ability of Center programs to influence consumers to adopt safe food handling behaviors with follow-up surveys and phone call records.

## ALLOCATED RESOURCES - GOAL 2

Programs listed below reflect funding from all sources including Hatch funds, Smith Lever funds, Offset, University operating, grants and special projects.

Finding resources for new program areas as well as funding ongoing programs as traditional support has vanished is critical. In some areas, current support is adequate while additional resources would facilitate moving the research and Extension agendas along at a faster rate.

Financial resources needed for the completion of the above activities include the following:

- graduate assistants
- technical support staff
- clerical support for grant and publication editing and submission
- additional EFNEP staff funded from non-EFNEP sources
- assistance in survey development and implementation
- development and maintenance of web sites
- staff to support conference planning
- staff support for the Home and Garden Education Center related to food safety
- staff support for graphic design and computer technical assistance
- support for Extension educators on financial management related to food safety budgets
- bi-lingual program staff and updated materials in both English and Spanish
- staff in EFNEP to provide education focused toward grandparents caring for young children

Additional non-staff support for programs includes:

- conference and annual symposium
- Extension and undergraduate educational material development
- newsletter development and distribution
- equipment maintenance and repair support
- renovated lab space
- yearly allocation for supplies, experimental animals
- funds to support translation of educational materials into Spanish
- space for the Family Nutrition Program
- renovation of the lipids lab
- ADA Program fees
- purchase of updated software
- more portable equipment for EFNEP presentations
- staff training for EFNEP in the areas of poverty issues, specialized health issues related to diet, training in motivating and counseling clients
- support for design, production, and marketing of EFNEP materials
- funds to support in-state and out-of-state travel needs
- computer software for nutrition education
- curriculum for EFNEP focused on low literacy

Funds Spent in Support of Goal 2

	1999	2000	2001	2002	2003	2004
Total from all Sources	262,990	262,990	262,990	262,990	262,990	262,990

GOAL 3: A healthy, well-nourished population. Through research and education on nutrition and development of more nutritious foods, enable people to make health promoting choices. (1862 Research, 1862 Extension)

COLLEGE PROGRAM TEAM PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

## FOOD, FOOD SAFETY AND HEALTH TEAM

### Pediatric Nutrition and Physical Activity

Research Focus: Pediatric obesity is a growing problem. The objectives for the Healthy People 2000 has made this a major public health initiative. This program area focuses on the design and implementation of appropriate weight management protocols for young children that integrate diet and physical activity.

Measures of success will be published research results in a number of peer-reviewed journals. To date approximately \$125,000 have been awarded for this work. Studies in healthy children are underway and submission of extramural proposals to extend this work are planned.

To date, outcome products have included peer reviewed articles, a number of interviews – both radio and in press- and Extension presentations. The eventual production of Extension education materials is desired.

Internal partners at the University of Connecticut include: Drs. Perez-Escamilla and Maria-Luz Fernandez. External partners include: Drs. Patty Freedson, Professor of Exercise Sciences at the University of Massachusetts, Amherst (Dr. Freedson is an internationally known expert in the area of pediatric physical activity assessment and program design); Dr. Cara Ebeling, Postdoctoral Fellow in Behavioral Medicine at University of Massachusetts Medical Center, Worcester, MA; Dr. Dan Cooper, Attending Physician and NIH supported researcher in the area of exercise and exercise endocrinology in children and adolescents. Professor, University of California, Irvine, CA; Dr. Elizabeth Estrada, Pediatric Endocrinologist at Connecticut Children's Medical Center, Hartford, CT.

Implementation of walking and resistance exercise training in young children and determining the effects of these activities on body weight, body composition, protein utilization, and energy and nutrient needs in this population.

Strategies include: Recruiting participants through flyers, newspaper advertisements and educational opportunities at local YMCAs. To date, subject participation (children and parents) has been 25 children for the obesity project, 13 children for walking program (healthy kids) and 16 children for resistance exercise program (healthy kids). Data from these programs has been used in lecture/presentations at major meetings and Extension-sponsored programs (Double-Dutch).

Target audiences include health educators, nutrition educators, nurses, pediatricians, and teachers of young children and adolescents.

Currently, there are no evaluation techniques in place for follow-up with study participants.

### Family Nutrition Program – Food Security

Cooperative Extension Focus: The State of Connecticut's report on food security, and recent reports from the Connecticut Anti-Hunger Coalition, indicate that the demand for emergency food assistance in Connecticut is increasing and changing along with changes in food assistance programs and welfare reform. It is projected that the demand on the private sector will continue to increase. Local food programs turn to Connecticut's food banks, whose membership includes over 600 food pantries, soup kitchens and emergency shelters. At the same time, food banks are faced with decreases in donations, uneven product inventory, and demands to meet needs of people transitioning from welfare to work. This creates a need for more networking and developing of relationships to meet these needs more effectively and efficiently. The role of food and nutrition education, both for the clients as well as the staff/volunteers, can help improve the quality and performance of the emergency food system, and possibly increase self-sufficiency of participants.

Measures of success will be improvements in nutritional quality of meals served/food bags distributed, improvements in diets and food behaviors of participants and improvements in safe food handling practices.

Outcome products will include: Extension publications, cookbooks, newspaper articles, presentations at professional meetings, collaborations formed and developed.

Partners will be: USDA Food and Nutrition Service/Food Stamp Program; UConn Department of Nutritional Sciences; Connecticut State Department of Social Services; Connecticut Food Bank; Foodshare of Greater Hartford; End Hunger Connecticut! Inc.; The Connecticut Association for Human Services; EFNEP; The Hartford Food System; 4-H Farm Resource Center; local food pantries, soup kitchens and shelters; Connecticut State Department of Public Health; Connecticut State Department of Agriculture.

The CT Family Nutrition Program/Food Security Component, will continue to work with the Connecticut Food Bank, Foodshare and their member agencies by providing educational materials, technical assistance, and workshops for staff, volunteers and participants at emergency food sites on food safety, food handling and preparation, food choices, nutrition and health, and feeding children. When possible, local agencies will be invited to work together on projects of mutual interest and concern.

Educational methods include one-on-one interventions with staff and clients, small group discussions and workshops, audio-visuals, hands-on activities, development of educational materials (cookbooks, flyers, fact sheets, recipes) and presentations at conferences, both in state and at professional meetings.

Target audiences are staff, volunteers of emergency food sites (food banks, food pantries, soup kitchens, homeless shelters), participants/clients/customers of emergency food sites.

Evaluation techniques are: quantitative - (participation numbers), qualitative - changes in knowledge, behaviors when appropriate to evaluate, process evaluation - advisory group provides feedback and input.

#### Food, Food Safety and Health/Family and Community Development

These activities coordinate with the Food, Food Safety, and Health as well as the Family and Community Development Teams. Particular joint efforts are the: development and maintenance of a web site; production of consumer materials; the initiation of a statewide conference on iron-deficiency anemia; collaboration on grant submissions; testing of food safety materials for young children.

#### Nutrition

Cooperative Extension System Focus: Too many Americans today are seriously overweight and out of shape. After smoking, weight related conditions are the second leading cause of death in the U.S., resulting in about 300,000 lives lost each year. According to recent federal statistics: nearly two Americans in five, men and women will eventually die of heart disease; childhood obesity has increased dramatically in the past two decades with 21% of all 12 to 19 year olds - one in five teenagers who are now overweight; health care costs related to and unhealthy weight and sedentary lifestyle are now at over \$100 billion a year.

Based on a 1997 National survey conducted by Parade Magazine, the majority of Americans (66%) say they would prefer to change their diets to treat a health problem, rather than to take medication. This Extension project would focus on the delivery of nutrition and health messages provided to the public that would foster positive diet and exercise behavior change. Information will be developed and provided on fat and cholesterol, antioxidants, weight control, physical fitness, and wise use of supplements based upon current research and recommendations in the field of nutrition. Numerous agency groups and consumers interested in nutrition already contact Extension for information and advice. This project would enhance current outreach efforts by development of newer materials and broadening audiences.

Measures of success include positive dietary changes as measured by 24 recalls or food frequency data from program participants; Behavior change in food shopping practices of program participants; Grant support for additional programming in health promotion and wellness; Greater collaboration with other agencies such as Dept. of Public Health, UConn Health Center.

This work will result in nutrition fact sheets on current nutrition topics; Extension articles for newsletters on health/wellness; Nutrition and health column for Home and Garden Center newsletter; Sponsor conference on nutrition topics of interest to consumer groups; Marketing of telephone resource within Extension for consumer nutrition and food safety calls; and nutritionists for workshop trainings.

Partners will include: Extension Outreach Committee, Office of Communication and Information Technology, Department of Public Health, Peer Reviewers - possibly from other CES states, UConn Health Center.

Agencies and consumers look to Cooperative Extension to provide current and reliable information on food preparation, food preservation, and nutrition to promote health and safety. As part of the mission of the land grant University, Extension translates nutrition research to the public in a way that is understandable and useful in their daily lives. Promoting positive nutrition and health behaviors such as controlling fat and sodium intakes, increasing consumption of fruits and vegetables, and weight control and exercise continue to be popular topics requested by consumers and agencies. This outreach effort will provide nutrition information via workshops, educational materials and telephone to agencies and consumers requesting the information. Low-income minority groups and individuals and groups at-risk for development of nutrition-related morbidity will be targeted for education.

Methods to be used are workshop series on fat/cholesterol, label reading, sodium restriction, weight control and fitness, safe use of supplements, antioxidants etc. to groups; telephone and materials requested- log number of

requests from the public and agencies monthly and yearly (use this info. for program planning); Development of nutrition fact sheets in English and Spanish.

Target audiences include interested consumers and agency groups in Hartford County. Targeted groups will include low-income minority audiences, groups at-risk for chronic disease (heart disease, diabetes, cancer etc.). Focus can include ages across the life span from youth to elderly.

Evaluation Techniques will include peer review of nutrition materials from other Extension states, Agencies. Pre and post tests of workshop series six month follow-up for participants of workshop trainings.

#### EFNEP/FNP Advisor

Focus: Family Nutrition Program provides a nutrition education program to soup kitchens, pantries and anyone else who receives food from the Connecticut Food Bank. Emergency feeding program often rely on donated and salvaged food to meet the needs of the hungry.

Measures of success will be staff of these establishments trained to: a) determine whether food is safe to eat; b) identify the four general types of microorganisms, which cause food borne illness; and c) types of food borne illness and food poisoning that could result from contaminated of food.

This work will result in newspaper articles, press release, videotapes or cable TV to make the donors and recipients aware of health related issues with donated food.

Partners will be the Connecticut Food Bank and the food programs that use it. UConn CANR Department of Nutritional Sciences, Cooperative Extension System.

The project is the UConn Family Nutrition Program.

The methods used are the Connecticut Food Bank and the food programs that use it.

The target audience is the Connecticut Food Bank and the food programs that use it - clients of emergency food programs. People who donate food to food bank/pantry program.

Evaluations will be food drives by a designated group and product. Compare quality of donated food before and after media awareness.

#### Food Safety and Health

Cooperative Extension System Focus: It is expected that the lead nutrition person in the state will become an integral member of the Food and Health Team through working with 4-H and will reach a number of individuals not only within the state but outside the state. It appears that this has been lacking in the past several years and will be beneficial both in and out of the state.

Measures of success include consistency of materials being used in the state 4-H programs for nutrition. Children involved in 4-H to demonstrate knowledge of nutrition information.

This work will result in developing some information from Connecticut.

Key components of the program will be to continually review educational materials on nutrition for 4-H.

Target audiences are 4-H leaders, children participating in 4-H, and Cooperative Extension System faculty and staff.

Evaluations will be through meetings with 4-H leaders and setting up an advisory committee in the state.

#### SMALL GROUP PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

#### Expanded Food and Nutrition Education Program

Cooperative Extension System Focus: Influencing food choice and increasing nutrition knowledge among the Hispanic Community. According to the National Hispanic Health Symposium, "Building a Healthy Nation," convened by DHHS from September 11-13, 1997, found on the web site of the National Coalition of Hispanic Health and Human Services Organization (COSSMHO) <http://www.cossmho.org>, in the year 2000, Hispanics will represent the largest racial or ethnic minority group in the nation. Today, more than one of every ten customers of the U.S. Department of Health and Human Services (DHHS) are Hispanic. COSSMHO Cross-Cutting Recommendations: outreach to Schools K-12 within Hispanic communities to encourage interest in health and behavioral health professions; involve community members in development of Spanish language and materials developed for the Hispanic community from "Una Vida Mejor" ways to increase Hispanic Involvement; have Spanish-language publications on exhibits in County Extension Office; and distribute Bilingual publications through elementary schools, etc.

Measures of success will be: to increase of Hispanic involvement in nutrition education outreach; knowledge and skill training, as measure by post program evaluation and outcome products and materials created by participants (volunteers); and improve dietary intake, food safety knowledge, skills and behavior.

This work will result in: bilingual articles for Newsletters of Family Resource Centers; translation to Spanish of important fact sheets; arrange of visual materials to enhance youth curricula in Spanish and English (with the help of Hispanic participants); bilingual recipe booklets from participants of diverse Hispanic population (Puerto Rican, Cuban, Peruvian, Colombian, etc.); and exhibits.

Partners include: the Office of Communications and Information Technology, Nutrition Youth Curriculum; Linda Drake, EFNEP Coordinator; Family Resource Centers (HTFD), 4-H youth Clubs (1) Mary Hooker Child Age Day Care and 2) Japanamaniacs).

Program content of Expanded Food and Nutrition Education series of Bilingual lessons. Subject matter can include: Food Guide Pyramid, Healthy snacking, Child Nutrition, etc. Participants' recipes and willingness to create, enhance and translate curriculum activities. Parents teaching children, youth teaching youth.

Strategies include creating an array of visual and written bilingual materials to enhance EFNEP, 5 a Day, Team Nutrition and other youth curriculums (lower level). After a series of four or five sessions of EFNEP, participants of Family Resource Center, Family Life Ed. and 4-H clubs will work on chosen project. They are tested on pilot material activities with childcare or with children from Maria Sanchez School Bilingual and Monolingual K-1st grades. Seven activity projects and four recipe booklet per year (bilingual) will be created.

Target audiences are the Hispanic Community in Hartford inner city youth - Pre-K to 1st grade.

Evaluations are measured by numbers of project reviewed and reproduced. Follow-up evaluations of knowledge and behavior changes reported by Maria Sanchez School K-1st grade teacher's team and adult participants.

### Agricultural Marketing and Policy

Focus: The competitiveness of food product markets at the national and international trade levels. At the international level, the focus will be on the globalization of processed food products. This information can be crucial in articulating arguments for U.S. food processors to gain greater access to foreign markets via trade negotiations. At the national and state level, the focus is on pricing and cost efficiency of industrial concentration in processed food markets. This information can prove useful in improving decision making with regard to antitrust and regulation of targeted industries.

Measures of success are based upon grant dollars received. A National Research Initiative grant from USDA and a CRIS project will be requested for the international component. The national component will be funded in part through state and the Food Marketing Policy Center. Results from these efforts are of primary interest to policy makers involved in trade negotiations or regulation of and assistance to U.S. and state food industries.

The primary outcome sought is refereed journal articles.

Partners of the program include three faculty members. For the international component, one faculty member within the department will be the primary collaborator. For the national component, there are two other collaborators: one professor from the University of Nebraska and another one from Rutgers university. The last component will be funded by the Food Marketing Policy Center.

The international component has an execution horizon of fiscal years 2000 to 2002, beyond which the focus will be revised. The national component seeks a permanent collaboration arrangement among the investigators.

The key research strategy is to apply empirical models developed by one of the investigators to the entire food processing subsectors, utilizing the time of the investigators as well as graduate assistants.

Target audiences for the program effort are policy makers and academics.

Evaluation is based upon the numbers of publications and the quality of scientific journal where research output is published. Also, the number of invited presentation and selected papers presented at professional association meetings.

### Preschool Children at Nutritional Risk in Connecticut

Iron-deficiency is the most widely documented micronutrient deficiency among preschoolers in the United States. In Hartford, 33% of 18-36 month-old children are anemic by Center for Disease Control criteria and 44% by CT WIC criteria. The prevalence of iron-deficiency without anemia is unknown. Prevalence for the same age group in suburban area surrounding Hartford is estimated at 2 cases for every 100 children. As iron-deficiency is linked to permanent impaired intellectual function, fatigue, malaise, reduction in gains in body weight and length, and reduced immune function, the long term impacts on learning potential are significant. Although all pediatric primary care centers screen for anemia and the Women, Infant's, and Children's program provides food vouchers for iron-rich foods, the current prevalence of anemia appears resistant to further reduction. Developing a community-wide education and health-care research and intervention program has been proposed to alleviate this problem.

Measures of success include reduction in prevalence of anemia, increase in diagnosis and treatment plan in charts, referral to WIC and Family Nutrition Program educational programs (Monitored by BI-annual chart reviews and state surveillance data.). Increase in caretaker compliance of prescription, increase in child's food pattern (decrease in long-term bottle-feeding, increase in heme iron source in diet, and increase in iron-fortified cereals), and reduction in pathogen load of child. In addition, the continuation of funding at greater than \$150,000 per year (50% USDA Food Stamps funds and 50% from other grant sources) would also serve as a measure of success.

Outcome products desired include various materials as well as peer reviewed publications. It is expected a minimum of two peer-reviewed publications per year and one technical report per year will be submitted. Furthermore, the following will be developed: an exhibit for loan, a web site for consumer information, a social marketing campaign and new culturally sensitive support materials.

All collaborators provide dedicated staff time. Those that are matchable on Food Stamp Funds are listed with the percent of time matched. Internal partners from the University of Connecticut in Storrs are: Department of Nutritional Sciences (R. Pérez-Escamilla, S. Beeman, L. Drake); Department of Anthropology (Faculty - P. Erickson, N. Diaz. Doctoral student); School of Family Studies - Child, Health, and Culture Program (Dean C. Super, Faculty Members - S. Harkness and J. Goldman. External partners are: The University of Connecticut Medical Center, School of Medicine - P. Joyce (10% time), B. Gould and V. McCain (5% time). Weicker General Clinical Research Center (Grant for \$8,500 to complete pilot analyses); Connecticut Children's Medical Center, Hartford, CT. H. Slivka (10% time), supportive services from Georgine Burke, Dept. of Research; St. Francis/Mt. Sinai Hospitals, Hartford, CT (C. Orkin, B. Bernstein, C. Lord); Aetna Child Health Data Center (G. Burke, A. Bingham); Pennsylvania State University, Department of Nutrition (MS) (F. Rosales - a cute phase reactant analyses, J. Beard - program review); Connecticut Association for Human Services (A. Sampson); Hispanic Health Council, PANA and Breastfeeding peer counseling program (A. Gonzales, G. Damio); Hartford Public Schools - UConn/HPS partnership grant - \$9,000; Institute for Community Research. J. Schensul.

Key components of the program include: assess the prevalence of iron-deficiency anemia and iron-deficiency and related co-morbidities in low-income children in Hartford, CT; decrease the prevalence of iron-deficiency anemia in this same population; increase the identification of iron-deficiency anemia; describe the available public health, community, and clinical information services, as well as the system for management and follow-up for the treatment of anemia; describe client perceived problems with compliance with dietary prevention and intervention and supplementation; describe culturally specific impediments to care, compliance, and dietary intervention; develop a simplified monitoring system to allow for yearly assessment; coordinate the comparison and reporting of data with those available from the CT State Department of Public Health and the Hartford Public Health Department; evaluate and develop appropriate educational materials for use with targeted audiences; develop a handbook for the care of iron-deficiency anemia for health care professionals and caregivers; work with the Food Stamp Infant-Toddler PANA and Salud programs to incorporate messages for this problem into the overall mass media campaign.

Strategies include: randomized retrospective chart review to document prevalence; key-informant interviewing and focus groups of providers and caretakers. Intervention: provider marketing campaign; social marketing campaign to caretakers; community Awareness campaign to decision-makers; outreach program through community health care providers.

The targeted audiences for the program effort include low-income families with preschool children and their health-care providers. In addition, pre-school educators will also be a part of the target audience.

Evaluations will be reviewed by: 1) overall - changes in prevalence of anemia and iron-deficiency (chart review that monitors level), diagnosis, treatment and follow-up; 2) educational program effectiveness - randomized intervention trial; 3) outcomes - incorporation of foods in diet that contain available iron or enhance iron absorption, changes in weaning practices (use of cup rather than bottle), compliance with supplementation, compliance with laboratory testing, reduction in pathogen load on child, improved hand-washing techniques. reduce occurrence of illness and reduced occurrence of anemia.

### Community Nutrition

For the next five years Connecticut Family Nutrition Program for Infants, Toddlers, and Children (FNP-IT) will continue to be directed. This program falls under the umbrella of the University of Connecticut family nutrition program.

It has been previously documented that low-income Latino children and their families living in Hartford are at risk of poor health and nutrition outcomes including an under consumption of a variety of fresh fruits and vegetables (a,b). Subsequently, focus groups (c) and a baseline survey (d) documented that Latino caretakers lack essential nutrition knowledge (e), such as in the area of folic acid and neural tube defects (f), that could facilitate

positive dietary behavioral changes. These data justified the need for developing a bilingual nutrition education program with the ultimate goal of facilitating positive dietary changes in this disadvantaged community. Since its inception in 1995, the Connecticut Family Nutrition Program for Infants, Toddlers, and Children (FNP-IT) was designed to: a) conduct quantitative and qualitative needs assessments to understand the food and nutrition needs and wants of low-income Latino children and their families in Hartford, b) develop, implement, and deliver culturally appropriate nutrition education services, c) improve dietary behaviors, and d) conduct process and impact evaluations to understand the cost-effectiveness of program activities. PANA is a bilingual nutrition education program that delivers face-to-face bilingual nutrition education through puppet shows and other activities to children and caretakers at schools, health fairs, and/or community agencies. PANA's nutrition puppet shows have been delivered mostly through public elementary schools to almost 10,000 children in Hartford, Bridgeport, and Stamford. ¡SALUD! is a nutrition marketing campaign targeting Latino caretakers and their children that features Latino TV celebrities and professional models "toasting" with fresh fruits or vegetables on street billboards, bus signs, bus stop shelter posters, and newspaper/magazine ads. Public Service Announcements are also delivered through radio and television. The design of the ¡SALUD! social marketing campaign centers around the concept of 'toasting' for life following sound dietary habits. This campaign was designed by a local professional marketing firm and delivered through multiple media channels. FNP-IT took into account valuable input from those whom the message was intended to reach and did not merely rely on what the campaign managers may have considered to be the most appropriate message. Dissemination of results from FNP-IT's research and evaluation findings have increased the awareness about the immense nutrition needs among low income groups. In fact, some studies and results have been widely covered by the mass media (radio, television, newspapers) and used to address legislative issues. The quality of services and products is reflected by the fact that FNP-IT's radio Public Service Announcements produced by a professional Hartford-based marketing firm, received two prestigious national awards. Also, FNP-IT has been featured by the United Nations, the American Anthropological Association, and the Society for Nutrition Education as an example of how academic institutions and community agencies can partner to improve the nutrition and health of disadvantaged communities.

Measures of success are based upon changes in knowledge and behavior of the program participants. For the next 5 years FNP-IT is projecting to provide nutrition education to a minimum of 10,000 children at school and 50,000 caretakers per year by continuing with its two main nutrition education activities: the PANA Program and the (SALUD! Campaign. These projections are based on FNP-IT's experience during the last five fiscal years. A recent evaluation of the ¡SALUD! campaign showed that 77% of the target audience in Hartford had been exposed to this effort. In addition, the vast majority of those exposed found it useful and easy to understand. A conservative estimate indicates that at least 50,000 target individuals have been reached at a cost of only \$1.60 per recipient. That study also showed that relative to the baseline, more women are now aware of the relationship between folic acid and neural tube defects and are able to identify foods rich in this water soluble vitamin. By the end of this fiscal year, PANA will have reached over 10,000 children just with the puppet show delivered at schools. Teacher evaluations and videos indicate that children reacted positively to the show, which elicits a high degree of participation. In addition to the PANA Program and the (SALUD! Campaign, during the next 5 years FNP-IT will provide food safety education and will actively promote optimal infant feeding practices, including breast-feeding promotion in partnership with the Hispanic health Council breast-feeding peer counselors program named 'Lactancia, Herencia y Orgullo/Breast-feeding, Heritage, and Pride' directed by Grace Damio.

Outcome products desired include education materials, a radio and television public service announcement. During the next 5 years FNP-IT projects the annual development and release of at least: a) 3 innovative nutrition education materials, b) one radio Public Service Announcement (PSA), c) one TV PSA, d) three printed mass media PSAs, e) one puppet show. These projections are made based on FNP-IT's experience during the last five fiscal years. Based on the quantitative and qualitative needs assessments, FNP-IT has developed: a) the bilingual nutrition education PANA program (Programa para Aprender Nutrición y Alimentación), the ¡SALUD! campaign, and nutrition education materials such as the Puerto Rican Food Guide Pyramid and a nutrition jeopardy game, a color-coded bilingual food label, and a low-fat vegetable cookbook. PANA is a bilingual nutrition education program that delivers face-to-face bilingual nutrition education through puppet shows and other activities to children and caretakers at schools, health fairs, and/or community agencies. PANA's nutrition puppet shows have been delivered mostly through public elementary schools to almost 10,000 children in Hartford, Bridgeport, and Stamford. ¡SALUD! is a nutrition marketing campaign targeting Latino caretakers and their children that features Latino TV celebrities and professional models "toasting" with fresh fruits or vegetables on street billboards, bus signs, bus stop shelter posters, and newspaper/magazine ads. Public Service Announcements are also delivered through radio and television. The design of the ¡SALUD! social marketing campaign centers around the concept of 'toasting' for life following sound dietary habits. This campaign was designed by a local professional marketing firm

and delivered through multiple media channels. FNP-IT took into account valuable input from those whom the message was intended to reach and did not merely rely on what the campaign managers may have considered to be the most appropriate message. A key feature of FNP-IT is its emphasis on research based program development. Thus far, UConn graduate students have based their masters theses on developing a bilingual Food Label (9), understanding the determinants of pediatric obesity (10) and, how to promote breastfeeding (11) in this population. Plans are underway to measure the impact of the PANA puppet show directly on the nutrition knowledge, attitudes, and behavior of children. Numerous undergraduate students have also been involved assisting with FNP-IT's research and evaluation efforts.

Other desired outcome products include presentations and publications. FNP-IT has delivered a total of 37 presentations at national and international scientific meetings. Three FNP-IT papers have been published in peer reviewed journals, 3 are in press and 3 have been submitted for publication. The program has been featured in over 20 newsletter / newspaper articles. During the next five years FNP-IT plans to publish at least 3 peer reviewed articles per year and to present research findings in two national and one international conference per year.

Partners of the program are between UConn's College of Agriculture and Natural Resources (Department of Nutritional Sciences and the Cooperative Extension System), and the Hispanic Health Council, Inc. in collaboration with the Connecticut Ballet, schools (Hartford, Bridgeport, Stamford), hospitals (Hartford Hospital, Connecticut Children's Medical Center), clinics, other community agencies, and the Department of Social Services. The same partnerships are expected to continue during the next 5 fiscal years.

The mission of FNP-IT is to provide nutrition education to food stamp recipient children and their caretakers. Since its inception in 1995, this initiative has been developed as a community participatory program based on sound multidisciplinary research and evaluation approaches. FNP-IT has now become a major source of nutrition education for food stamp recipients in Connecticut through its bilingual PANA program and the nutrition campaign ¡SALUD!. This past fiscal year, ¡SALUD! reached over 50,000 target individuals in and around Hartford. By the end of this fiscal year, PANA's puppet shows will have reached over 10,000 preschool-6th grade children in Hartford, Stamford and Bridgeport. Evaluation studies indicate that FNP-IT's coverage and level of audience satisfaction are high. FNP-IT represents a partnership between UConn's College of Agriculture and Natural Resources and the Hispanic Health Council, Inc. in Hartford in collaboration with the Connecticut Ballet, area schools, hospitals, clinics, and other community agencies. The same basic objectives are in place for the next 5 fiscal years.

For the next 5 fiscal years the target audiences and/or consumers will continue to be low-income Latino caretakers and children attending public elementary schools in urban areas in Connecticut.

As during the past 5 fiscal years (see below) FNP-IT will continue to be delivered during the next 5 fiscal years based on sound research, and formative, process, and outcome evaluation approaches.

Evaluation techniques consist of formative/process and outcome evaluations. The formative/process evaluation has two sections, qualitative and quantitative. Qualitatively, eight focus groups have been conducted to understand the nutrition education needs and desires of the target community. These focus groups have provided invaluable input for the design and evaluations of FNP-IT materials such as the Puerto Rican Food Guide Pyramid and the bilingual Food Label. Staff development is a key component of FNP-IT strategy. Staff provide constant input on the decision making process through monthly meetings. Every PANA presentation is evaluated by at least one observer from the school or agency. In the case of the school, it is usually the teacher.

Quantitatively, a program monitoring system is in full operation to track all program activities including place, date, location, and audience size of each presentation or activity (e.g., health fair). Costs are being closely monitored to be able to document the cost-effectiveness of FNP-IT.

The outcome evaluation consists of a baseline study on nutrition knowledge, attitudes, and behaviors of Latino caretakers and their children was conducted between January 1 and September 30, 1997. The criteria for selecting the neighborhoods was that, based on census data, at least half of its residents identified themselves as Latino. Sample size estimations indicated that 500 respondents were needed to obtain a representative assessment of the nutrition knowledge, attitudes and practices of the population living in these neighborhoods. A needs assessment conducted in 1995-96 examined the dietary intake, anthropometry, food security, and iron status of 248 Latino preschoolers and their caretakers. These two assessments were done prior to the launching of FNP-IT. Follow-up surveys have begun to be conducted. By comparing the situation before with that after the launching of FNP-IT the potential impacts and cost-effectiveness of this program will be better understood.

#### Expanded Food and Nutrition Education Program (EFNEP)

Cooperative Extension System Focus: Connecticut has the highest per capita income in the nation, but that statistic does not reveal the high poverty levels in many areas of the state. Hartford, the state capital, is the eighth

poorest moderate-sized city in the US Today approximately 45% of Hartford children live in poverty. Hartford residents are confronted with a slew of health and social problems, including poor nutrition. Welfare Reform Impact Study Executive Summary - Show That 56% of their clients found it harder to buy food than six months ago! An overwhelming number of interviewees indicated that every month they ran out of food before the end of the month. EFNEP works with families and youth who are living in poverty and facing barriers to balanced nutrition which include limited resources to buy food, poor access to supermarkets, limited food preparation and storage facilities.

Measures of success include: improvements in dietary intake; food resource management and food safety knowledge skills and behavior; and documented by ERS computerized data system.

This work will result in: clients' recipes booklet (with healthy changes); newspaper articles for community (such as El Extra and Advocate); and lesson plans (revised, updated, and bilingual side-by-side)

Partners include the Cooperative Extension System Family and Youth Team, Family Place Libraries, Public Schools Family Resource Centers, Family Center for Affirmation, and the New Britain Hispanic Counseling Center.

Program content is determined by specific needs of each EFNEP audience, based on assessment data collected upon enrollment in EFNEP and by discussions with agency and community leaders.

Subject matter can include; Child Nutrition, Diet and Health risk reduction, shopping for better nutrition and economy, Food Guide Pyramid and dietary Guidelines, etc.

Educational methods include lessons that will be taught in Spanish and English. With individual, in small or large groups, discussions and demonstrations, hands-on workshop, video/audio-visual presentations and educational experiences all designed to engage the learners. In some cases integrate parents and children for more effective behavior changes. Projected number of attendees is of approximate 150 youth and 75 adults a year.

The target audience for the program effort includes inner cities individuals, families and youth who are living in poverty or low income and facing barriers to balanced nutrition. Also included in the target audience are clients who are at health risk because of drug, alcohol or emotional problems, in which nutrition plays an important factor.

Informal evaluations with participants are used to assess if learning occurred, looking for changes in food and nutrition practices that indicate improvement. EFNEP will document socio-economic data, participation levels, dietary intake and food behaviors. ERS 24-hour food recall taken before and after educational intervention are used to measure dietary changes. Lastly, individual success stories will be documented.

### Expanded Food and Nutrition Program (EFNEP)

Cooperative Extension System Focus: Connecticut has the one of the highest per capita incomes in the nation, but that statistic does not reveal high poverty levels seen in many areas of the state. The disparity between the rich and poor in Connecticut can be seen in 1996 income per capita data, where the highest income is in New Canaan at \$91,777, compared to the average per capita income in Hartford at \$17,274. Other town with incomes around \$21,000 include Bridgeport, Killingly, New Haven, New London, Plainfield, Stafford and Windham. EFNEP works with families and youth in these areas who are living in poverty and facing barriers to balanced nutrition: limited resources to buy food, poor access to supermarkets and farm markets, high costs of housing and energy, limited skills and facilities in food handling and preparation, cuts in benefits, low-paying jobs, lack of affordable and good quality child care, limited transportation and few opportunities to escape from poverty. Welfare reform does not allow heads of households to develop skills and potential to increase earnings before taking away essential financial benefits. Often, the food budget is short-changed when other needs must be met first. Poor nutrition can lead to higher rates of infant mortality, low birth-weight infants, learning disabilities, school absenteeism, compromised immunity, chronic diseases and hunger.

Measures of success include improvements in food handling behaviors and food choices as well as increases in knowledge and skills related to food and nutrition. Cost effectiveness is also a measure of success.

Outcome products desired are Extension publications, exhibits and newspaper articles.

Partners of the program include: EFNEP staff, CES educators, CANR faculty and support staff with specific expertise; State Department of Health (WIC, Adolescent and Preventive Health, Environmental Health); State Department of Education (Child Nutrition Programs; State Department of Social Services (Food Stamps, Family Nutrition Program); State Department of Agriculture; End Hunger Connecticut! Inc., The Hartford Food System; CT Pathways from Poverty Team; 4-H Farm; Foodshare and the Connecticut Food Bank and member agencies. Each EFNEP staff person also has networks within the scope of their work at the local level.

EFNEP has been providing food and nutrition education to low income families and youth since 1969. It is hoped that the program will continue as long as it is needed. EFNEP Units currently work in Hartford, out of the West Hartford Extension Center; New Haven, out of the North Haven Extension Center; and in Eastern

Connecticut out of the Brooklyn Extension Center. Exact program content is determined by specific needs of each EFNEP audience, based on assessment data and by discussions with agency or community leaders and clientele. Subject matter can include nutrition during pregnancy, nutrition and teen mothers, infant feeding, feeding young children, the Food Guide Pyramid and Dietary Guidelines, shopping skills, reading food labels, diet and disease risk reduction, food safety and food preparation.

Educational methods include one-on-one educational programs, small group discussion and workshops, audio-visuals when appropriate, and hands on activities as much as possible. Educational programs are conducted as a series, and adult participants "graduate" upon completion of a specified number of lessons and documented behavior change. During this next program planning cycle, youth evaluations will be conducted as well to document impact with youth. Revision of Child Nutrition Home Study Course for Day Care Providers and parents.

The target audiences are primarily homemakers/heads of household of families with young children, pregnant women, and youth from limited resource communities.

Evaluation techniques include the use of informal evaluations and surveys. EFNEP documents socio-economic data, participation levels, dietary intake and food behaviors. Staff also conduct informal evaluations with participants. Instruments and methods include the EFNEP Survey (food behavior checklist), 24-hour food recalls, knowledge and skills assessments, and feedback from participants. EFNEP data is collected and entered into a computerized reporting system which can generate reports at several levels. These reports can be used to monitor progress of individuals and groups, summarize impacts and document performance of EFNEP staff.

### EFNEP

Cooperative Extension System Focus: EFNEP is designed to improve the nutrition and food behaviors of low-income families with young children, and youth, EFNEP staff provide food and nutrition education in a variety of settings and assist clients in obtaining needed services by a well-established, community based network.

Measures of success include a change in knowledge and/or behavior with the use of EFNEP 24-hour dietary recall as a tool of assessment along with practicing the information gained from the EFNEP program.

An important desired outcome would be a newspaper article that focuses on the program effort.

Internal partners that provide program development and support include: CES, educators, specialists, EFNEP, NUSC, and 4-H. External partners include: Salvation Army, State Department of Social Services, agencies and organizations serving EFNEP clientele; private non-profit groups, and Crossroads.

Presently a relationship with a project titled "Cooking Good In New Haven" is being developed. The focus is on teaching the participants the value of knowing nutrient contents of foods when working in the food industry. Participants will learn the importance of following the Food Guide Pyramid when making food selections and incorporating the dietary guidelines into their work and personal family life. The EFNEP participants will be better prepared for jobs that will be acquired upon completion of the program. "Cooking Good" is a job training and placement project that assists the welfare- to -work audiences who have an interest in working in the food industry. Their job placement is generally specific to cafeterias, restaurants and various types of kitchens. Also, when the participants complete the EFNEP program successfully, they often receive a certificate that they utilize as part of their resume which has helped them acquire the job; many participants have limited job skills.

The partnership will continue with Crossroads, a halfway house designed to assist men and women who were formerly incarcerated and are recovering from substance abuse. This program houses women with children and men. Some individuals within this audience are also seeking employment while regaining their independence. A positive relationship with food selections and menu planning will be continued. Participants will be taught to recognize the importance of a healthy diet and their physical health. Participants will be provided with information on ways to lower their food costs. When the participants resume their independent lifestyle, they will need to be wise consumers as their financial status is already compromised.

Efforts with individuals who are interested in weight loss will continue. Individuals will be provided with one-on-one lessons focusing on eating right and light, and walking three to five times a week. EFNEP participants will be invited to ask a friend to join them as a partner which could encourage the EFNEP participant to develop a new healthier lifestyle.

Educational methods used include videos, handouts, food preparation, small group and one-on-one discussion.

The target audience for the program effort consists of individuals with limited income and limited resources.

The evaluation techniques used to assess if learning occurred are EFNEP reporting system survey, 24-hour recalls and follow up lessons.

### Expanded Food and Nutrition Education Program (EFNEP)

Cooperative Extension System Focus: Connecticut has the highest per capita income in the nation, but that statistic does not reveal the high poverty levels in many areas of the state. For example, among 200 U.S. cities with more than 100,000 residents, Hartford ranks 6th in terms of percentage of children living in poverty (over 42%). Poverty rates for New Haven, New London and Bridgeport are higher than the national average. Rural areas of Connecticut also reflect high poverty rates. Connecticut cities also had high percentages of minority populations living in poverty. Based on the 1990 census, Hartford had the state's largest Hispanic population – 31% of the city's population.

EFNEP works with families and youth who are living in poverty and facing barriers to balanced nutrition which include limited resources to buy food, poor access to supermarkets, expensive housing and energy costs, limited food preparation and storage facilities, marginal health care, cuts in benefits or low-paying jobs, lack of affordable and good quality day care, and few opportunities to help them escape poverty. Many have low literacy skills. Nutrition education provided by EFNEP para-professional staff to families and youth in their communities allows these high-risk individuals the information and tools to improve dietary habits and behaviors.

Measures of success include: improvements in dietary intake and eating behaviors among program participants as measured by computerized ERS data reporting system; linkages to other Extension programs such as 4-H, Double Dutch, Urban Gardening for low-income families and youth; agency support of EFNEP for collaboration on grants, and financial support for educational programs (food donations, facility use etc.); recruitment of under served low-income minority populations as program participants to comply with Civil Rights laws under USDA.

Outcome products desired include: newspaper articles providing visibility for EFNEP; articles in nutrition and Extension journals to highlight program successes; development of bilingual nutrition materials; and exhibits at state, regional conferences.

Partners include: public libraries; Hartford Food System; public schools family resource centers; CANR Food and Health Team; Extension Outreach Committee; and the Salvation Army.

EFNEP Paraprofessional staff will conduct group nutrition education programs to a number of Agencies and individuals statewide based upon the needs of each area (Hartford, New Haven, Norwich and Brooklyn). Extension needs assessments conducted by the Council Steering committees will help identify needs in year 1 of this plan. Nutrition education content has included child nutrition, food budgeting, food guide pyramid, and diet and health risk reduction to low-income groups. Lesson plans are targeted to the specific needs of each group. Supervision and training will be provided by EFNEP Supervisors.

With individual, in small or large groups, discussions and demonstrations, food preparation, and audiovisual presentations designed to provide participation of the learners. Many lessons are bilingual; sessions are offered as a series. Some classes involve both parents and children to promote better integration of dietary behavior change.

Families and youth who are living in poverty and facing barriers to good nutrition. Under served minority populations will be targeted in Hartford County for program effort.

Evaluation techniques include: EFNEP documents socio-economic data, participation levels, dietary intake, and food behaviors via a computerized data system (ERS); 24-hour recalls taken before and after educational interventions are used to measure dietary changes; food behavior checklists measure behavior changes; case studies provide documentation of an individual's direct benefit from EFNEP involvement.

### Expanded Food and Nutrition Education Program

Cooperative Extension System Focus: Funded by the United States Department of Agriculture since 1969; EFNEP is one of the federal government's oldest educational outreach program for low-income families. Feeding a family on a limited budget is extremely challenging as low-income families face inadequate and expensive housing, lack of day care and few educational or career opportunities to help them get out of poverty.

Measures of success are based upon the change in knowledge of the program participants. EFNEP offers knowledge and skills to help people control and manage their food and nutrition Practices for better health and quality of life. EFNEP helps homemakers understand the relationship of food and nutrition to health and fitness, to get the most for their food dollars, to prepare nutritious meals and snacks that their families will like, to handle and store food safely.

Outcome products desired include exhibits, program materials, brochures, videos and an advisory board.

Partners of EFNEP are collaborations with other agencies, which increase impact and provide culture-specific education. Linkages include Headstart, Preschool Intervention Program, Organized Parents Make a Difference, state departments, Family Resource Centers, UConn Family Studies, Hispanic Health Council, American School for the Deaf and WIC.

EFNEP will conduct programs in the following areas: food safety, consumer nutrition, meal planning, basic food preparation skills and dietary guidelines.

Targeted audiences will include the following: Family Resource Center Parents, Teen Parents, Parent form diverse communities (culture and physical disability) EFNEP -4-H volunteers, Extension Council members, State Department staff, educational methods will include, workshop series, fact sheets, exhibits, health fairs. Projected number of attendees include 110-125 adult participants per year 650 youth participants per year health fairs attendees 500 per year

Evaluation techniques include quarterly reports and informal assessments. EFNEP is evaluated with quarterly reports by a computerized ERS data system, documenting enrollment and dietary assessments of participants. In addition, informal evaluations with youth and family members will be made.

#### Expanded Food and Nutrition Education

According to the Anti Hunger Coalition, Connecticut has the highest per capita income in the nation but unfortunately the poverty rankings are just as high. For example, among 200 U.S. cities with more than 100,000 residents, Hartford ranks 6th in the percentage of children living in poverty (43.8%). Poverty is intertwined with the issues of hunger and homelessness. The Expanded Food and Nutrition Education Program provides community outreach and nutrition education to low income families. Programs are provided in community locations and help to assess and improve food practices and behaviors through interactive education. EFNEP seeks to provide knowledge and skills that help families build on strengths encouraging independence and self-sufficiency.

The success of the program is measured by the improvement in participants' nutrient intake and dietary changes. This is assessed by a national computer program that analyzes dietary intake data and behavior change. According to 1998 data 94% of all EFNEP participants improve their consumption of food groups which leads to better health.

Partners of the program include foodbanks, homeless shelters and educational sites. For example, Foodshare is an area food bank that provides emergency food to community organizations. The homeless shelter, Salvation Army Marshall House, is also an important partner. Other partners include the educational sites, Helping our Mothers through Education (HOME) program and Hartford Neighborhood Centers. Finally, the Salvation Army Community Service collaborates with the program, Many Voices Healthy Choices.

The EFNEP program has been in operation for thirty years. The success of the program is centered in the relationships within the community that foster trust with participants. Generally, 80 families per year are taught. Of the 80 families, one third complete a four-part series in nutrition education.

Educational methods include providing group and individual instruction to 80 families per year from low-income families. Another method is to provide community presentations by community groups and staff.

EFNEP targets under-served minority communities within Connecticut. The families served are low-income families who have difficulty meeting their needs because of limited resources.

Evaluation techniques include 24-hour recalls and checklists. Participants' dietary intake is measured through collection of 24-hour recalls, which is done before and after education. Behavior change is measured through the behavior checklist that is housed in the EFNEP reporting system. At the close of the program an evaluation is collected and anecdotal information gathered for use in case studies of families to document program impact.

#### Expanded Food and Nutrition Education

Improve the dietary intake, resource and money management and, food safety issues, knowledge, skills and food behaviors of senior adults. Adults that have restricted dietary needs due to chronic illness or aging.

Desired outcomes of this program are increased knowledge and behavior changes of the program participants. Also desired is the understanding of the need to decrease consumption of fats, salts, and sugars. Weight loss and increased energy was reported from clients in attendance.

The resources of the program are the Center for Healthy Aging and the Day Kimball Hospital Dietary Department. They have provided a classroom, advertisement, supplies, and the clients.

A key component of the program is to provide nutrition information to all seniors regardless of income, race or religion. Audiences are at-risk seniors with chronic illnesses, diabetes, high blood pressure, arthritis, and are all over weight. Groups are 10-20 persons.

Evaluation techniques include 24-hour recalls and questionnaires. A 24-hour food survey is taken three times during the education period. Questionnaires are filled out at the end specific questions are asked (what changes have you made as a result of this class?). In addition, clients are tracked for a year for weight losses, lower blood sugars, lower blood pressure by the Department of Healthy Aging.

### Family Nutrition Program: Food Security

Low income families are experiencing a reduction in funds available for food due to welfare reforms. Therefore, emergency food providers have experienced an increased need to fill the gaps. According to surveys with Greater Hartford emergency food providers, 90% of clients they serve need nutrition education and printed materials. The Family Nutrition Program provides community outreach and nutrition education to low income families who are served by emergency food organizations such as, soup kitchens, food pantries, shelters and regional food banks. Programs are provided to staff and clients in community locations. FNP seeks to provide knowledge and skills that help families to improve diet quality, and stretch food resources.

The program measures success through the improvement in participants' nutrient intake and decreased reliance on emergency food resources. This is measured through a national computer program that analyzes dietary intake and change. The participants in the program report less food waste, improvement in food group consumption, dietary and grocery shopping management skills.

Partners of the program include food banks and emergency food pantries. They are: Foodshare; Hockanum Valley Tri Town pantry; Home Program, which is also an educational site; Salvation Army Community Services; and the Hartford Neighborhood Center.

The FNP program has been in operation for two years. The success of the program is centered in the relationships within the community that foster trust with participants.

Strategies involve group and individual instruction as well as community presentations to roughly 60 participants per year from low income families that rely on emergency food.

Target audiences for the program or project effort consist of low income families who use emergency food offered at community locations.

### Meat and Food Science

The food industry is the second largest employer nationwide. There are numerous employment opportunities for College graduates trained in the food science area, especially in the area of animal food products. The focus is to provide courses in food science which will prepare students for employment and/or graduate school.

Success is measured by the number of students that gain employment in the food industry. Another measure is the enrollment of students in food science related courses that are taught.

Desired outcomes include students with a greater appreciation for the food industry and with expanded knowledge of food processing, chemistry and safety. Also desired is the development of a Food Science minor.

Partners will be faculty in the Departments of Molecular and Cell Biology, Pathobiology, Nutritional Sciences, industry personnel to provide guest lectures and donations of teaching supplies, faculty in the University of Connecticut Writing Center and food businesses which provide field trip opportunities.

Key components of the program include the following food science courses, which are offered in the Department of Animal Science: ANSC 160, The Science of Food; ANSC 224, Food Safety; ANSC 253/W, Animal Food Products. In addition, Dr. Venkitanarayanan will propose a new Food Microbiology class to be offered in the Spring 2000 semester.

Laboratory opportunities which provide for experiential learning are essential for courses in the sciences and this is especially true for food science classes. Additionally, student-centered learning will be emphasized where appropriate and an emphasis on improvement of student writing will also be incorporated. The audience will be students from the College of Agriculture and Natural Resources for upper division courses, and students from throughout the University for 100s level courses.

Target audiences are undergraduate students interested in the food sciences.

Student evaluations from the Office of Instructional Research will form the primary basis for class evaluation. In addition, peer evaluation of classes as assigned by the Department Head and/or Associate Dean for Academic Programs will also contribute to the evaluation process.

### Nutrition

Research Focus: Pediatric obesity is a growing problem. The objectives for the Healthy People 2000 has made this a major public health initiative. This program area focuses on the design and implementation of appropriate weight management protocols for young children that integrate diet and physical activity.

Measures of success will be published research results in a number of peer-reviewed journals. To date approximately \$125,000 have been awarded for this work. Studies in healthy children are underway and submission of extramural proposals to extend this work are planned.

To date, outcome products have included peer reviewed articles, a number of interviews (both radio and in press) and Extension presentations. The eventual production of Extension education materials is desired.

Internal partners at the University of Connecticut include: Drs. Perez-Escamilla and Maria-Luz Fernandez. External partners include: Drs. Patty Freedson, Professor of Exercise Sciences at the University of Massachusetts, Amherst (Dr. Freedson is an internationally known expert in the area of pediatric physical activity assessment and program design); Dr. Cara Ebbeling, Postdoctoral Fellow in Behavioral Medicine at University of Massachusetts Medical Center, Worcester, MA; Dr. Dan Cooper, Attending Physician and NIH supported researcher in the area of exercise and exercise endocrinology in children and adolescents. Professor, University of California, Irvine, CA; Dr. Elizabeth Estrada, Pediatric Endocrinologist at Connecticut Children's Medical Center, Hartford, CT.

Key components of the project include: implementation of walking and resistance exercise training in young children and determining the effects of these activities on body weight, body composition, protein utilization, and energy and nutrient needs in this population.

Strategies include: Recruiting participants through flyers, newspaper advertisements and educational opportunities at local YMCAs. To date, subject participation (children and parents) has been 25 children for the obesity project, 13 children for walking program (healthy kids) and 16 children for resistance exercise program (healthy kids). Data from these programs has been used in lecture/presentations at major meetings and Extension-sponsored programs (Double-Dutch).

Target audiences includes health educators, nutrition educators, nurses, pediatricians, and teachers of young children and adolescents.

Currently, there are no evaluation techniques in place for follow-up with study participants.

#### Nutrition Education and Training Programs and Team Nutrition

The Nutrition Education and Training Programs and Team Nutrition Training Grants are USDA funded projects that involve outreach to several diverse groups including children, school food service personnel, teachers, and parents. Through these programs a large number of individuals are reached for nutrition education including food safety education. Competitive funding has been received in 1998 for a two year project involving the development of a web-site to service all of the above mentioned audiences. In addition, a book which will be geared to the secondary school population, which focuses on current nutrition topics and trends and includes recipes submitted from people in the state.

Desired outcomes include the publishing of a peer reviewed article, the creation of a web-site and the writing of a book on nutrition for secondary school population.

There are two important partners of the project are: Susan Fiore (MS), RD, State Department of Education, Child Nutrition Programs; and Shortie McKinney, Ph.D., RD, FADA, Drexel University.

The duration of this project is two years, from September 1, 1998 to August 31, 2000. A key component of the project is the development of a web-site for nutrition education for children, teachers, school food service personnel, and parents.

The program strategy involves an "opening," which will be held in 2000 for the web-site in order to introduce it to teachers throughout the state. Audiences will include school food service personnel, teachers, students and parents. The educational tool that will be used is a resource book for secondary school aged children on nutrition topics including appropriate recipes.

The target audiences for the project effort include school food service personnel, teachers, students and their parents.

Evaluation of the project is based on the number of people who visit the web site and by book sales.

#### Interaction of Nutrition and Metabolic Hormones

Growth in all organisms is regulated by the interaction of nutrient supply with internal metabolic regulators. Mechanisms underlying this regulation are not well described. Improved understanding is required of the growth failure in humans associated with nutritional deficiencies, particularly of micronutrients. Optimization of growth and production performance in agriculturally important animals is also dependent on better understanding of these pathways.

Measures of success are based on the anticipated results of the research effort. Anticipated outcomes include research publications and research grants. Changes in clinical and agricultural practices could also result.

Desired outcomes include both peer reviewed articles and Extension publications.

An important resource is the UCRF, which has provided pilot funds. Other valuable resources are the graduate students that participate in the research project.

Currently, the role of zinc in the thyroid hormone signaling pathway is being investigated. Results in vitro have suggested both positive and negative effects. Clinically, both hypothyroidism and zinc deficiency produce similar failure of growth and development. Therefore, testing focuses on whether zinc deficiency impairs thyroid hormone function in a rat model. The effects of changing thyroid hormone status will be tested in zinc deficient, pair-fed and control animals. Tissue and whole body growth will be monitored as well as the ability of thyroid hormone to induce gene expression in a range of target tissues. Several variables in the somatotrophic axis will be monitored in an attempt to explain the causes of growth failure.

The overall research strategy is to integrate at the level of the whole organism observations made and hypotheses developed using entirely in vitro or cell culture approaches.

Target audiences of the research effort include fellow scientists, government and non-governmental agencies involved in nutrition, and agricultural agencies.

A statistical evaluation of the results will be performed. In addition, peer reviewed publications will help to assess the results of the research project.

### Interaction of Nutrition and Metabolic Hormones

Growth in all organisms is regulated by the interaction of nutrient supply with internal metabolic regulators. Several metabolic hormones, including somatotropin and thyroid hormones, influence the rate at which animals grow and the efficiency at which an animal utilizes of nutrients. Importantly, there is interaction between these metabolic hormones and availability of nutrients. Deficiencies in micronutrients, especially zinc, and metabolic hormones, especially somatotropin and thyroid hormones, cause a reduction in growth rate and overall development. Mechanisms underlying this regulation are not well described. Improved understanding is required of the growth failure in humans and cattle associated with nutritional and hormonal deficiencies. Optimization of growth and production performance in agriculturally important animals is also dependent on better understanding of these pathways.

The primary measures of success will be completed experiments in which the interaction of zinc, thyroid hormones and somatotropin are addressed. The goal is to complete experiments that investigate this interaction in rats and beef cattle. Another measure would be to secure outside funding from USDA.

Desired outcomes include both peer reviewed publication and quality recommendations for Extension publications on nutrients.

There are three individuals that assist with the program effort. First, K. Guda provides assistance with animal management and data collection. Next, K. Govoni assists with sample collection and data analysis. Lastly, B. Cooker (MS) provides assistance with IGF analysis. In addition to these partnerships, there are two possible resources for external funding.

Possible resources for external funding include the University of Connecticut Research Foundation (UCRF) and the United States Department of Agriculture (USDA).

Currently being investigated is the role of zinc in the thyroid hormone signaling pathway. Results in vitro have suggested both positive and negative effects. Clinically, both hypothyroidism and zinc deficiency produce similar failure of growth and development. Testing is being done whether zinc deficiency impairs thyroid hormone function in a rat model. The effects of changing thyroid hormone status will be tested in zinc deficient, pair-fed and control animals. Tissue and whole body growth will be monitored as well as the ability of thyroid hormone to induce gene expression in a range of target tissues. Several variables in the somatotrophic axis will be monitored in an attempt to explain the causes of growth failure. Empirical data collection from well-designed experiments in rats and beef cattle. The duration of each experiment will vary from one month to one year.

The primary strategy will be to design quality experiments with a well-trained group of technicians, graduate students and undergraduates to collect, prepare, assay and analyze the results.

The target audience is fellow scientists interested in the somatotrophic axis, thyroid hormones and zinc. In addition outreach programs that target nutrition and normal growth.

The peer-review process will be the major evaluation tool. If a manuscript is accepted for publication in a peer-reviewed journal, that will be considered a successful experiment.

### Nutritional Sciences

**Research Focus:** This project is aimed at examining the associations between foods that the elderly have consumed (Framingham Heart Study) that contain putative protective nutrients, such as antioxidants vitamins E and A, and risk for disease, such as coronary heart disease. The significance of studies such as these is that the information gleaned can provide the basis for making practical dietary recommendations that are health-outcome

based. The Framingham Heart Study cohorts provide us the largest and best described population in the world with respect to heart disease and many other degenerative diseases that are now routinely assessed.

Anticipated measures of success are based upon anticipated research results. The research results will provide the basis for making dietary recommendations. Also, the data will provide the basis for the application for other extramural funding.

Desired outcome products include peer-reviewed journal articles, abstracts and presentations at national and international meetings as well as consultancies with industry.

There are both internal and external partners associated with the research effort. Specifically, this is a cooperative project between investigators at the University of Connecticut, the Human Nutrition research Center on Aging (HNRCA), Tufts University and the Framingham Heart Study, Framingham, MA. The project described in this plan is part of a larger cooperative regional project.

Retrospective analyses of plasma biomarkers and antioxidant status. Retrospective analysis will be conducted using data from the Framingham Heart Study, Cohort 20 (67-93 yr). In the previous project, plasma vitamin E, retinol and carotenoids were analyzed in this latter population. In the current project I, as PI, will work with those at the HNRCA to study the relationship of macular degeneration to plasma antioxidants. Macular degeneration has been determined in this population by investigators at the National Eye Institute. The major research hypothesis is that incidence of macular degeneration will be related to lower concentrations of plasma carotenoids, lutein and zeaxanthin. The duration of this project is 10/01/99-9/30/04.

The target audience basically consists of the nutrition community.

Assessment of the research findings will be conducted with a biostatistical approach.

#### INDIVIDUAL PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

##### EFNEP/FNP Advisor

Cooperative Extension Focus: High divorce rates, the growth of single parenthood, increasing drug use among adults and a poor economy have significantly altered the "traditional" family. As a result, more and more grandparents find themselves once again in the role of parents, raising and caring for their grandchildren. More than 5% of the nation's children, more than 3.4 million - currently live with their grandparents, says the National Center for Health Statistics. These grandparents, once looking forward to their retirement years, now find themselves facing new challenges and difficulties. A recent study by the American Associates of Retired Persons, found that households headed by grandparents have lower incomes than most. More than half have incomes under \$20,000, compared to only 26% of traditional households that bring in that amount. Some grandparents also face eviction because children are not permitted in housing for the elderly. Those who do not have to move often are forced to use their retirement savings and monthly income for the up bringing of their grandchildren.

Impact is measured by behavioral improvements and changes in knowledge of the program participants.

Desired outcomes include newspaper articles set up citywide workshops on nutrition with other support groups and a press release about what can be done with the 20 or so grandparents support groups.

Partners of the program include both internal and external linkages. Internal linkages include the EFNEP Supervisor, EFNEP Advisor and the Cooperative Extension System Coordinator. External linkages include the Varick Family Life Center, Martin Luther King School Parent Coordinator, Wexler School Grandparent Coordinator, the Greater New Haven Community at large local churches and Inner City Newspaper and two local radio and television stations.

This program is unique because it addresses not only grandparents who are raising their grandchildren but it also addresses a gap in inner city resources for inner city residents. Where they can come and feel comfortable because they all have a common denominator. Living in the inner city deprived of resources and knowing that someone is raising a grandchild and having the same problems.

The 24-hour recall will be used to determine whether they are following the guidelines of the food grouping and serving sizes for children. The need to feed children less fats and sweets and how to make more nutritious meals out of their traditional foods. Compare the foods of this generation to that of when they were raising their own children, healthy foods vs. diseases. Discuss meal and recipes they usually make and see how to make them with less sugar, salt, and fat while increasing fiber in meals and recipes. This will provide opportunities for members to share feelings and concerns while giving and receiving information and support about resources and methods for coping with the new care given role.

The target audience for the program effort consists of grandparents raising their grand children that will be eligible for the EFNEP program.

The primary evaluation technique that will be used is a 6-month follow up with 24-hour recall and recipes with a nutritional diagnostic review will be used to assess if learning has occurred.

#### Expanded Food and Nutrition Education Program

Cooperative Extension System Focus: Funded by the United States Department of Agriculture since 1969; EFNEP is one of the federal government's oldest educational outreach programs for low-income families. Feeding a family on a limited budget is extremely challenging as low-income families face inadequate and expensive housing, lack of health care, cuts in welfare benefits, lack of day care and few educational or career opportunities to help them get out of poverty.

EFNEP offers knowledge and skills to help people control and manage their food and nutrition practices for better health. EFNEP helps homemakers understand the relationship of food and nutrition to health and fitness, to get the most for their food dollars to prepare nutritious meals and snacks that their families will like, to handle and store food safely. Adults and youth also learn skills that build their self-sufficiency and self-esteem.

Outcome products desired include exhibits, videos, brochures, youth advisory boards and various program materials.

Partners of the project include the After School Program, Organized Parents Make a Difference, American School for the Deaf, Hispanic Health Council, Family Resource Centers and state departments.

EFNEP will conduct programs in the following areas: basic food preparation skills, dietary guidelines, meal planning, healthy snacks, food safety and consumer nutrition.

Educational methods include workshop series, fact sheet, exhibits and health fairs printed matter. These methods will be targeted to a projected number of 500 attendees from the above list of partners.

Evaluation of EFNEP is conducted with quarterly reports documenting enrollment and with informal evaluations with youth.

#### Family Nutrition Program: Food Security

In 1997, 12 surveys were distributed to Greater Hartford emergency food providers. Emergency food providers reported that 90% of clients they serve need nutrition education and printed materials. The Family Nutrition Program provides community outreach and nutrition education to low income families who are served by emergency food organizations such as, soup kitchens, food pantries, shelters and regional food banks. Programs to staff and clients are provided in community locations. Printed materials are also provided on food safety, food budgeting and recipes for foods commonly found in food pantries. FNP seeks to provide knowledge and skills that help families to improve diet quality, and stretch food stamps. In 1998 the Salvation Army Community Services Department and FNP joined forces to offer a nine-week comprehensive life skills program featuring a four-week nutrition education focus, at rotating community locations. This program is in the second year and it has been expanded to meet at different times and locations.

Cooperative Extension Focus: FNP - Food Security: Many Voices Healthy Choices Program. The program measures success through food behavior change and a decreased reliance on emergency food resources. The participants in the program report less food waste, improvement in food group intake, dietary and grocery shopping management skills. The success of the program is measured by the improvement of nutrient intake and dietary changes. This is measured by a national computer program looking at dietary intake and behavior change.

Foodshare: a area food bank that provides emergency food to community organizations in the Northeast region of the state Salvation Army Community Services: Program Collaboration: Many Voices Healthy Choices

The FNP program has been in operation for two years. The success of the program is centered in the relationships within the community that foster trust with participants. One highlighted program is the Many Voices Healthy Choices program that is a collaboration with the Salvation Army Community Services Department. This program is targeted to under served minority communities within the greater Hartford area. This is a nine-week Life skills program with a four-week nutrition component.

Educational methods include group and individual instruction in addition to community presentations. These methods will be applied to 60 people that are emergency food providers, Low-income families that use emergency food or community groups and staff.

Target audiences consist of low-income families who use emergency food and/or community groups.

Participants' behavioral changes are measured through collection of 24-hour recalls, which is done before and after education. At the close of the program an evaluation is collected and anecdotal information is gathered. A survey has been developed to assess participants' emergency food use before and after attending workshops. A six-month follow up and one year follow up is done on participants both by phone and by mail.

In order to gather stakeholder input into the College Plan, contact Milagros Marrero, Director of Salvation Army Community Services.

### Food and Health

Statement of the Issue: Improved dietary intake, money and resource management and food safety knowledge. Improve diets, food skills, and better health for pregnant teens, teen parents, and the infants and children in their care.

Outcome products desired include Teen parent cookbooks, which focus on quick and healthy recipes, money management skills and food resources.

Partners include EFNEP supervisors, EFNEP coordinator, Department of Youth and Family Services, Young Parents Program, QVCCA Adult Education Program (Young Parents School) and the Northeast School District.

EFNEP is designed to improve the nutrition and food behaviors for low-income families with young children. EFNEP staff provides food and nutrition education in a variety of settings, and assist clients in obtaining needed services by a well-established, community-based network.

Educational strategies consist of group and individual instruction, including discussion, food demonstration and hands on educational opportunities.

Evaluation techniques are based upon a number of factors. These factors include: Numbers reached, Target populations, Awareness increased, Knowledge increased and Practices adopted.

### Expanded Food Nutrition Education Program (EFNEP)

Connecticut has the highest per capita income in the nation, but that particular statistic does not reveal the high poverty levels in many areas of the state. For example, among 200 US cities with more than 100,000 residents, Hartford ranks 6<sup>th</sup> in terms of percentage of children living in poverty (over 42%). Poverty rates for New Haven, New London and Bridgeport are higher than the national average. Rural areas of Eastern Connecticut also reflect high poverty rates.

The success of this program relies on the improvement of knowledge, skills, and behaviors related to dietary intake, children's eating behaviors, food budgeting and money management, food safety.

Desirable outcomes include case studies of participants, an EFNEP flyer to local agencies and local radio presentations.

Partners of the program include the EFNEP Supervisor, CES Educators and Specialists, all of which are internal linkages. Other partners include Casa Otonal, Hispanic Clinic and Latino Youth Development, all of which are external linkages.

EFNEP is designed to improve the nutrition and food behaviors of low income families with young children, and youth. EFNEP staff provide food and nutrition education in a variety of settings and assist clients in obtaining needed services by a well-established community based network. In collaboration with Casa Otonal Project M. I. (Day care providers), The Hispanic Clinic Parenting Skills Program, Latino Youth Development (Life Coping Skills), provide nutrition education to small groups. Subject matters will include: food guide pyramid, dietary guidelines, learning how to prepare nutritious and economical meals, shopping skills, food budgeting, money management, stress management, food safety, health and fitness, feeding young children, cancer risk reduction, food labeling. Other topics tailored to individual needs.

A variety of methods will be used in small groups including: food dietary intake (food recalls), discussions, hands on activities, and video/audio visual presentation.

The target audience consists of low-income families with children who are trying to get out of poverty.

Evaluation techniques are to look for changes in the dietary intake and food behaviors of all participants. The plan is to conduct informal evaluations with participants looking for changes in food and nutrition practices that indicate improvement. In addition, 24-hour food recalls will be taken before and after educational intervention will be used to measure dietary changes.

### Pediatric Nutrition and Physical Activity

Research Focus: Pediatric obesity is a growing problem. The objectives for the Healthy People 2000 has made this a major public health initiative. This program area focuses on the design and implementation of appropriate weight management protocols for young children that integrate diet and physical activity.

Measures of success will be published research results in a number of peer-reviewed journals. To date approximately \$125,000 have been awarded for this work. Studies in healthy children are underway and submission of extramural proposals to extend this work are planned.

To date, outcome products have included peer reviewed articles, a number of interviews (both radio and in press) and Extension presentations. The eventual production of Extension education materials is desired.

Internal partners at the University of Connecticut include: Drs. Perez-Escamilla and Maria-Luz Fernandez. External partners include: Drs. Patty Freedson, Professor of Exercise Sciences at the University of Massachusetts, Amherst (Dr. Freedson is an internationally known expert in the area of pediatric physical activity assessment and program design); Dr. Cara Ebbeling, Postdoctoral Fellow in Behavioral Medicine at University of Massachusetts Medical Center, Worcester, MA; Dr. Dan Cooper, Attending Physician and NIH supported researcher in the area of exercise and exercise endocrinology in children and adolescents. Professor, University of California, Irvine, CA; Dr. Elizabeth Estrada, Pediatric Endocrinologist at Connecticut Children's Medical Center, Hartford, CT.

Implementation of walking and resistance exercise training in young children and determining the effects of these activities on body weight, body composition, protein utilization, and energy and nutrient needs in this population.

Strategies include: Recruiting participants through flyers, newspaper advertisements and educational opportunities at local YMCAs. To date, subject participation (children and parents) has been 25 children for the obesity project, 13 children for walking program (healthy kids) and 16 children for resistance exercise program (healthy kids). Data from these programs has been used in lecture/presentations at major meetings and Extension-sponsored programs (Double-Dutch).

Target audiences includes health educators, nutrition educators, nurses, pediatricians, and teachers of young children and adolescents.

Currently, there are no evaluation techniques in place for follow-up with study participants.

### The Digestion and Absorption of Lipid-Soluble Nutrients

One objective of research is to understand factors affecting bioavailability of lipid and lipid-soluble nutrients. It is anticipated that this research will have implications for human health. Most of the research relies on animal models and may have implications for animal health. Comparative nutrition is an interest and during the past decade publications have been authored and co-authored based on observations with humans, cattle, sheep, rats rabbits and fur seals.

Health Implication for the General Population: Because of the recent attention given to the possible role of lipid-soluble nutrient/antioxidants (vitamin E and carotenoids) in the prevention and treatment of a wide variety of illnesses, segments of the general population have greatly increased their consumption of these dietary compounds. Unfortunately, possible interactions among these lipid-soluble nutrient/antioxidants may adversely affect utilization and negatively impact health. During the next five years, the results of interactions among carotenoids and vitamin E during absorption and transport will be completed and published. Studies in this area have been completed using the lymph-duct cannulated rat. Publications are in preparation but additional work will be needed to complement the some observations before publication is warranted. Some of this work will include studies using the preruminant calf as an animal model.

Health Implications for the Elderly: Xanthophylls, are little studied carotenoids relative to human health, that may be important in the prevention of two diseases of the eye: age-related macular degeneration and senile cataract. Two xanthophylls (lutein and zeaxanthin) are selectively deposited in the macula of the human retina. Degeneration of the macular of the human retina is the most common cause of irreversible blindness in people over 65 years of age and may be prevented by increased or the progression slowed by increased utilization lutein and zeaxanthin. Cataract surgery is one of the most frequently performed surgeries in the elderly. Cataracts resulting from photooxidation may be ameliorated by the presence of xanthophyll in the retina.

Infant: The ideal food for newborn mammals is the milk from their own mothers. However, for various reasons the newborn may receive artificial feedings. To provide the best formulas for the newborn, complete information on nutrient composition of milk is needed but collecting this information is often hampered by the lack of reliable methods of analysis. The development of methods for analysis of lipids and lipid-soluble nutrients in milk from humans, the cow and other mammals will continue. Emphasis will be placed on techniques to measure carotenoids, fat-soluble vitamins and phospholipids in milk.

This work will result in peer-reviewed articles and presentation at national and international meetings.

Dr. Harold Furr is an expert on fat-soluble vitamin and carotenoid analyses. He also is internationally recognized for mathematical modeling of vitamin A metabolism. In addition, Dr. Sheila Andrews Department of Animal Sciences will assist with experiments utilizing the preruminant calves.

## Connecticut Grown: Marketing Opportunities for Connecticut Agriculture

After a day long conference on "Connecticut Agriculture, Focus on the Future," and a follow up session a month later, leaders in the agriculture community prioritized issues that will have an effect on the viability of agriculture in CT in the years to come. On the top of the list was the need for greater efforts in public relations/public education and marketing. The "Connecticut Grown" marketing concept was mentioned as needing to be revitalized. Back in 1988, work was done with Dr. Boris Bravo-Ureta and staff at the Agriculture Experiment Station in New Haven, as part of the food subcommittee on the Commission on Connecticut's Future. Six monthly menus were developed featuring CT grown vegetables and fruits in season, analyzed consumption figures for each commodity, multiplied that by the population, and extrapolated acreage and income figures based on those hypothetical consumption figures. Since then, several states and regions have developed local food guides. With the increase in interest in fruit and vegetable consumption for health, a focus on choosing more locally grown foods, and the importance of preserving farmland and connecting people more with agriculture, this work should be revived and expanded.

Measures of success include: greater consumption of locally grown fruits and vegetables; greater production and retail sales of locally grown fruits and vegetables; possible development of a marketing system to promote and even distribute locally grown fruits and vegetables to supermarkets, restaurants and institutions; increase in Consumer Supported Agriculture (CSAs).

Desirable outcome products include: CT Grown Food Guide, menus, recipes; newspaper articles; journal articles; presentations at professional meetings and interagency discussions, web site.

Partners include: CT Department of Agriculture, CT Food Policy Council, Hartford Food System, Chef's Collaborative, State Department of Public Health, Northeast Cooperative Extension Food and Nutrition network, CES staff, Department of Nutritional Sciences staff, food service staff, CT regional market, supermarkets, farm market masters.

An advisory group will be identified to provide input and feedback on the project. Objectives will be to develop revised CT Grown Menus that follow dietary guidelines and the food guide pyramid, analyze nutritional value of menus, develop sample recipes to put in menus. Produce CT Grown Food Guide. Distribute these at supermarkets, farm markets, farm stands, restaurants, schools. Develop marketing campaign. Integrate concept into nutrition education programs (EFNEP, FNP, Child Nutrition, Elderly Nutrition, WIC).

Educational methods include publications, workshops, interviews with media, networking meetings, advisory committee meetings, web site.

Target audiences include consumers, producers, suppliers and the food industry.

Evaluation techniques include survey sample farm markets, farm stands, supermarkets, restaurants, and consumers regarding their use/consumption/sale of locally grown products before marketing campaign (pre-intervention assessment). Conduct marketing campaign and do a follow up survey to measure impact. With nutrition education intervention programs, can do food frequency or 24-hour food recall evaluations as well as behaviors associated with purchasing locally grown products.

## Diet Effects on Lipoprotein Metabolism and Heart Disease

Research Focus: One research program is focused on studying how dietary factors affect cholesterol and lipoprotein metabolism. Once the most important mechanisms by which diet affects these parameters are identified, dietary recommendations can be made for target populations to decrease their risk for heart disease. Studies are focused on the understanding on how diet and gender interact to determine plasma lipid levels. Men, pre and post-menopausal women will be benefited from these studies since a better understanding on how hormones and diet affect the risk for heart disease is expected to be derived from these studies. Research is currently being done in identifying the difference in risk between Caucasian and Hispanic post-menopausal women. It is well known that Hispanic women have a lipid profile which makes them more at risk for heart disease including lower plasma HDL cholesterol concentrations, higher triglycerides and possibly increased susceptibility to LDL oxidation. What is the extent by which diet modifies these risk factors in Hispanic women is one of the goals of the research program.

If it becomes clear what dietary factors favorably alter lipoprotein profiles in men, pre and postmenopausal women, this information can be of great interest to this target population in order to modify their risk for heart disease. Also it is important to understand that ethnicity has a major role in determining risk factors. Again dietary recommendations targeted to these populations could potentially alter their plasma lipid profiles and decrease their risk for heart disease. There are funds available from USDA to conduct these studies and grants have been submitted to the American Heart Association and to the Donahue foundation to expand these studies.

A number of publications in peer reviewed journals are expected to be derived from these studies. These journals include: The Journal of Lipid Research, American Journal of Clinical Nutrition, The Journal of Nutrition

and others. Part of these studies will be submitted for the Graduate Student Competition for the American Society for Nutritional Sciences. Depending on the results obtained, radio productions or video tapes are also envisioned. Collaborating investigators in other Institutions: Robert J. Nicolosi, Professor, University of Massachusetts, Lowell, Penny Kris-Etherton, Professor, Penn State, Zaida Cordero-MacIntyre, Assistant Professor, University of Loma Linda, Loma Linda, CA, Monsanto Company, Saint Louis, MO, DR. Reyna Luz Vidal-Quintanar, University of Sonora in Mexico and Dr. Natalia Gonzales, Center of Food Research, in Sonora, Mexico.

These studies are aimed to understand the interaction between nutrients and gender on cholesterol and lipoprotein metabolism as they relate to heart disease risk. For example, dietary fiber will be provided to men, pre and postmenopausal women and effects on several parameters will be evaluated compared to a placebo. Some of the measurements will be plasma lipids, lipoprotein composition, activities of enzymes involved in the intravascular processing of lipoproteins, susceptibility of LDL to oxidation, number of LDL receptors in isolated monocytes, and markers of cholesterol synthesis and catabolism in plasma. Based on these measurements, it will be possible to assess some of the mechanisms by which fiber lowers plasma cholesterol levels. The duration of these studies will be for 2 years. Other studies evaluating the effects of dietary cholesterol are also contemplated. It has been shown that dietary cholesterol affects men and women differently and that men might have a higher risk than women. It is important to define which are the mechanisms that are associated to these gender differences.

These studies will be published and information will be provided to the scientific community and to nutrition evaluators who are in charge of making nutrition policies.

Target audiences are the scientific community and the lay public. It is expected that this new information will help educate people regarding diet, gender and interactions with heart disease risk.

#### Preschool Children at Nutritional Risk in Connecticut

Iron-deficiency is the most widely documented micronutrient deficiency among preschoolers in the United States. In Hartford, 33% of 18-36 month-old children are anemic by Center for Disease Control criteria and 44% by CT WIC criteria. The prevalence of iron-deficiency without anemia is unknown. Prevalence for the same age group in suburban areas surrounding Hartford is estimated at 2 cases for every 100 children. As iron-deficiency is linked to permanent impaired intellectual function, fatigue, malaise, reduction in gains in body weight and length, and reduced immune function, the long term impacts on learning potential are significant. Although all pediatric primary care centers screen for anemia and the Women, Infant's, and Children's program provides food vouchers for iron-rich foods, the current prevalence of anemia appears resistant to further reduction. A community-wide education and health-care research and intervention program has been proposed to alleviate this problem.

Measures of success include: reduction in prevalence of anemia, increase in diagnosis and treatment plan in charts, referral to WIC and Family Nutrition Program educational programs (Monitored by BI-annual chart reviews and state surveillance data.). Increase in caretaker compliance of prescription, increase in child's food pattern (decrease in long-term bottle-feeding, increase in heme iron source in diet, and increase in iron-fortified cereals), and reduction in pathogen load of child. Funding: continuation of funding at greater than \$150,000 per year (50% USDA Food Stamps funds and 50% from other grant sources.)

Outcome products desired: 1) Peer-reviewed scholarship - it is expected to submit a minimum of two peer-reviewed publications per year and one technical report per year. 2) Materials: An exhibit will be developed for loan, a web-site for consumer information, and a social marketing campaign, and new culturally sensitive support materials.

All collaborators provide dedicated staff time. Those that are matchable on Food Stamp Funds are listed with the percent of time matched. Internal partners include: The University of Connecticut Storrs, Department of Nutritional Sciences - R. Pérez-Escamilla, S. Beeman, L. Drake; Department of Anthropology - P. Erickson (Faculty), N. Diaz (Doctoral student); School of Family Studies, Child, Health, and Culture Program - C. Super, Dean and S. Harkness and J. Goldman (faculty). External partners include: The University of Connecticut Medical Center, School of Medicine - P. Joyce (10% time), B. Gould and V. McCain (5% time); Weicker General Clinical Research Center (Grant for \$8,500 to complete pilot analyses).

Connecticut Children's Medical Center, Hartford, CT. H. Slivka (10% time), supportive services from Georgine Burke, Dept. of Research; St. Francis/Mt. Sinai Hospitals, Hartford, CT - C. Orkin, B. Bernstein, C. Lord; Aetna Child Health Data Center - G. Burke, A. Bingham; Pennsylvania State University, Dept. of Nutrition (MS) - F. Rosales (acute phase reactant analyses), J. Beard (program review); Connecticut Association for Human Services - A. Sampson; Hispanic Health Council, PANA and Breastfeeding Peer Counseling Program - A. Gonzales, G. Damio; Hartford Public Schools - UConn/HPS partnership grant - \$9,000; Institute for Community Research - J. Schensul.

Key components of the program include: 1) assess the prevalence of iron-deficiency anemia and iron-deficiency and related co-morbidities in low-income children in Hartford, CT; 2) decrease the prevalence of iron-deficiency anemia in this same population; 3) increase the identification of iron-deficiency anemia; 4) describe the available public health, community, and clinical information services, as well as the system for management and follow-up for the treatment of anemia; 5) describe client perceived problems with compliance with dietary prevention and intervention and supplementation; 6) describe culturally specific impediments to care, compliance, and dietary intervention; 7) develop a simplified monitoring system to allow for yearly assessment; 8) coordinate the comparison and reporting of data with those available from the CT State Department of Public Health and the Hartford Public Health Department; 9) evaluate and develop appropriate educational materials for use with targeted audiences; 10) develop a handbook for the care of iron-deficiency anemia for health care professionals and caregivers; 11) work with the Food Stamp Infant-Toddler PANA and Salud programs to incorporate messages for this problem into the overall mass media campaign.

Strategies include: 1) needs assessment; 2) randomized retrospective chart review to document prevalence; 3) key-informant interviewing and focus groups of providers and caretakers; 3) intervention - a) provider marketing campaign, b) social marketing campaign to caretakers, c) community awareness campaign to decision-makers, d) outreach program through community health care providers.

Targeted audiences are low income families with preschool children and their health-care providers as well as pre-school educators.

Evaluations will be reviewed by: 1) overall - changes in prevalence of anemia and iron-deficiency (chart review that monitors level), diagnosis, treatment and follow-up; 2) educational program effectiveness - randomized intervention trial; 3) outcomes - incorporation of foods in diet that contain available iron or enhance iron absorption, changes in weaning practices (use of cup rather than bottle), compliance with supplementation, compliance with laboratory testing, reduction in pathogen load on child, improved hand-washing techniques. reduce occurrence of illness and reduced occurrence of anemia.

#### Mechanisms of Action of Thyroid Hormone

Research Focus: The molecular actions of thyroid hormone are being examined, with particular regards to its effects on fat synthesis. Basic understanding of this hormone is useful because (a) disorders of thyroid hormone are clinically common, (b) it is a key regulator of the basal portion of energy expenditure and therefore has implications for obesity, (c) it regulates the conversion of carbohydrate to fat, particularly in liver, again with implications for obesity and (d) it regulates nutrient partitioning and fat accumulation in animals, used for human consumption.

Ref: Freake HC and Oppenheimer JH. Thermogenesis and thyroid function. *Annu. Rev. Nutr.* 15, 263-292, 1995.

The immediate measures of success are research publications and additional research grants.

Peer reviewed articles are perhaps the most desirable outcome.

Some resources and/or partners of the program are the USDA NRICGP Effects of zinc on thyroid hormone receptor function, USDA Hatch Molecular mechanisms of thyroid hormone regulation of lipogenesis, and graduate students.

Tissue specific regulation of fatty acid synthesis by thyroid hormone has been thoroughly described in the rat and shown to occur at the level of mRNAs encoding important enzymes. Enzyme acetyl-CoA carboxylase is being focused and the interactions between thyroid hormone and the regulatory regions of this gene are being examined. Thyroid hormone regulation of growth hormone gene expression in a rat pituitary tumor cell line is also being investigated, with specific emphasis on the zinc requirements of this process. Contrary to the original hypothesis, zinc removal amplifies the effects of thyroid hormone and the mechanism underlying this observation is now being sought.

Research strategies followed include approaches entirely in vitro, in cell cultures and in rats. Research hypotheses generated in one system are then tested in another. The aim is to integrate molecular with physiological/nutritional observations/approaches.

Fellow scientists and clinicians make up the target audience for the program.

A statistical evaluation of results will be conducted. Further, peer reviewed publications will also evaluate the results.

#### The Digestion and Absorption of Lipid-Soluble Nutrients

Research Focus: Absorption and metabolism of carotenoids and vitamin A. Carotenoids (beta-carotene and related compounds) are important as dietary sources of vitamin A and also as antioxidants for humans and for animals. Research is focusing on factors which affect intestinal absorption of carotenoids and on the mechanisms

by which tissues take up and use carotenoids and vitamin A compounds: 1) Support of health for the general population: A significant fraction of the US population is now consuming dietary supplements of vitamin E and beta-carotene, and some are consuming supplements of other carotenoids such as lycopene. Interactions among these fat-soluble nutrients (enhancement of or interference with intestinal absorption) are not well understood. Nor is the effect of type and quantity of dietary fat on absorption of these micronutrients completely clarified. Studies conducted with Dr. Richard Clark using the lymph duct-cannulated rat model have addressed some of these issues, and will be continued. New studies using the preruminant calf as a model for human carotenoid absorption are being implemented, in cooperation with Dr. Clark and with Dr. Sheila Andrew. 2) Health implications for the elderly: Xanthophylls are a particular category of carotenoids that have been implicated in prevention of macular degeneration and senile cataract, two diseases of the elderly. Using in vitro and in vivo systems, faculty are investigating the factors controlling intestinal digestion and absorption of dietary xanthophylls. 3) Estimation of human vitamin A status: Assessment of human vitamin A status is still a major public health issue, especially in developing countries but possibly also in the United States. Improved methodology such as the isotope-dilution method and the relative dose response have been developed, but lack a firm conceptual basis for interpretation. Mathematical modeling of vitamin A metabolism has been developed by Dr. Michael Green at the Pennsylvania State University but has not yet been applied to these specific problems. One faculty member plans to spend a semester on sabbatic leave with Dr. Green to apply the techniques of mathematical modeling to these problems in nutrition. These mathematical techniques will be applied to the study of carotenoid absorption and metabolism. 4) Analytical support: The laboratories will continue to provide support for analysis of fat-soluble nutrients such as carotenoids and vitamin E (as in conjunction with Dr. Cameron Faustman).

Measures of success rely on the anticipated research results. Results from each of these projects are expected to result in several publications over the next five years, and also to result in external grant support.

Desirable outcomes include peer reviewed articles and reviews as well as meeting abstracts.

Internal partners are: Dr. Richard Clark (Dept. Nutritional Sciences), on intestinal absorption of lipid-soluble nutrients; Dr. Sheila Andrew (Ruminant Nutritionist in the Department of Animal Science), assisting in use of the preruminant calf as a model for carotenoid absorption. External partners are: Dr. Michael Green (Penn State University), on application of mathematical modeling to studies of human vitamin A metabolism; Dr. Andrew Clifford (University of California - Davis), on assessment of human vitamin A status; Carotenoids Research Interaction Group (CARIG) - a national research interaction group, sharing data and interpretations via an annual workshop and a regular newsletter; Dr. Dhiren Makdani (Lincoln University, Jefferson City, MO), on collaborative projects in carotenoid absorption with an 1890s institution.

Results will be assessed in terms of publications and grant support.

#### Nutritional Sciences/Essential Fatty Acid Status During Pregnancy and Infant Biobehavioral Outcome

Research Focus: This project is aimed at determining essential fatty acid status of women during pregnancy and the relationship of essential fatty acid status, achieved through dietary intake, to the biobehavioral outcome of the infant. The significance of this work is that it will bring the nutrition community closer to being able to make practical dietary recommendations to women regarding their fat intake before conception and during pregnancy. Improved infant outcome in terms of behavioral function is the ultimate goal. One of the groups of women being studied is women with gestational diabetes mellitus, which is a diabetes which occurs first during pregnancy. The data to date indicate that the infants of these women are at risk for lower levels of the essential fatty acid which is crucial to central nervous system development. Gestational diabetes occurs in up to 10% of all pregnant women, but the risk is 2 to 3 times higher for some populations, such as Latinos.

It is anticipated that the data gleaned from this project will provide the basis for future intervention studies; it will also provide preliminary data for grant proposals seeking further funding. On a practical level, dietary recommendations may be made to the population regarding the types and amounts of fats that should be consumed.

Outcome products will be reflected by peer reviewed articles, abstracts and presentations at national and international meetings and possibly consumer-oriented brochures.

(MS) This project is a collaborative effort between me as Principal Investigator and Dr. Evelyn Thoman, Co-PI, Biobehavioral Sciences, UConn. Clinicians at Hartford Hospital, Connecticut Children's Medical Center (CCMC), Hartford and The Cleveland Clinic Foundation, Cleveland, round out the research group. Charles J. Ingardia, M.D., Director of Maternal/Fetal Medicine and Director of Obstetrics is Co-investigator on this project; Dr. Ingardia has provided guidance to us in implementing the project and he will identify women with gestational diabetes mellitus, in addition to serving as clinical liaison. Victor Herson, M.D., Director of Neonatal Medicine, CCMC, is a cooperating clinician who is the liaison with his unit. Elliott H. Philipson, M.D., Chief, Section of Obstetrics and Maternal-Fetal Medicine, The Cleveland Clinic Foundation, is a consultant and collaborator on the

project; Dr. Philipson is an expert on gestational diabetes mellitus and has worked with us on previous projects. The Donaghue Medical research Foundation has awarded funding for this project in the amount of \$180,000 (total).

Diabetes, which occurs during pregnancy, gestational diabetes mellitus (GDM), is one of the most common abnormalities of pregnancy and occurs in up to one in ten of all pregnancies. Compared to Caucasians, Latinos have a risk 2 to 3 times higher. Infants of women with GDM often have developmental complications. It has been found that women who have GDM have lower levels of a fat, referred to as docosahexaenoic acid, or DHA. The importance of DHA during pregnancy is that large amounts of it are transferred to the fetal brain. That is, brain growth depends in large part of a supply of DHA during pregnancy. Studies suggest that perhaps women with GDM should be eating more foods rich in DHA (e.g., cold water marine fish). Lower levels of DHA, such as those observed in GDM, may be associated with impaired development of the brain and central nervous system in the infant. This is important, because this, in turn, relates to behavior and learning ability. Interestingly, development of the central nervous system has been assessed by measuring how the baby sleeps. That is, by measuring periods of sleep and wakefulness, there is an idea about development of the brain and central nervous system. The aim is to study women in pregnancy who have GDM and those who do not. DHA in their blood will be measured. They will also study how their infants sleep, using a special mattress covered with a fleece pad. The mattress is sensitive to very small movements of the baby and these movements tell us something about the baby's sleep or wake states. It is not necessary to attach anything to the baby to make these measurements. Based on data, if the pregnancy is complicated by diabetes, there may be a need for i) greater amounts of dietary DHA, or/and ii) tighter metabolic control under the direction of a physician. The duration of the study is 01/01/99-12/31/01.

The target audiences for the program effort include both nutritionists and clinicians.

Significance of findings will be assessed with a statistical approach.

#### Vitamin A Regulation of Gene Expression

Research Focus: In order to understand the role of diet in promoting health, it is imperative to delineate the role of specific nutrients in the human body. To this end, further research is being conducted to define the numerous effects of vitamin A on gene expression. Utilizing vitamin A deficient mice that contain a foreign gene that are monitored and vitamin A regulation of this gene in liver under different conditions of altered vitamin A status is measured. The studies in this project will also assess the effects of vitamin A on liver glucose metabolism using a recently developed method, in vivo liver NMR. The cellular vitamin A signaling pathway will also be examined to determine how the vitamin A message is sent to the nucleus of the cell and is transmitted to the DNA. The nuclear vitamin A receptors and their binding to specific regions of the DNA in target genes will be examined. Additionally, co-activators and co-repressors which are recruited by vitamin A receptors to the transcriptional machinery of target genes will be measured. As the final objective, the requirement for vitamin A for the correct differentiation of the liver in the developing mouse fetus will be examined. Overall, this project will determine the need for vitamin A in the correct differentiation and function of the liver and endogenous glucose production by this tissue. Potentially, this will increase the understanding of the metabolic dysfunction which occurs in liver in Type II diabetes, which is characterized by oversecretion of glucose by the liver.

In this field, success is measured in terms of grants funded and research results published.

The desired outcome products are peer reviewed articles in high-impact journals, the opportunity to present research results at national/international meetings, and funding to maintain my research program and recruit good graduate students.

Internal partners are: 1) Dr. Harold Furr (Nutritional Sciences) - Dr. Furr does the analysis of vitamin A metabolites in the blood of experimental animals. He has been working with me on my NIH project which is now in its fifth and last year. He will also work with me on my USDA project which will begin 9/1/99 and continue for the next three years. 2) Dr. Richard French (Pathobiology) - Dr. French provides critical expertise in the analysis of liver samples from mice on different dietary regimens. He has worked with me over the past year to analyze both mRNA and protein patterns in liver tissue. His expertise will also be required on the newly funded USDA project. External partners are: 1) Dr. Alex Lange, (Biochemistry Dept. University of Minnesota School of Medicine) - Dr. Lange is highly involved in the newly funded USDA project. He will provide all the expertise on liver NMR techniques applied to experimental animals. Dr. Lange pioneered this technique specifically for metabolic assessment for the mouse. The NMR equipment is located at the University of Minnesota and transgenic mice will be shipped to Minnesota for these studies.

Two federally funded research projects are ongoing both of which examine the effects of vitamin A on gene expression. The NIH project is a five year project with \$350,000 plus indirect costs. The funding period for the

NIH project is 5/1/95 - 4/31/00. One USDA project is a three-year project with \$260,000 plus indirect costs. The funding period for the USDA project is from 9/1/99-8/31/02.

The research methods involved are as follows: 1) Nutritional - a) vitamin A deficiency and retinoid treatment protocols, b) HPLC analysis of retinoids; 2) Molecular Biological - a) RNA analysis, b) In situ hybridization, c) Immunohistochemistry, d) Differential Display, e) DNA binding (Electrophoretic Mobility Shift Assay), f) Biochemical - In vivo liver NMR.

These NIH and USDA-funded projects are basic research projects and, as such, do not really involve target audiences. It is hoped that successful basic research will lead to applied therapeutic benefits in biomedicine in the future.

### Community Nutrition

During the next five years, one area of concentration will continue to be public health and community nutrition. This topic will continue to cut across my teaching, research, and Extension duties. Public health nutrition is of major importance as over half of premature death and disability worldwide is related to poor nutrition practices.

Success will be measured by grant dollars received and published research articles. During the past five years over \$1 million dollars in extramural funding has been generated and it's expected to bring the same level of funding during the next five years.

Publishing is expected to continue at the current rate of four peer reviewed research articles per year, one high quality Extension report per year, and 3 Extension educational products per year. During the coming five years a minimum of 10 research/Extension invited and regular talks at national meetings every year is expected continue.

Partners include: 3-5 graduate students, 10 Family Nutrition Program - IT staff, administrative assistant (Lisa Phillips), Hispanic Health Council, Hartford Hospital, Hartford School System.

Critical thinking and problem solving skills of students are encouraged. They are challenged with questions that require serious thought before they can be answered. This allows students to understand and apply the 'problem solving' strategy i.e. problem identification, problem definition, alternative solutions, choosing best solution(s), evaluating best solution(s), re-defining the problem and restarting the problem solving cycle. Emphasis is placed on relating the biological basis of nutrition with public health issues in Connecticut, the rest of the USA and abroad. Teaching also involves supervising field experiences (NUSC 281) and independent studies (NUSC 298) that allow students to experience real life community nutrition problems and programs. In Spring 1997 for the first time this faculty member taught 80% of a graduate course in Nutritional Epidemiology (NUSC 342). The main goal of this course was to teach students how to critically evaluate research papers published in this field. Based on the final assignments and course evaluations it seems that this goal was accomplished. Student evaluations are taken very seriously, knowledge is constantly updated and state of the art teaching technology is used to keep improving.

Research and Extension Focus: Goals are to: a) develop a cost-effective research-based nutrition education program to serve the inner-city in collaboration with community health agencies, b) examine the impact of food assistance programs on child health and nutrition, c) understand the relationship between infant feeding practices and lactational amenorrhea, and d) identify modifiable determinants of lactogenesis II in humans. During the last four fiscal years Family Nutrition Infant and Preschooler Program has been directed (FNP-IT, a collaboration between UConn and the Hispanic Health Council). FNP-IT Extension efforts reached approximately 50,000 people this year through direct services from bilingual staff, health fairs and social marketing. This program was designed with a built-in evaluation component which will allow measuring the cost-effectiveness of efforts. FNP-IT has received handsome coverage by the mass media. FNP-IT technical reports have assisted legislators with their policy decisions related to welfare reform and child nutrition. Doctoral students are doing research examining: a) the determinants of lactogenesis II in humans, and b) the impact of the Food Stamp Program on child nutrition outcomes. Masters students have recently completed research projects on: a) determinants of pediatric obesity, b) maternal nutritional status and lactational amenorrhea, and c) development of a color-coded bilingual food label. Results from these studies and FNP-IT have been presented at scientific meetings and have already been disseminated through peer reviewed publications.

Evaluation techniques include: the number and quality of peer reviewed publications; the number and quality of Extension publications; FNP-IT evaluations; and student teaching evaluations

### Food Service Systems Management and Dietetics

Academic Program Focus: The dietetics program is going through a self-study and will be evaluated by the Commission on Dietetic Registration, American Dietetic Association (ADA). This process entails reviewing the entire curriculum and focuses on outcomes. Evaluation measures are necessary to ensure that all knowledge

requirements are successfully met. The evaluation is by students, graduates internship directors, and employers, in addition to an external advisory committee.

The impact of the self-study will be accreditation by the American Dietetic Association. With the recent changes by the Commission on Dietetic Registration (CDR), a site visit will take place in 2001. In the past Didactic Programs in Dietetics were approved program, they will now become accredited program.

Outcomes desired are accreditation and continued success in student placement into dietetic internship programs and passing of the national registration examination.

Partners include: Department Faculty; Advisory Committee members: Tom Horn, Aramark Corporation; Susan Fiore, Nutrition Education and Training Program Director, State Dept. of Education, Child Nutrition Programs; Debbie Ford Flanel, Yale-New Haven Hospital; Susanne Neubauer, Ph.D., RD, Framingham State College.

The didactic program in dietetics is continually evolving program and requires constant attention. A director of the program is always appointed. The site visit will occur in the year, 2001.

Students in the dietetics program including graduate students who want to become registered dietitians and second degree bachelor's students.

The target audience consists of nutritional sciences undergraduates, graduate students, second degree undergraduate students, and students in Nutritional sciences courses.

Becoming accredited and continuing with a good pass rate on the registration examination will serve as the evaluative tools.

### Nutrition Education and Training

Cooperative Extension Focus: With the passing of USDA's Healthy School Meals Initiative (SMI) in 1997, nutrition education training for all Connecticut school food authorities is a necessity. The SMI states that all school food authorities serve meals to children in keeping with the Dietary guidelines for Americans with specific nutrient standards for each age/grade grouping of children. Training is necessary at the level of the school cafeteria as well as for teachers, students and parents so that healthy school meals are not only prepared and offered but also consumed.

While funding was not available from Nutrition Education and Training (NET) this fiscal year, an application was submitted and received for a Team Nutrition Training Grant funded through 2000 and additional funds have been requested through 2002. Funds from this grant are being used to implement the SMI in Connecticut. It is anticipated that, upon state mandatory review and menu analysis, 95% of school food authorities will be offering menus in compliance with SMI regulations. Training will include regional training, individual technical assistance and resource accessibility through a Team Nutrition Web site.

Desired outcomes include menus in compliance with SMI regulations and student acceptance of healthy menus demonstrated by increased participation in the school meals programs. Other outcomes include a Team Nutrition web site with resources, training opportunities and educational materials for school food personnel, teachers, students and parents.

Some of the resources and partners of the program are Susan Fiore, the State Department of Education, Child Nutrition Programs and the Connecticut School Food Service Association.

Team Nutrition Training Grant is a 2-year project from 9/1/98-8/30/2000. Additional funds are requested for 9/99-8/2001. On-going training for school food authorities in SMI regulations, healthy culinary techniques, menu planning, production, food safety and standardized recipes.

Audiences include 227 school food authorities and their staff of over 5000 (cooks, managers, and production personnel). All Connecticut school teachers and students with access to the Internet will also be targeted. Training will include regional workshops, train-the-trainer models, individualized technical assistance and web site resource development.

Target audiences include 227 school food authorities and their staff of over 5000 (cooks, managers, and production personnel). All Connecticut school teachers and students with access to the Internet will also be targeted.

There are two main evaluation techniques. First, schools are reviewed every five years for compliance with Child Nutrition Programs regulations. This review will include menu analysis. Second, all trainings will include an evaluation component and the web site will have an evaluation/comment page to submit.

### ALLOCATED RESOURCES - GOAL 3

Programs listed below reflect funding from all sources including Hatch funds, Smith Lever funds, Offset, University operating, grants and special projects.

Finding resources for new program areas as well as funding ongoing programs as traditional support has vanished is critical. In some areas, current support is adequate while additional resources would facilitate moving the research and Extension agendas along at a faster rate.

Financial resources needed for the completion of the above activities include the following:

- graduate assistants
- technical support staff
- clerical support for grant and publication editing and submission
- additional EFNEP staff funded from non-EFNEP sources
- Assistance in survey development and implementation
- development and maintenance of web sites
- staff to support conference planning
- staff support for the Home and Garden Education Center related to food and nutrition
- staff support for graphic design and computer technical assistance
- support for Extension educators on financial management related to food budgets
- bi-lingual program staff and updated materials in both English and Spanish
- staff in EFNEP to provide education focused toward grandparents caring for young children

Additional non-staff support for programs includes:

- conference and annual symposium
- Extension and undergraduate educational material development
- newsletter development and distribution
- equipment maintenance and repair support
- renovated lab space
- yearly allocation for supplies, experimental animals
- funds to support translation of educational materials into Spanish
- space for the Family Nutrition Program
- renovation of the lipids lab
- ADA Program fees
- purchase of updated software
- more portable equipment for EFNEP presentations
- staff training for EFNEP in the areas of poverty issues, specialized health issues related to diet, training in motivating and counseling clients
- support for design, production, and marketing of EFNEP materials
- funds to support in-state and out-of-state travel needs
- computer software for nutrition education
- curriculum for EFNEP focused on low literacy

#### Funds Spent in Support of Goal 3

	1999	2000	2001	2002	2003	2004
Total from all Sources	122,703	122,703	122,703	122,703	122,703	122,703

GOAL 4: Greater harmony between agriculture and the environment. Enhance the quality of the environment through better understanding of and building on agriculture's and forestry's complex links with soil, water, air, and biotic resources. (1862 Research, 1862 Extension)

COLLEGE PROGRAM TEAM PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

#### ECONOMIC VIABILITY TEAM

##### Program of Landscape Architecture

A significant portion of the economic viability team's mission lies within the training and expertise of the landscape architect. Issues such as environmental protection, natural resource management and balancing preservation and conservation with the needs of development and economic viability are the exact issues that many professional landscape architects deal with everyday.

The primary impact would be to enhance the existing abilities of the economic viability team. In addition, landscape architects through this team or related teams, could specifically address issues of how land use decisions impact perception, interaction and enjoyment of various environments.

This work will result in Extension publications and community workshops.

Partners will be: Communities, Foundations such as the Pew Charitable Trusts and the Charles Stewart Mott Foundation; Others within CANR working on related projects; Other similar programs in other states.

An ongoing resource for the state that would address the diverse issues related to land conservation, land development, resource management and related issues.

Methods will include workshops for professionals and workshops for community officials, both of which will have 15-20 attendees. Results will be presented at state and regional conferences (40-60 attendees) and results published.

Target audiences are professional (landscape architects and community planners) and community officials.

Evaluations will be primarily through changes in professional methodologies and possibly follow up studies to see if changes have occurred.

##### Marine Resource Economics and Policy

Cooperative Extension System and Research Focus: Long Island Sound is an important natural resource for Connecticut and nearby states. The Sound has been called an "urban sea" because of the large population and high levels of commercial and industrial activity surrounding it. The Sound is used for a wide variety of purposes, some of which are dependent on good water quality, such as commercial fishing and recreation. However, the Sound has been experiencing deteriorating water quality over the last several decades. Significant improvements in water quality in Long Island Sound will come only after substantial outlays of public and private funds. Therefore in order to justify such large expenditures, it is essential to have accurate economic estimates of the benefits or values accruing from Long Island Sound.

Measures of success will be at least 2,000 citizens gaining knowledge of the process of developing programs and policies related for Long Island Sound. At least 200 public officials understanding the importance of incorporating economics in formulating programs and policies for Long Island Sound.

This work will result in journal articles, abstracts, conference presentations, workshop presentations, M.S. Thesis, Extension publications and fact sheets.

Partners will be Connecticut DEP, Marine Advisory Service (Avery Point and Yale), Graduate Assistants.

The Long Island Sound Study's Comprehensive Conservation and Management Plan makes a number of recommendations for improving the environmental quality of the Sound, some of which require substantial public and private expenditures. Consequently there is a need to accurately estimate the values of natural and environmental resources of the Sound in order to justify the considerable outlays required. The objective of this program is to prepare such valuation estimates. Specifically, this program will: (a) Identify economically significant resources and uses of Long Island Sound. (b) Develop estimates of values of the important uses of Long Island Sound which are dependent on water quality, including (but not limited to) commercial finfishing and shellfishing, recreational beach swimming, boating, and sportfishing. Also estimates of coastal wetland values and intrinsic or "non-user values" will be developed. (c) Provide information to policy makers for use in allocations of funding for environmental improvements in Long Island Sound.

Methods will include: Survey Development and Implementation; Analysis of Survey results; Preparation of journal articles and technical reports.

Target audiences are Government agencies (CT DEP), State legislature, Faculty at UConn and other universities (MS), Environmental Organizations.

Evaluations will be measuring change and improvement in programs and policies related to Long Island Sound.

### Agriculture in New England Project

Cooperative Extension System Focus (multi-state): Within New England, the dairy industry is the major commodity group affected by changes in federal agricultural programs. The phase-out of dairy commodity programs creates new challenges for regional dairy farmers, the rural landscape and rural communities. Diversification strategies will be developed to enable dairy and other types of farmers to expand to new crops and agricultural based enterprises, in order to increase farm income and viability.

Measures of success include: a. 50% of Connecticut dairy farmers will complete a survey form providing information on current operations, future plans, and interest in considering alternative agricultural enterprises and activities; b. Identification of specific alternative farm-based enterprises for adoption by New England farmers: incorporation of selected alternatives in a series of case studies which will be used by farmers assessing the profitability of alternative enterprises on their farms.

This work will result in: a) dairy survey report; b) case study reports/fact sheets; c) newsletter and magazine articles; d) presentations for farm association meetings; e) radio program interviews

Partners will be: Connecticut dairy farmers, Connecticut Farm Bureau Association, Connecticut Department of Agriculture, Connecticut Rural Development Council, University of Massachusetts, First Pioneer Farm Credit System.

Partners serve on project advisory committee, providing advice, contacts and support for project activities.

Develop research and outreach education programs that will provide assistance to individual producers and farmers who are seeking to expand or diversify into new agricultural enterprises such as agri-tourism, aquaculture, or specialty crop production. a. Determine the extent of alternative farm-based activities currently ongoing in New England and the extent of interest on the part of existing producers in engaging in or expanding such activities. b. Identify specific alternative farm-based enterprises for adoption in the New England region and incorporate these in a series of case studies for assessing profitability of existing production units seeking to diversify their activities. c. Develop teaching and outreach programs and activities that help farmers develop and implement alternative farm-based enterprises.

Strategies will include reviewing literature and research projects in the area of alternative farm-based enterprises; surveying of dairy farmers; developing case studies of alternative farm-based enterprises; and developing outreach education materials and presentations.

Target audiences are dairy farmers and other producers in Connecticut and New England; agricultural associations, financial institutions, and State Department of Agriculture.

The project advisory board will identify issues that emerge and suggest ways to resolve and improve the project implementation. Program monitoring will be an integral part of project activities. Post-workshop questionnaires will provide information about participant's benefits from the educational programs. An impact evaluation will be conducted to determine program outcomes, and changes in individual behavior and communities that result from the project. Outcome indicators will include: Increased levels of farmer information about farm-based alternatives; and increased numbers of farmers starting alternative farm-based enterprises.

### Forestry, Wildlife and Land Use

Cooperative Extension System Focus: Connecticut's 1.8 million acres of forest provide the raw material for over 350 forest products processing and manufacturing firms, which collectively employ 3,600 citizens and contribute over \$400 million annually to the state's economy. They also clean air and water, provide habitat for wildlife, and provide recreational opportunities for nearly a million citizens each year. Research shows that Connecticut is losing some 11,000 acres of forest annually to development, and that forest fragmentation has caused the average forested parcel size to decline 34% over the past 20 years. In addition, only about one commercial forest products harvest in seven involves any professional forestry input or supervision.

Measures of success will be forested acres under stewardship plans; forested acres enhanced for wildlife, forest products production and other benefits; important forested acres protected from conversion to other uses; knowledge gained by forest owners, natural resource professionals and forest products harvesters.

This work will result in Extension publications; peer reviewed articles in the Journal of Forestry and Society and Natural Resources; video productions.

Partners will be The Quinebaug/Shetucket National Heritage Corridor, Inc (QSHC)(MS); UMass Extension (MS); DEP Division of Forestry, Wildlife and Inland Water Resources; the Society of American Foresters (MS); The Nature Conservancy; the Southern New England Forest Consortium, Inc (MS). Grants from The Ruffed Grouse Society, QSNHC, DEP and the U.S. Forest Service.

Annual training and support of forest landowner educational volunteers; workshops and short courses for forest owners; continuing education periodical and conferences; comprehensive safety and environmental training for forest products industry; continuous print and electronic media outreach campaign; UConn Forest demonstration management areas and program.

Methods will include random sample surveys and focus groups as needs assessment tools; goal of 5,500 forest owners, 650 resource professionals, 300 loggers impacted annually.

Target audiences are non-industrial private forest owners, natural resource professionals, commercial forest products harvesters.

Evaluations are pre, post and time-lag impact and behavior change surveys to all three audiences.

### Food Marketing Policy Center

Research Focus: The FMPC conducts an extensive research program with faculty participating on industrial research projects. Currently, 13 researchers from five universities participate.

Impacts will include advice to policy makers on competition and food safety issues at the state, federal and international level, several conferences, and research publications.

Partners will be Henry Bahn, USDA/CSREES, funds FMPC, FTC, US DOJ, State Attorneys General, USDA, US Congress, World Trade Organization. Nearly all of this is multi-state.

The FMPC has a four-year plan of work with more than 12 individual projects in the competitive strategy and food safety areas. All are research projects that will produce publications.

Strategies will include assembling FMPC researchers at least once a year to identify research topics, and methods, and to monitor progress.

Clearly, the best evaluation for policy oriented research is use and impact on policy decisions. Past impacts have been highly visible.

### Consumer and Family Economics

Cooperative Extension System Focus: The economy has had a profound effect on Connecticut citizens. Consumer debt has soared in the past five years and has led to escalating rate of personal bankruptcies that exceeded 1.4 million in 1997. According to CCCS, 10,000 Connecticut residents were spared bankruptcy by financial counseling which was up 256% from 1998. According to Rubin (1997) consumer expenditures by the elderly is expected to grow as much as 20% by the middle of the next century due to the changing elderly population that retire early and live longer. Three times as many single females live below the poverty level than married couples. The vulnerable elderly (incomes less than 200% of poverty) spend three-quarter of their budget on necessities (food, housing, and health care). Unemployment in Northwest CT has increased in 1999 with five towns reporting job loss ranging from 5% to 66.2% (Source The Connecticut Economy Winter 99). According to Bureau of Census data, Connecticut cost of living ranks among the highest in the country, 20% higher than the national average. Due to these situations and political issues such as welfare reform, many Connecticut citizens have experienced financial stress.

Cooperative Extension faculty in North/West Connecticut will improve the economic well-being of individuals and families through educational training and decimation of consumer education and financial information. Collaborative efforts with sponsoring agencies, organizations and media will be utilized to reach client groups including low income consumers, unemployed, divorced, widows, single parents, and financially stressed elderly. Issues to be addressed including basic money management, budgeting, debt management, banking services, credit, savings, financial planning, resource management and consumer education.

Measures of success will be: 400 financially stressed individuals will gain knowledge and improve money management practices through participation in CES Money Management programs; 2. 50% of individual program participants will improve their personal financial situation through improved money management practices, reduced indebtedness, and/or increased savings; 3. 60% of financially stressed individuals will develop a spending plan to more effectively utilize their income and reducing indebtedness.

This work will result in presentations at professional conferences and community groups, media outreach - radio, television, newspaper articles; Distance learning and electronic media will be used for dissemination of information. (i.e. satellite programs, e-mail, WWW); Development of Extension publications, Consumer and Financial Management Fact Sheets for CES Web site if funded and supported technically by CES; Impact sheets to UConn administration, collaborators, local community groups, government officials, Agricultural Economics.

Resources and partners are CES state funds (publications; travel to professional meetings ACCI/NAEFCS; evaluation, technical support, and equipment), allocation of CANR/University faculty and staff time from Agricultural Economics faculty, CIT for Web site development and maintenance, design of publications, fact sheets and exhibits, state agencies (Department of Social Services, Town Social Service Providers, etc.) and agencies/organizations (Connecticut Consumer Credit Counseling, AARP, CL&P, Area Agencies on Aging, Community Council, Community Forum, local media, etc.)

The following program will be utilized to improve the financial wellbeing of Connecticut families: Money 2000 (MS)-web site and financial information program designed to increase saving and reduce debts of Connecticut participants. Financial Information Workshop (MS) - A six-week course designed for midlife and older adults to make informed decisions about their finances. Topics addressed range from record keeping and investing to estate planning issues. Sponsored by AARP and local community leaders. Money Management Workshop/publications - A money management workshop featuring individual fact sheets designed to help individuals understand basic financial services including money management, goal setting, budgeting, cash management, banking services, debit cards, and savings and debt reduction. Agency/Teacher Training- Educational seminar and or training session in emerging financial and consumer education issues. Summer institute for teacher education/4-H leader training at UConn in conjunction with Agricultural Economics/Family Youth Teams.

Educational strategies include: develop and market MONEY 2000 program and fact sheets through CES Web site and local media outreach efforts; conduct Money Management Workshops and Agency Training for individuals and staff through cooperative effort with sponsoring agencies and College Team; conduct Financial Information Workshop (WFIP) for midlife and older adults annually utilizing local community sponsors; use of satellite for distance learning when available at CES site); publish fact sheets and articles in newspapers, newsletters, and other popular press outlets; use media (radio, TV, and electronic) for distribution of financial information.

Target audiences are: 100 Connecticut consumers will report increase savings or debt reduction through participation in MONEY 2000; 100 unemployed/limited resource adults will adopt money management skills in budgeting and resource management. 100 low income will gain money management skills through participation in training programs to improve money management practices and reduce debts; 100 widows/divorced/single parents will utilize knowledge gained through financial information workshops and/or publications (Parenting Apart/Divorce Ed/WFIP); 100 agency staff/teachers will gain knowledge of consumer and financial management issues through participation training programs.

Program results will be obtained from pre-post test of workshop participants. Names, addresses, and phone numbers of program participants will be utilized to conduct follow-up impact evaluation based upon use of graduate students and/or UConn faculty. Program Impacts by sponsoring agencies will be utilized to document measurable results based upon data provided. Participant surveys and questionnaires may be utilized or phone survey conducted to assess program impacts annually. Use of such evaluation techniques is limited to availability and staff support from UConn.

### The Economic Viability of Agricultural Biotechnology

Measures of success will be: 1) conduct world-class research/scholarship and Ph.D. education through selective excellence, focusing resources in those areas where true national and international distinction can be attained; 2) create an understanding among the people of the state of the importance of agricultural biotechnology; 3) an increase in the number of ag biotech patents produced by UConn; 4) an increase in the geographic economic development coming from those patents produced.

This work will result in scholarly articles, articles in the popular press on the importance of Agricultural Biotech and the creation of five new start-up companies in the biotech field in the state.

Partners will be Food Marketing Policy Center, University of Connecticut, Ron Cotterill Director; Office of Technology Transfer, University of Connecticut, Charles Goodman Director; Jerry Yang, Professor, Animal Science Department, University of Connecticut; Bradford Barham, Professor, Agricultural Economics, University of Wisconsin-Madison.

Many land grant institutions are in the process of investing heavily in research and education efforts in agricultural biotechnology as part of an effort with state and local support to assist in developing a vibrant and proximate biotechnology sector. This study seeks to go beyond the current work in the field by providing an empirical examination of the importance of university research in the agricultural biotechnology industry. An understanding of these linkages will be used to generate teaching opportunities for students, faculty, and university administrators. This can further the development of the ag biotech sector in the state of Connecticut.

Strategies of the Extension work will be presentations to the target audiences described below at a number of different forum including classrooms, Extension meetings.

Target audiences are: people of the state of Connecticut involved in ag. biotech or who might become involved; scientists, businessmen, venture capitalists; farmers; policy makers; and students of UConn.

The program will be evaluated based on its ability to meet the goals described above as evidenced by the measures of success, the desired outcome products. This evaluation can be completed with discussions with the target groups.

### Resource Preservation

Research Focus: Land trusts have emerged in recent decades as an important element in environmental conservation and preservation efforts. Collectively, land trusts are credited with protecting almost 3 million acres of private land from development in the U.S. In the situation of increasing environmental concern and faced with the limitations of governmental actions, citizens have formed land trusts in order to act upon these concerns to preserve and protect their local land resources. Any steps that can be taken to enhance the effectiveness of land trusts will serve the public interest by helping to assure that local environments will be protected for the benefit of this and future generations. The fundamental objective of this research is to attempt to understand, and thereby to enhance the effectiveness of these important organizations.

Measures of success will be increased collaboration among Connecticut trusts and between land trusts and governmental (e.g. DEP) and nongovernmental (e.g. The Nature Conservancy) organizations; increased acreage preserved; citations.

This work will result in peer reviewed articles.

Partners will include the Nature Conservancy which has provided mailing lists of Connecticut land trusts.

Three years: Develop mailed questionnaire, analyze responses, interview respondents from selected land trusts, write up results for publication.

Strategies include a mix of quantitative (survey) and qualitative (interviews) methods aimed at identifying structural and interorganizational characteristics which are associated with highly effective land trusts and on that basis propose means by which less effective land trusts might enhance their effectiveness.

Target audiences are Connecticut land trusts; environmental sociologists.

Evaluations are feedback from land trust officials; publication of results in peer reviewed journals.

### Product Differentiation for Environmental Policy

Producers, industry groups, consumers groups, and retail outlets commonly provide information to consumers about food products. Some information is mandatory through government laws and regulations, while other information is provided voluntarily in a presumed attempt to influence consumption. As a logical Extension of these common methods of conveying information to consumers, varying notions of "eco-labels" have appeared over the last twenty years in U.S. and foreign markets (fresh and processed food products, non-food agricultural products, natural resource industries, and manufacturing). Most existing eco-labels were developed in the late 1980s and early 1990s. There were eco-label schemes operating in at least 17 countries as of about 1995, although this number has certainly grown over the past couple of years, with labeling possibilities existing for over 200 product categories as of early 1995. Given the explosion in interest in eco-labels over the past couple of decades, there has been surprisingly little analysis of the market impacts from the development of various eco-labels and of the hoped-for environmental benefits of eco-label programs. In the end, while there is little reason to suggest that providing information to consumers is inappropriate in a market economy, there is seemingly little information (empirical or theoretical) to suggest if, or under which conditions, voluntary eco-label programs can be a useful instrument to support environmental policy objectives.

Measures of success will be one-two analyses completed of the environmental impacts of eco-labels for specific agricultural commodities.

This work will result in about two-three articles completed as part of the program (of which at least one is in a refereed journal articles), and presentations in at least one national or international conference.

Partners include The Food Policy Marketing Center, Harvard University, and USDA (ERS) through collaborative research and publications (MS).

Key components are joint research on a variety of topics related to ecolabels and environmental protection. The initial stage of this program will last through about August 2001. Additional details on program initial focus: In one of the few existing published pieces on eco-labels, Mattoo and Singh (1994) conclude that "labeling will lead to a reduction in market demand for the product produced by environment-unfriendly methods if and only if the quantity demanded by potentially concerned consumers at the undifferentiated market price is greater than the quantity supplied at this price by environment-friendly producers" (p. 63-64). Mattoo and Singh (1994) suggest that this conclusion provides an empirical test to consider when the creation of an eco-label will lead to an

environmentally preferred outcome (defined as less environmental impact from production of the non-labeled and labeled products). To date, this empirical test has not been implemented. As a result of these suggestions, Mattoo and Singh (1994) conclude that the criteria for eco-label status should be endogenous based on market share of different production methods and finally that the standards for eco-label status should be ratcheted up over time to keep the share of the labeled product in the total market at an appropriate level. While suggestive of the issues, the rather severe assumptions of the model by Mattoo and Singh (1994) are questionable in realistic situations. As a result, two activities are to: implement the empirical test outlined in Mattoo and Singh (1994) for one food product; and to generalize the theoretical analysis in Mattoo and Singh (1994) to more general and realistic conditions.

Strategies and methods include research, publications, and presentations.

Target audiences include: the academic community (U.S. and foreign), USDA, other governmental organizations such as USAID, the World Bank, the WTO and the UNEP.

### Economic Viability

Academic Program Focus: The purpose of this project is to develop a coordinated approach among the Extension and research units of the College of Agriculture and Natural Resources to address the broad producer, environmental, and community related issues and problems that the transition away from government dairy commodity programs will create in New England. The dairy industry is the most significant agricultural sector in the region in terms of cash receipts. The long-term viability of this sector is a matter of growing concern due to changing public policies and economic incentives.

\$350,000 has been received from the Fund for Rural America to evaluate these issues. Measure of success will be research output and outreach programs that will assist dairy farmers in their long-term decision making.

This work will result in peer reviewed articles, Extension publications, conferences and workshops are all anticipated products.

The project includes a broad based external advisory board which includes: Connecticut Farm Bureau, Connecticut Department of Agriculture, First Pioneer Farm Credit, Natural Resources Conservation Service, private dairy farm owner/operators in Connecticut, each of these groups along with other advisory board members has participated in an advisory board meeting and assisted the group with a survey of dairy farm owners in Connecticut, researchers at the University of Massachusetts (Joe Moffitt) and out-of-state advisory board members.

The project is a three-year program designed to address interactions among on-farm dairy producer technology, agricultural diversification alternatives, and rural community development.

Educational methods include workshops, publications and bulletins, and web sites. Audience size will vary from 20 to 100 depending on the nature of the workshop or conference.

Audiences include dairy producers, landowners, state and federal agricultural and environmental agencies, and regional and community development groups.

Program monitoring will be conducted using evaluations of workshops or events. Program evaluations using expert assessments or case studies will be conducted of the overall program success in informing farmers public agencies and communities about technologies and alternatives.

### Economic Viability

Northeast agriculture is facing competition with other sectors of the economy for the use of labor force. Also, the poultry and dairy productions in the Northeast region rely heavily on feed grains produced in the Midwest states. Modern transportation, highways, and refrigerated trailer trucks, and communication systems coupled with market news services through Internet result in strong interregional competition. The government policies and provisions of GATT also result in significant international competition in trade. The trade affects the domestic and regional prices, consumption, and henceforth production.

In general, new research methodology and models that can be used in broader area of economic applications is being developed. In particular, useful results regarding factors directly or indirectly affecting competitive Northeast agriculture will be measured and the empirical model will serve as a basis of answering questions regarding the competitiveness of Northeast, New England, and Connecticut.

This work will result in publication of peer-reviewed articles, presentation of results and discussion in association meetings, publication of proceedings of meetings in a form of abstract or book Chapters.

Partners will be maintaining contact with other members of faculty in the Department regarding their research projects and try to work together where possible to achieve a team project such as the publication of Connecticut 2000 in the past. External linkage includes co-authors of books as described in individual plans.

The basic objective of this research is to analyze the factors that directly and indirectly affect the Northeast Agriculture. Published data will be used on mathematical models in estimating the parameters of equations that

explain economic phenomena. The causal effects of economic variables will be identified and measured. This Hatch project CONS00655 has duration till 2002. Continued effort will be placed to extend the research into future. On the other hand, this researcher will cooperate with other members of the team to assist quantitative aspects of research including determination of sample size, and statistical analyses. As a team project, the emphasis can be shifted to the assistance of other individual projects concerning econometric analyses.

The approach is to investigate the degree of the effect of agricultural commodity trade regionally and internationally on the changes of agricultural activities in the Northeast region. Specifically, the growth or decline of selected agricultural industries pertinent to the Northeast agriculture will be studied with respect to the import and export of the final outputs such as poultry and dairy, and the inputs such as feed grains. Alternative models of interregional and international trade will be used to measure the impact of the changes in input costs or changes in trade volume as a result of policy changes or trade barrier removal, or implementation, on the selected agricultural industries. Models considered include spatial equilibrium, and aggregate partial equilibrium models. Homogenous versus differentiated products can be considered where the data are available and allowed.

Target audiences will be the readers of journal articles, technical bulletin, or book chapters.

The best evaluation technique is the response of readers in the form of book reviews of your work, citations of your papers or books, and number of requests of software you created, and the number of visits of your web pages.

### Economic Viability

The competitiveness of food product markets at the national and international trade levels. At the international level, the focus will be on the globalization of processed food products. This information can be crucial in articulating arguments for U.S. food processors to gain greater access to foreign markets via trade negotiations. At the national and state level, the focus is on pricing and cost efficiency of industrial concentration in processed food markets. This information can prove useful in improving decision making with regard to antitrust and regulation of targeted industries.

A National Research Initiative grant from USDA and a CRIS project will be requested for the international component. The national component will be funded in part through state and the Food Marketing Policy Center. Results from these efforts are of primary interest to policy makers involved in trade negotiations or regulation of and assistance to U.S. and state food industries.

The primary outcome sought is refereed journal articles.

For the international component, one faculty member within the department will be the primary collaborator. For the national component, there are two other collaborators: one professor from the University of Nebraska and another one from Rutgers university. The last component will be funded by the Food Marketing Policy Center. The international component has an execution horizon of fiscal years 2000 to 2002, beyond which the focus will be revised. The national component seeks a permanent collaboration arrangement among the investigators.

The key research strategy is to apply empirical models developed by one of the investigators to the entire food processing subsectors, utilizing the time of the investigators as well as graduate assistants.

Target audiences are policy makers and academics.

Evaluations will be the numbers of publications and the quality of scientific journal where research output are published. Also the number of invited presentation and selected papers presented at professional association meetings.

### Program of Landscape Architecture

A significant portion of the economic viability team's mission lies within the training and expertise of the landscape architect. Issues such as environmental protection, natural resource management, and balancing preservation and conservation with the needs of development and economic viability are the exact issues that many professional landscape architects deal with everyday.

The primary impact would be to enhance the existing abilities of the economic viability team. In addition, landscape architects through this team or related teams, could specifically address issues of how land use decisions impact perception, interaction and enjoyment of various environments.

This work will result in Extension publications and community workshops.

Partners will be communities, foundations such as the Pew Charitable Trusts and the Charles Stewart Mott Foundation, others within CANR working on related projects and other similar programs in other states.

The purpose of the project is an ongoing resource for the state that would address the diverse issues related to land conservation, land development, resource management, and related issues.

Strategies include: workshops for professionals including (15-20 attendees); workshops for community officials (15-20 attendees); present results at state and regional conferences (40-60 attendees); and publish results. Target audiences are professional (landscape architects and community planners) and community officials. Evaluation techniques will be primarily through changes in professional methodologies and possibly follow up studies to see if changes have occurred.

### Forestry/Forest Stewardship

Cooperative Extension System Focus: The forested land area of the state of Connecticut provides numerous benefits to the quality of life and economy of the state. Protecting public and private water supplies, supporting a 300+ million dollar annual forest products industry, providing the backdrop for a growing recreational and tourist industry, and wildlife habitat are just some of the benefits identified. The bulk of this forestland (almost 90%) is owned by private individuals and groups. These private holdings comprise more than one-half the land area of state. The continued health and productivity of the forest is threatened by population pressures resulting in conversion and fragmentation, as well as other natural factors, bringing about a decline in the collective and individual benefits provided by forest resources.

The Connecticut Forest Stewardship Program provides technical assistance to private forest landowners, educating them as to the advantages of actively managing their forest holdings. The forest products industry of Connecticut depends on private landowners for 90% of its raw material supply. Education and assistance provided to landowners helps to insure the health and productivity of the forest for now and into the future.

Measures of success will be improving upon the numbers of forest landowners who utilize the services of a professional forester when conducting commercial forest operations is a measure of the success which indicates concern for the long-range health and productivity of the forest. The primary indicator of the success of the Forest Stewardship Program has been shown to be the number of forestland owners (and acreage) utilizing the benefits of the program to obtain a Forest Stewardship Plan for their property. The numbers of professional foresters utilizing the program to provide clients with improved services is also tracked to provide a measure of success.

This work will result in: Detailed Forest Stewardship Plans for non-industrial private forestlands; GIS-based Stewardship Plan Maps; Stewardship Plan and Mapping database; Poster Exhibits; Formal agreements between town governments; Fact Sheets and Technical Bulletins Programs hosted by Cooperating professionals and Video Production volunteers; Articles - evidence of increased value and improved utilization; Planning Manuals.

Partners will be: COVERTS Project; NEMO Project (internal); USDA-Forest Service - Provides base funding for the program and technical assistance (MS); CT-DEP Forestry Division - Administrative assistance and field implementation; U.S. Fish and Wildlife Service and Ruffed Grouse Society provide funding support (MS); Connecticut Forest Stewardship Committee: Advisory Role, membership includes Connecticut Forest and Park Association, Connecticut Farm Bureau, Farm Service Agency, USDA-NRCS, Connecticut Audubon Society and private consultants and industry members

Forest Stewardship Program is an on-going program, supported by federal funds and the role of Coordinator involves the following: Providing education and technical assistance for landowners and forestry professionals; Promoting the Forest Stewardship to landowner and industry audiences and the general public; Cooperating with partner groups and agencies to accomplish stewardship goals; Networking with individuals and groups to provide services and build new partnerships; Supporting where possible other Extension programs when mutual goals and audience contact can be enhanced, such as with watershed and wildlife projects; Contributing to the body of marketing information available commercial forest operators; Educational methods include workshops, field days, direct mail, one-on-one visits, articles, surveys, video productions.

Target audiences are non-industrial private forest landowners, municipal officials, property managers, forest products producers, community leaders and activists, members of the forestry profession, land-use decision-makers, the general public.

Records are kept of the successful completion and implementation of Forest stewardship Plans for private landowners. Numbers of acres treated, timber sale activities, and numbers of trees planted, and prices paid or obtained for forest products are examples of the types of statistics evaluated. Stewardship Plan quality is also a factor in maintaining funding support. Attendees and referrals from volunteer-sponsored programs, requests for technical assistance and actions taken by municipal land-use decision-makers are also tracked.

## WATER RESOURCES TEAM

### Coastal Residential Water Quality

Focus: In Connecticut improvements have been made to surface water quality. A number of water quality problems remain to be addressed, including pollutants from nonpoint sources. Public interest in this sort of pollution has been of concern in recent years in coastal regions due to concerns for low dissolved oxygen in Long Island Sound caused by excessive inputs of nitrogen. This has led to swimming areas being contaminated as well as overall lowering of water quality standards. The above problems are caused by leachates from residential properties, a direct result of overfertilization and runoff.

The overall impact will be the utilization of a more sustainable approach to management of residential and associated landscapes to protect water quality. Measures of success will include increased knowledge of pollution prevention control practices and personal actions that can be utilized to protect streams and marine water systems. Implementation to protect these resources include sustainable landscaping practices and best management practices and best management practices for residential ecosystems.

This work will result in six new Extension publications on environmental landscapes with emphasis on site assessment procedures, landscape design techniques and on-site composting.

Internal partners are: Department of Plant Sciences, Department of Natural Resources Management and Engineering and The Department of Agricultural and Resources Economics. External partners are Bartlett Arboretum, Department of Environmental Protection and the University of Rhode Island.

This will be an ongoing educational training program to teach residents, groundskeepers and lawn care operators about nitrogen management methods and practices for purposes of reducing the export of nitrogen to surface waterways in the coastal region. Particular focus will be to foster the use of water quality BMP's within the residential landscape in the coastal region. The project is designed to expand on an existing water quality project being conducted in Branford, Connecticut, where a focused resident survey indicated widespread use of lawn care operators for management of residential properties. This project will provide the opportunity to educate the residents and/or those who maintain the residential properties on recommended residential water quality BMPs.

Methods will include short courses, presentations at industry meetings, listings on Home and Garden Education Center. Web Page, Master Gardener programs, train-the-trainer courses. Attendees will vary depending upon educational techniques, but ultimately will reach over 5,000 consumers. Research strategy will include collaboration with CANR faculty in research design development, literature research, and professional conference attendance.

Target audiences will be residential consumers and residential landscape service providers.

Evaluation techniques are: One short term (6 months) and mid term (12 month) survey of train-the-trainer activities, and residential and service provider activities associated with the Coastal residential Water Quality project.

### Water Quality

One role within the Water Resources Team is to assist in the integration of NEMO outreach and research activities with the other water resources research and education initiatives. To this end, the NEMO project will work during the plan period to further strengthen existing collaborations with other CANR faculty and staff, in particular those in NRME. For instance, collaboration with NRME on the new NASA Regional Earth Science Application Center will be a major focus during this period, as will ongoing collaboration with Plant Science and NRME staff involved with the Jordan Cove Long-Term 319 Monitoring Project (led by Jack Clausen). It is expected to work toward forging new cooperative relationships involving making geographic information system (GIS) technology and information accessible to Connecticut communities.

### Water Resources

Focus: Nonpoint source pollution remains as the primary cause of water quality problems in the United States, including Connecticut. The primary sources of nonpoint source pollution are agriculture and urban stormwater runoff. Agriculture is the leading source of impairment in the Nation's waters, contributing to impairment of 25% of river miles, and 19% of lake acres assessed. Urban runoff contributes to impairment of 5% of river miles, 8% of lake acres, 18% of estuaries, and 7% of wetlands. Various management practices are used and proposed to reduce nonpoint source pollution but the effectiveness of such measures are largely unknown. The citizens of the U.S. stand to gain from water quality improvements resulting from the implementation of nonpoint source controls.

Success will be measured by adoption of nonpoint source control strategies developed through this program and ultimately by improvements in water quality.

This program will generate two peer reviewed articles per year. In addition, Extension documents and presentations will be prepared.

Internally, the partners will include the Water Resources Team members. Externally, the primary partners will be the CT Department of Environmental Protection, U.S. Environmental Protection Agency, and the USDA Natural Resources Conservation Service. All three groups currently cooperate in nonpoint source research projects and can be expected to continue in the future.

Research continuing includes the Jordan Cove Urban Watershed study (1995-2006), the Stormwater Treatment Devises Project (1997-2001), and the Branford River Project (1998-2001).

The primary techniques used in this research are water quality and quantity monitoring to test hypotheses regarding the effectiveness of select management practices. Education will be used to teach nonpoint source pollution control to Extension audiences.

The target audiences are primarily the state and Federal agency personnel in Connecticut and elsewhere in the nation. Secondly, the citizens of the state of Connecticut as they contribute to nonpoint source pollution are also target audiences.

Results in this research are obtained through water quality and quantity monitoring at the field sites where the research projects are located.

#### Coastal Residential Water Quality Stewardship Project

Cooperative Extension System Focus: Nonpoint source pollution has been identified as a major source of pollution to coastal waters. Residential activities and inputs (by homeowner actions or those of professionals on residential properties) contribute significantly to this problem. Two of the primary pollutants of concern are nitrogen and bacteria; the two pollutants currently being monitored in the Branford River Stewardship Project.

The overall impact will be for implementation of a holistic approach to management of residential and associated landscapes in order to protect water quality. Specific measures of success will include increased knowledge of pollution prevention control systems/methods and of personal actions that can be employed to protect stream and marine water systems via implementation of residential BMP's and sustainable landscaping.

This work will result in peer reviewed articles, Extension publications, sustainable landscaping exhibit, CD ROMs, CREES Water Quality Funding continued.

Internal partners are: Department of Plant Science; Department of Natural Resources Management Engineering; Department of Agricultural and Resource Economics. External partners are local environmental groups/associations.

This will be an ongoing program that follows the Branford River Stewardship model in terms of volunteer involvement and community education. A key aspect of this program will be to establish and promote guidelines for environmentally friendly management of residential and associated landscapes in Connecticut. The targeted geographic area is the coastal region from Old Saybrook to Greenwich.

A major source of information to consumers will be via volunteers trained in environmentally oriented landscape and property management. Volunteers will target consumers via programs, exhibits, articles and one-on-one information sharing. Professional lawn care service providers will receive information via professional training at conferences or on-site visits with UConn faculty. The Home and Garden Web page will also be a source of information to those with computer access.

Target audiences are: residential consumers, professional lawn care service providers.

Evaluation techniques are the train-the-trainer program and associated activities will have two follow-up evaluations conducted. They will address knowledge gained, behaviors changed and actions taken.

#### Land Use Education in the Quinebaug-Shetucket Heritage Corridor

Cooperative Extension Focus: Northeastern Connecticut is often referred to as the "Last Green Valley" between Boston and Washington, DC because of its natural, historic and cultural resources. In recognition of the unique value of Northeastern Connecticut, Congress designated a 25 town, 850 square mile area as the Quinebaug and Shetucket Rivers Valley National Heritage Corridor in 1994. The Quinebaug-Shetucket Heritage Corridor presents a unique opportunity because it is the first heritage corridor in the State of Connecticut. The 25 towns are linked because they are all part of the watershed of either the Quinebaug River or the Shetucket River. Because of this linkage, Northeastern Connecticut should be of special concern to the Water Resources Team of the College of Agriculture and Natural Resources. Suburban sprawl, loss of farmland and the abandonment of historic mills are threatening the character of the area. Members of the Water Quality Team will work to develop integrated, multi-disciplinary educational programs and methodologies that will not only prove beneficial to towns in the Quinebaug-Shetucket Heritage Corridor, but also to the state as a whole. This cross-town approach will illustrate the

importance of an effective, multi-disciplinary approach to watershed management. The College Team, as a multi-disciplinary, will stay abreast of the latest methods and technologies in the respective areas of expertise in order to provide the most up-to-date education to municipal CEOs, planning, zoning, conservation and economic development commissions, and other key decision makers in the region. Resources - Quinebaug-Shetucket Heritage Corridor Management Plan; Quinebaug-Shetucket Heritage Corridor Action Plan; A Study of the Quinebaug-Shetucket Region of Connecticut (National Park Service); A Historical Overview of the Quinebaug-Shetucket Region (National Park Service); New England ArcView listserv; and CT GIS users listserv.

Measures of success of this program will be most apparent through the change in knowledge and subsequent behavior of program participants. Examples of these anticipated behavior changes include the formation of Conservation Commissions, natural resource inventories, open space plans, historic preservation plans, changes to subdivision and/or zoning regulations to promote farmland preservation and open space protection, and linkages between towns through the Plan of Conservation and Development, municipal regulations, and resource management approaches.

The outcome products will be partnerships between related disciplines to draw upon the unique resources each has to offer in order to best serve and educate the target audience on the importance of regional thinking when working to preserve water quality and natural, cultural and historic resources.

Internal partners are: Natural Resources Department - Assist in GIS training workshops; College of Agriculture and Natural Resources; Economic Viability Team - Information on appropriate economic development for rural communities. External partners are: Quinebaug-Shetucket Heritage Corridor - monetary and resource support, sponsor workshops in towns (if Congress approves expansion, then will become multi-state); Regional Councils of Government - sponsor workshops in towns, help to promote the importance of regional thinking in water quality protection.

The Team will work together to develop educational programs and methodologies that will not only prove beneficial to towns in the Quinebaug-Shetucket Heritage Corridor, but also to the state as a whole. This multi-town, multi-disciplinary approach to watershed management will guide municipalities to begin thinking regionally and across political borders, further working toward the greater goal of preserving the region's water quality through the enhancement of the natural, cultural and historic resources. The topics of these programs will focus on ways for towns to work together regionally through their individual Plans of Conservation and Development, the Regional Plan of Conservation and Development and through other watershed level planning efforts.

The educational method utilized will be presentations with supplemental written information. The number of attendees is likely to vary by topic, town, and region.

The target audience will be planning and zoning commissions, conservation commissions, historic preservation organizations, economic development commissions, boards of selectmen, and other groups in Connecticut concerned with land use planning, historic preservation, conservation strategies, and other watershed level approaches to resource protection.

After the educational program has concluded, an immediate evaluation of the program will be assessed through the attendees. A six month and one year follow-up with the program organizer will be conducted to help assess any changes which have occurred as a result of efforts. These changes could be in the form of inventories, plans, regulation updates or new committees formed.

### Turfgrass Management

Research Focus: Proper management of turfgrasses is critical for turf performance and quality in addition to preventing losses of nutrients and turf chemicals offsite. Research in this area will benefit professional grounds keepers, golf course superintendents, managers of athletic fields and parks, homeowners, and others who desire information on turfgrass management. Regulatory agencies such as EPA and CT DEP will benefit from project results as well.

Measures of success will be the development and evaluation of best management practices for various turf systems. As results are released, many of these practices should be adopted by those interested in quality turf without compromising environmental quality. As the turfgrass science program develops in the College, it is expected that grant funding of the program will increase as well as student enrollment in the Agronomy major.

This work will result in peer-review journal articles which will be published from the turfgrass research. The results will also be used by Extension personnel for Extension publications.

Partners and potential funding sources are: United States Golf Course Association; Golf Course Superintendents Association; CT Department of Environmental Protection; New England Turfgrass Foundation; U.S. EPA.

Key components of the program include turfgrass nutrient management and alternative pest control methods for turf.

Strategies include field, greenhouse, and laboratory experiments utilizing standard designs and analyses.

Research in this area will benefit professional grounds keepers, golf course superintendents, managers of athletic fields and parks, homeowners, and others who desire information on turfgrass management. Regulatory agencies such as EPA and CT DEP will benefit from project results as well.

Evaluations will be statistical analyses of data will determine treatment effects of experiments.

### Coastal Residential Water Quality

Focus: Significant improvements have been made to surface water quality; however, a number of water quality problems remain to be addressed, including pollutants from nonpoint sources. Public interest in this sort of pollution has been raised in recent years in coastal regions due to concerns for low dissolved oxygen in Long Island Sound caused by excessive inputs of nitrogen, and swimming area closure due to bacterial contamination. Portions of these problems are due to activities conducted on residential properties.

The overall impact will be for implementation of a holistic approach to management of residential and associated landscapes in order to protect water quality. Specific measures of success will include increased knowledge of pollution prevention control systems/methods and of personal actions that can be employed to protect stream and marine water systems via implementation of residential BMP's and sustainable landscaping practices.

This work will result in six new Extension publications on environmental landscapes, with a particular focus on site assessment procedures, on-site composting, and landscape design techniques.

Internal partners include: Department of Plant Science, Department of Natural Resources Management and Engineering, and the Department of Agricultural and Resources Economics. External partners include: Bartlett Arboretum, Department of Environmental Protection, and the University of Rhode Island.

This will be an ongoing program that is tied in closely with activities of the Home and Garden Education Center. A key aspect of this program will be to establish and promote guidelines for environmentally friendly management of residential and associated landscapes in Connecticut. Collectively called Environmental landscape Management, they will be implemented in the Old Saybrook to Greenwich area through the CSREES funded Coastal Residential Water Quality Project.

Methods will include short courses, presentations at industry meetings, listings on Home and Garden Education Center Web Page, Master Gardener programs, train-the-trainer courses. Attendees will vary depending upon educational techniques, but ultimately will reach over 5,000 consumers. Research strategy will include collaboration with CANR faculty in research design development, literature research, and professional conference attendance.

Target audiences will be residential consumers and residential landscape service providers.

Evaluation techniques are: One short term (6-month) and mid term (12-month) survey of train-the-trainer activities, and residential and service provider activities associated with the Coastal residential Water Quality project.

### Water Quality

Focus: One role within the Water Resources Team is to coordinate the watershed projects that are being conducted in the Lower Connecticut River Watershed. These watershed projects are an ongoing commitment by the University to work with municipal officials, forest land owners, and riparian home owners within targeted watersheds. An additional role represents the University of Connecticut in the regional Northeast Watershed Roundtable (NEWRT). NEWRT is comprised of watershed groups from throughout the Northeast as well as federal and state agencies in the region. This group is being focussed on by national river groups and is seen as exemplary by the Environmental Protection Agency and the National Park Service. The role the University will play will increase over the next five years as NEWRT becomes more established in the region.

### Fisheries Management (Natural Resources Management and Engineering)

Fishes and other living aquatic resources have served as a source of food, commerce, and recreation for people since ancient times (Ross 1997). Today, in addition to their commercial and social value, fishes are the focus of an ever-growing recreation base. A fishery has three primary components: biota, habitat, and human users. Because of the growing demand for fishes, fisheries need to be successfully managed to avoid overharvest, user conflicts, and to provide sustainability. There is also a great need to protect, enhance, and restore fishery habitat. In addition to the biota and habitat, the human user component of a fishery includes socioeconomic values and impacts. Maximizing the benefits of a fishery for humans is one primary goal of fisheries management. In

Connecticut, approximately 300,000 residents fish in freshwater each year, with another 200,000 fishing in saltwater. The direct expenditures by resident anglers in Connecticut in 1996 was over \$300 million dollars (USDI 1996). Water resources problems facing fishes include both water quantity and water quality.

Measures of success include development of collaborative partnerships with other members of the Water Resources Team and outside partners. A successful team will be measured through research dollars received for multidisciplinary projects, peer-reviewed articles, and service publications related to fisheries and water resources. Impact will be measured by the importance of research to water resource problems facing Connecticut. These problems range from instream flow needs for fishes, contaminants, sedimentation, eutrophication, and water-level management.

For the years 2000-2005, one goal is to develop and submit (as part of a team) funding proposals to conduct multidisciplinary research related to water resources. Outcome products desired include peer-reviewed articles, funded proposals, education of graduate students, and service publications.

From a fisheries standpoint, the Water Resources Team could develop partnerships with the following agencies to conduct research related to water resources in CT. Partners are: Connecticut Department of Environmental Protection – contribute financially and through staff; Connecticut Department of Public Health – contribute financially and through staff; U.S. Fish and Wildlife Service – contribute financially; (MS) American Fisheries Society – contribute through information transfer, education, professional development; U.S. Environmental Protection Agency; Organizations dedicated to fisheries conservation in the Connecticut River.

Key components of the program are to develop research opportunities related to fisheries/water resources under the auspices of the Water Resources Team of the College and collaboration with other University researchers and outside agencies/individuals (duration: 2000-2005).

Target audiences are citizens of Connecticut and region, local and regional agencies, other researchers and students.

Evaluations techniques will be by grant dollars received, reputation of funding agency, peer-reviewed articles.

#### Land Use and Water Quality/Geographic Information Systems (NEMO and NAUTILUS Projects)

One faculty member is available to assist in a College-wide team through collaboration with CANR and other faculty through outreach, teaching and research. Experience with organizations outside the university should be of value in helping to design and direct activities aimed at addressing pressing local, regional and national environmental problems. Research opportunities will continue to be pursued, such as the 319 and NASA research, that will further the understanding of water resources and will strive to develop collaborations within CANR whenever possible.

#### Connecticut Institute of Water Resources

Research Focus: IWR is a federal/state authorized program to facilitate water resource related research in Connecticut. The institutes are located at the land grant school in each state, but serve all academic institutions in that State.

The Connecticut Institute of Water Resources (IWR) mission is stipulated by the Federal Water Resources Research Act and involves two programmatic responsibilities. The first is to plan, conduct and otherwise arrange for competent research that fosters (a) the entry of new research scientists into the water resources fields, (b) the training and education of future water scientists, engineers and technicians, (c) the preliminary exploration of new ideas that address water problems or expand understanding of water and water-related phenomena, and (d) the dissemination of research results to water managers and the public. The second responsibility is to cooperate closely with other Colleges and universities in Connecticut that have demonstrated capabilities for research, information dissemination, and graduate training in order to develop a statewide program designed to resolve state and regional water and related land problems.

IWR responds to topical environmental issues in Connecticut through a state-wide Advisory Board and an academic Technical Committee which creates a close consultation and collaboration with various state and federal environmental agencies, leading water resources officials and interested members of the public. In addition to facilitating applied and basic research in response to annual priorities established by these support bodies, the Institute conducts a seminar series each year, which provides a forum for all water-related interests to present and discuss related environmental issues.

Measures of success will include: 1) to continue to be accredited under the federal Water Resources Research Act as a State Institute; 2) to continue to receive an annual federal stipend under the 104G authorization in the amount appropriated by Congress with equal share going to each of the 54 Institutes – currently, \$68,178 is

received each year (which requires a 2:1 match; Non-federal to Federal Dollars); 3) to continue to conduct 5 seminars a year on Connecticut water resource related topics as a forum which brings together the academic community with the government, private and public sectors; 4) to continue to facilitate research projects between academic researchers and funding agencies.

Outcome products desired: 1) to assist the Principal Investigators of IWR sponsored research to have peer reviewed publications; 2) to support students through the IWR grants provided to Principal Investigators; 3) to create high quality of intellectual exchange during IWR sponsored seminars.

Partners include: Other academic institutions in Connecticut through the IWR Research Grant RFP process; Connecticut Cooperative Extension System through collaboration on research and outreach; Environmental Research Institute through collaboration on research and outreach; Connecticut Department of Environmental Protection in response to their water-related research needs; Connecticut Department of Public Health in response to their water-related research needs; and the Connecticut District Office of the USGS in support of their national and state cooperative programs.

The annual research focus of the RFP is determined by the IWR Advisory Board and Specific Projects are determined on the selection process in response to the proposals received by the researchers.

Evaluation techniques will be determined by the USGS through the 5-year evaluation process.

### Water Quality and the Environment

Cooperative Extension System Focus: The availability of non-polluted water is a central issue that impacts all citizens - especially in a state densely populated like Connecticut. Providing an adequate water supply in terms of quality and quantity are directly related to good health and economic viability. By educating consumers about *their* impacts on the environment, (through Best Management Practices (BMP's) state, municipal and individual water supplies can be protected.

Measures of success include consumers and homeowners who report: knowledge and skills gained as measured by post program evaluations in multi-disciplinary areas and implementation of BMP's in their homes and communities.

This work will result in: publications (with web site availability); radio interviews/tapes; exhibits; training curricula.

Partners and resources include: CT DEP and USDA (grant funding)/

Key components of the program include multi-disciplinary educational programs, web pages, and publications in these areas: consumer responsibility; household contaminants; septic system maintenance; landscape protection; water conservation; and consumer activities impacting community waters.

Strategies include distributing information via the internet and through educational programs.

Target audiences are homeowners (100 per year) and youth (100 per year).

Evaluation techniques are pre-post evaluations at program completion assessing knowledge gained and skills learned; hits on web site.

### Atmospheric-Hydrologic Interactions

Research Focus: To provide a scientific basis for studying the effects of atmospheric transport processes on water cycling and quality at various spatial and temporal scales. Topics include cloud processes, precipitation and precipitation chemistry, dry and wet deposition, evapotranspiration, and surface emissions of chemicals and nutrients. Recent studies have shown that many hazardous substances regularly move between air, water, and soil, which makes their control and cleanup intractable in both engineering and legal senses. The study will help to better understand the nature and impact of the atmospheric processes in water quality that is critical in the protection of public health.

Measures of success will be: theoretical development in interfacial processes; and advances or improvements in system modeling and watershed management.

This work will result in: peer reviewed journal articles; modules to fit into water quality and management models; and joint proposals.

Partners and resources will be: CT DEP Air and Water Bureaus (financial support, data collection and provision); UConn ERI (laboratory data analysis); CT WRI (project coordination); and Team members (academic exchange and collaboration).

Key components of the program include: Collect, analyze, and characterize the spatial and temporal distributions of meteorological, hydrological, surface, and ecological parameters for the State of Connecticut, the Connecticut River Basin, and the Northeastern United States. Develop modules that would predict cloud processes, precipitation and precipitation chemistry, dry and wet depositions, evapotranspiration, and surface emission fluxes at

various spatial and temporal scales that can be fitted into meteorological, hydrological, and ecological models to study the atmospheric effects on water quality. Parameterize the modules and text theoretical considerations using data from team members and other sources.

Strategies include: Regional historical data will be collected from EPA databases, DEP sources, and team members. Spatial maps of key parameters will be created at regular time steps and archived for public use. Theoretical frames will be developed to simulate the atmospheric-hydrologic interactions based on the input parameters. Open schemes will be developed for the models to fit into other available models, and to be evaluated by fellow members.

Target audiences include the scientific community and stakeholders of Connecticut and New England water resources.

Evaluation techniques are the success of the study will be evacuated by the deliverables, including theses, reports, papers, and models, and by the recognition by Federal and State agencies through funding appropriation.

## WILDLIFE RESOURCES TEAM

### Wildlife Resources

Research Focus: Wildlife resources (undomesticated plants, animals) possess an exceptional array of socioeconomic, scientific, educational, utilitarian, recreational, and aesthetic values. Comprehension and conservation of wildlife resources have failed to keep pace with the many threats to wildlife (e.g. urban sprawl, pollution, exotic parasites and diseases, misuse). As a result hundreds of vertebrate, invertebrate and plant species are declining precipitously or threatened with extinction. The ability to comprehend and apply environmental health and status information to one's existence, as well as that of the biota, is of paramount importance. For example, accumulation and persistence of airborne or water transported anthropogenic contaminants such as organochlorine compounds (PCBs, dioxins) and pesticides, polyaromatic hydrocarbons, heavy metals, substances inducing upper level ozone destruction and global warming are likely to have increasing roles in the welfare of wildlife resources and, similarly, human populations. Interaction of colleagues can forge new linkages for securing knowledge and applying new insights to wildlife resource management.

### Wildlife Resources Team

Focus: Several researchers have interests in different aspects of wildlife biology and natural resource management. The Wildlife Resources Team was created to promote collaborations between investigators with the intent of disseminating information and cooperating on research objectives.

Success will be measured by the number of new faculty participating, the duration of their participation, and the value of their collaborations in terms of successful competition for external funding and publication of research findings peer-reviewed journals.

The outcome products are more faculty collaborations, greater research publications, and increased external funding.

The partners will be members of the Wildlife Resources Team. Meetings are designed to promote discussions of relevant research topics and to discuss more efficient means of disseminating information about the Team to interested parties inside and outside of the University.

Methods used will be regular meetings scheduled and a yearly symposium planned.

Target audiences are faculty and students with interests in wildlife are the principal target audiences, with eventual Extension to agencies and departments in the region.

Evaluations will be the number of new collaborations, grants and at publications in peer-reviewed scientific journals resulting from the Team will be evaluated.

### Department of Pathobiology

The mission of the Wildlife Resources Team is to encourage, support and facilitate excellence and productivity in research, teaching and service of benefit to: a) individual wildlife resources; b) scientific community; c) providers of wildlife resources; d) users and supports of wildlife resources.

A particular area of interest in the department of pathobiology is Aquatic Animal Pathology in the diagnosis and research on diseases of shellfish, finfish and aquatic mammals.

Measures of success will be in disease diagnosis with implementation of treatment of prevention plans, publication of results, educational programs and grant proposals.

The work will result in publications, identification of disease process and development of treatment or prevention plans.

Partners will be the Bureau of Aquaculture - Connecticut Department of Agriculture, Mystic and Norwalk Aquariums, USDA- APHIS, Connecticut Department of Environmental Protection - Wildlife Division.  
Methods will include educating staff in new diagnostic methods.

### Wildlife Resources Team

Focus: Several researchers have interests in different aspects of wildlife. The Team is meant to promote discussion leading to better knowledge of each other's work and possible collaborations.

Success will be measured by the number of new collaborations, the success of continuous funding of research efforts and dissemination of the information through peer-reviewed publications.

Partners will be the members of the Wildlife Resources Team and their partners.

Strategies will be to promote discussions leading to better knowledge of each other's work and possible collaborations and regular meetings with yearly symposium.

Target audiences will be faculty and students with interests in wildlife, and eventually extending to organisms and individuals in Connecticut and around with interests in wildlife.

A number of new collaborations, grants and at publications in peer-reviewed scientific journals resulting from the new Team.

### SMALL GROUP PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

#### Land Use and Natural Resource Protection

In a rapidly urbanizing region, balancing development and conservation is one of the greatest challenges facing public officials. Planned growth is a land use issue and volunteer commissioners make land use decisions at the local level. These local officials are in desperate need of education related to their powers and duties, how to inventory existing community resources, and how to plan for and control future land use. In this arena, Extension must focus its' limited resources where they will do the most good. Under the goal of providing education to help local officials make rational land use decisions, the following areas of emphasis will be concentrated:

Local government education, public issues education, increasing public awareness of the environment and natural resources, land use planning, open space and natural resource protection and economic development.

The ultimate positive impact will be leadership development in which local land use officials gain greater insight into land use planning and decision making as well as learn and practice community development skills. As a result of acquiring such skills, land use conflicts are reduced and there will be greater community participation in land use issues. Measurable successes include changes in public policy such as; land use plans revised or adopted, land use regulations revised, site plans approved, acres of open space and natural resources protected.

Desired outcomes include new and updated Extension publications, high tech PowerPoint slide presentations, interactive web sites and awards from state and national planning organizations.

Major partners include the CT Department of Environmental Protection, Regional Planning Agencies, The American Planners Association, Local Land Use Boards, Professional City Planners and Land Trusts.

For the past twenty years the program has consisted of being invited to present guest lectures and workshops both within the state and nationally. These invitations have resulted in an annual average of 60 to 70 workshops reaching 2,000 to 6,000 people per year. As this approach has proved so successful, it is intended to continue using it. In addition to presentations, each year new publications or existing ones updated related to a host of land use issues.

The educational methods used are lectures, workshops and distribution of visual and printed educational material as well as interactive web-sites. These methods are targeted to local land use officials. The average annual audience is 2,000 to 6,000 attendees as well as another 1,000 to 2,000 who read printed materials or visit web-sites. All programs are based on the latest research regarding the issue.

The target audience for the program effort consists of local land use officials.

Evaluation of the program will be based on the number of officials who have increased their understanding of land use issues as a result of the educational programs provided. Another method is to document the changes in public policy resulting from the programs. Such changes include; town plans revised, zoning and subdivision regulations revised, site plans approved and more rational land use decisions made.

#### Land Use Education in the Quinebaug-Shetucket Heritage Corridor

Cooperative Extension Focus: Northeastern Connecticut is often referred to as the "Last Green Valley" between Boston and Washington, DC, because of its natural, historic and cultural resources. In recognition of the unique value of Northeastern Connecticut, Congress designated a 25 town, 850 square mile area as the Quinebaug

and Shetucket Rivers Valley National Heritage Corridor in 1994. Suburban sprawl, loss of farmland and the abandonment of historic mills are threatening the character of the area. One role will partner with the Quinebaug-Shetucket Heritage Corridor, Inc. to implement their Action Plan which focuses on land use, economic development, tourism, agriculture, outdoor recreation, and historical, cultural and natural resources. Throughout the next five years, one plan is to provide on-going education to municipal CEOs, planning, zoning, conservation and economic development commissions, and other key decision makers in such areas as land use planning, open space and farmland protection, historic preservation, stewardship, and appropriate economic development.

The anticipated success of this program will be most apparent through the change in knowledge and the subsequent change in behavior of program participants. Examples of these anticipated behavior changes include the formation of Conservation Commissions, natural resource inventories, open space plans, historic preservation plans, increased grant dollars received by Quinebaug-Shetucket Heritage Corridor towns, and changes to subdivision and/or zoning regulations to promote farmland preservation and open space protection.

Desired outcome products will be in the form of Extension publications. Fact sheets on different land use planning methods and preservation/conservation strategies will be created. Also, a scenic roads design manual will be completed. This manual will target developers, private property owners, and municipal officials to help provide appropriate development alternatives along scenic roads.

Partners of the program are located within the College of Agriculture and Natural Resources (CANR) at the University of Connecticut. For instance, the CANR Economic Viability Team provides information on appropriate economic development for rural communities. Further, the CANR Water Resources Team provides NEMO workshops and assists in other land use and water quality workshops. The Natural Resources Department assists in GIS training workshops. Finishing off the list of partners is the Landscape Architecture Department, which assists student design projects in different QSHC towns.

Resources of the program include the Quinebaug-Shetucket Heritage Corridor, which provides monetary and resource support and also sponsors workshops. If Congress approves expansion, then this particular resource will be designated as multi-state. Other resources are Northeastern Connecticut Council of Governments, Southeastern Connecticut Council of Governments and Windham Council of Governments, all of which sponsor workshops in their respective towns.

Within the context of the Quinebaug-Shetucket Heritage Corridor Action Plan, a topic list will be made available to all boards and commissions in each of the 25 towns. The list will include such subjects as open space planning, farmland preservation, design review, sign regulation and tools for historic preservation. Municipal boards and commissions will be able to choose a relevant topic and request a presentation at the beginning of their regular meeting. If, after a twenty-minute presentation, it is found that the issue is of further interest to the commission, a more in-depth follow up workshop will be scheduled, possibly involving the partners listed above. A package of supplemental written materials including fact sheets and other Extension publications will be available for each board member.

The educational method utilized will be presentations with supplemental written information. The number of attendees is likely to vary by topic and by town.

The target audiences will be planning and zoning commissions, conservation commissions, historic preservation organizations, economic development commissions, boards of selectmen, and other groups in the Quinebaug-Shetucket Heritage Corridor concerned with land use planning, historic preservation, or conservation efforts.

An immediate evaluation of the program will be assessed through the attendees after the educational program has concluded. A six month and one year follow-up with the program organizer will be conducted to help assess any changes which have occurred as a result of my efforts. These changes could be in the form of inventories, plans, regulation updates or new committees formed.

### Urban Gardening Program

Cooperative Extension System Focus: The primary focus of the urban gardening program is to increase urban food production using efficacious and environmentally sound practices. This is done through education of community leaders, urban families, adults and youths. As a result of this, the program provides improved nutrition for limited-income families and individuals, substantial monetary savings, better neighborhood pride and cooperation and better public health and safety from clean up open space areas. The urban gardening program has given good citizens of poor neighborhoods the chance to take back control of their own environment. By working together to physically improve their surroundings the neighbors form community. The community gardens serve as a melting pot of various ethnic, racial and economic groups. Hope and good will return to the neighborhood as long time residents and newcomers work together. Fear, apathy and reclusiveness begin to disappear.

Measures of success include: to empower limited-income people to grow their own produce in an inner-city environment and to bring people together to solve a problem; to increase urban food production using efficacious and environmentally sound; to increase urban low-income families and individuals participation in the program; to involve master gardeners in the program.

This work will result in a number of community gardens established, a number of volunteers and CES staff recruited and trained, total number of limited income-income people included, total number of volunteer hours and total value of produce raised.

Resources and partners include: Department of Housing (contributes \$ 18,000 in supplies such as soil, plants, fencing, wood, garden tools and water system each year); Bridgeport Neighborhood Services (contributes \$500 in supplies such as garden tools); schools/churches; Department of Public Works; and the College of Agriculture Natural Resources Plant Diagnostic Center.

Key components include: train community leaders; promote community gardening in localized as well as expand statewide involvement; and develop instructional materials.

Strategies include: demonstration gardens; printed materials; develop and present clinics, workshops, and garden tours; provide diagnosis and recommendations,

Target audiences are limited-income families and individuals and other interested groups and individuals.

Evaluation techniques are the number of community gardens, number of program participants, number of garden plots, number of people included in the program and total value of produce.

### Forestry, Wildlife and Land Use

Cooperative Extension System Focus: Connecticut's 1.8 million acres of forest provide the raw material for over 350 forest products processing and manufacturing firms, which collectively employ 3,600 citizens and contribute over \$400 million annually to the state's economy. They also clean air and water, provide habitat for wildlife, and provide recreational opportunities for nearly a million citizens each year. Research shows that Connecticut is losing some 11,000 acres of forest annually to development, and that forest fragmentation has caused the average forested parcel size to decline 34% over the past 20 years. In addition, only about one commercial forest products harvest in seven involves any professional forestry input or supervision.

Anticipated measures of success include forested acres under stewardship plans, forested acres enhanced for wildlife, forest products production and other benefits, important forested acres protected from conversion to other uses, knowledge gained by forest owners and natural resource professionals and forest products harvesters.

Desired outcomes include Extension publications, peer reviewed articles in the Journal of Forestry and Society and Natural Resources and video productions.

Partners include: The Quinebaug/Shetucket National Heritage Corridor, Inc (QSHC)(MS), UMass Extension (MS), DEP Division of Forestry, Wildlife and Inland Water Resources, The Society of American Foresters (MS), The Nature Conservancy, The Southern New England Forest Consortium, Inc (MS). Resources include grants from the Ruffed Grouse Society, QSNHC, DEP and the U.S. Forest Service.

Annual training and support of forest landowner educational volunteers; workshops and short courses for forest owners; continuing education periodical and conferences; comprehensive safety and environmental training for forest products industry; continuous print and electronic media outreach campaign; UConn Forest demonstration management areas and program.

Strategies include the use of random sample surveys and focus groups as needs assessment tools; goal of 5,500 forest owners, 650 resource professionals, 300 loggers impacted annually.

Target audiences are made up of non-industrial private forest owners, natural resource professionals and commercial forest products harvesters.

The use of surveys will serve as the main evaluation technique in order to assess if learning occurred. Pre, post and time-lag impact and behavior change surveys will be given to all 3 audiences.

### Water Quality

Cooperative Extension System Focus: Nonpoint source water pollution is the number one water resource impairment in the United States, and urban stormwater runoff is the number one water quality problem for the nation's coastal areas, according to the Environmental Protection Agency. Nonpoint source pollution is generated by land use, which is decided at the county and municipal levels of government, by local land use officials. This critical audience must be educated on the causes, impacts, and remedial measures associated with the control of nonpoint source pollution.

Measures of success will be: number of Connecticut communities hosting educational programs; changes to town plans and regulations; number of communities composing watershed management plans and/or open space

plans; number of school projects and research project related to natural resource-based land use planning and environmental stewardship of water resources.

This work will result in educational workshops, PowerPoint presentations, peer-reviews journal articles, fact sheets, technical papers, abstracts and proceedings from regional and national conferences, web sites and awards.

Internal linkages: NRME faculty/remote sensing (Dan Civco) provide remote sensing data and expertise. NRME faculty/water resources (Jack Clausen, Glen Warner) provide water pollution remediation expertise. Plant Science/Landscape Architecture faculty provide landscape and subdivision design expertise. CES Forestry staff conduct complementary forest stewardship programs within watershed context. CES Family and Community staff provide home-based water quality programs. External linkages: EPA Region One provides funding for work in Southwestern Connecticut and Westchester County, NY (MS). US Fish and Wildlife Service provides funding for work in Lower Connecticut River watershed. EPA Office of Water provides support for national workshops (MS). NASA provides funding and data for expanding work related to the effects of sprawl on water and forest resources (MS). CTDEP provides funding for educational workshops and research in Connecticut.

The program consists of several key components nested within the overall context of the Nonpoint Education for Municipal Officials (NEMO) Project. These include: overall coordination of team activities; grant writing and administration, liaison with federal and state agencies, production of educational materials, presenter of educational programs -- both to Connecticut and national target audiences, and oversight of national activities.

Goals during this period are to write two peer-reviewed journal articles; write five fact sheets; continue to foster the National NEMO Interagency Work Group; work with the new National NEMO Coordinator to create a true national network of at least 25 projects; complete the NASA-funded project undertaken with NRME; and continue to provide overall guidance to the NEMO team's many and varied activities.

Target audiences include local land use decision-makers in Connecticut and natural resource professionals/peers in other states.

Surveys will be used as an evaluation technique to assess if learning occurred. Principal project contacts in Connecticut communities will be surveyed yearly to ascertain attitudinal changes, changes to town documents and policies, and initiation of related research, education, watershed management, and open space planning initiatives. These changes will also be documented through commission minutes, newspaper articles, letters and memos. Project contacts in other states will be surveyed yearly to ascertain the progress and extent of NEMO adaptations: number of partner agencies; number of presentations; number of local officials reached; funding.

#### Biogeochemical Cycling in the Connecticut River Airshed and Watershed

Research Focus: As part of the Connecticut River Airshed-Watershed Consortium Initiative, collaborative research will be done in the next five years toward a regional scale study on the biogeochemical cycling in the Connecticut River Airshed and Watershed. The Connecticut River has enormous economic impact for the region, yet there lacks coordinated research program to ensure the long term sustainability of the river and its watershed. The study will focus on the coupling of airshed and watershed models to provide management tools for use by all stakeholders in the basin, and to provide pollution abatement, regulatory and land-use decision-making tools to government, business, and residents in the Connecticut River airshed and watershed.

Measures of success are based upon grant dollars received and anticipated research results. Specifically, support from Federal appropriation to conduct and continue the research and the scientific basis to significantly enhance air and water quality in CT and New England.

Desired outcome products include peer reviewed journal articles, methodologies in watershed-airshed coupling and modules to fit into a basin-wide environmental quality model.

Partners of the program include: US EPA, support and guidance; CT DEP Air and Water Bureaus, data collection and provision; UConn ERI, data analysis and project management; Dr. Hugo Thomas, CTWRI, coordination with government partners; Dr. Dave R. Miller, NRME, Co-PI; and The CT River Airshed-Watershed Consortium (to be established), research collaboration (MS).

Regional scale models are available to study the transport processes in airshed and watershed, respectively. However, the models are not coupled to describe the whole cycle in the basin. To understand the behavior and impact of a target chemical species, the nature and extent of the interfacial transport between soil, water, plants, and the atmosphere must be understood. Collectively, it is proposed to quantify the fate and transport of specific toxic pollutants and nutrients, such as mercury, MTBE, arsenic, particulate matter, nitrogen and phosphorus in the Connecticut River Basin. The study will focus on the interactions between watershed and airshed to understand and model the movement of target species through the whole system, including soil, water, plant canopies, and the atmosphere.

The strategy involves a new approach of system modeling starting from the multi-media interfaces, which will be developed and tested to couple the watershed and airshed models. Experiments will be designed and conducted to parameterize the interfacial processes.

Target audiences for the research effort includes the scientific community as well as all of the stakeholders in the Connecticut River Basin.

The success of the study will be evaluated by the deliverables, including theses, reports, papers, and models, and by the recognition by Congress and Federal agencies through funding appropriation.

### Economic Viability

**Academic Program Focus:** The purpose of this project is to develop a coordinated approach among the Extension and research units of Agricultural and Resource Economics Department to address the broad producer, environmental, and community related issues and problems that the transition away from government dairy commodity programs will create in New England. The dairy industry is the most significant agricultural sector in the region in terms of cash receipts. The long-term viability of this sector is a matter of growing concern due to changing public policies and economic incentives.

Anticipated research output and outreach programs will assist dairy farmers in their long-term decision making. A grant for \$350,000 has been received from the Fund for Rural America to evaluate these issues.

Outcome products desired include peer reviewed articles, Extension publications, conferences and workshops.

Partners of the project include a broad-based external advisory board, which includes the Connecticut Farm Bureau, Connecticut Department of Agriculture, First Pioneer Farm Credit, Natural Resources Conservation Service and private dairy farm owner/operators in Connecticut. Each of these groups along with other advisory board members has participated in an advisory board meeting and assisted the group with a survey of dairy farm owners in Connecticut. Further interaction and assistance is planned over the duration of the project.

The project is a three-year program designed to address interactions among on-farm dairy producer technology, agricultural diversification alternatives, and rural community development.

Educational methods include workshops, publications and bulletins, and web sites. Audience size will vary from 20 to 100 depending on the nature of the workshop or conference.

Targeted audiences include dairy producers, landowners, state and federal agricultural and environmental agencies, and regional and community development groups.

Program monitoring will be conducted using evaluations of workshops or events. Program evaluations using expert assessments or case studies will be conducted of the overall program success in informing farmers, public agencies and communities about technologies and alternatives.

### Program Impact Evaluation – Cooperative Forest Management Program

The research focus is to objectively quantify the credibility, impacts and cost-effectiveness of the DEP Division of Forestry's Cooperative Forest Management (CFM) program. The DEO's CFM program provides professional forestry advice and information on the ground, one-on-one to these Connecticut forest landowners. The market externalities such as clean air, clean water, wildlife habitat, outdoor recreation and scenic beauty provide the rationale for the CFM Program. No other objective study has ever been undertaken to measure the return to society from the CFM Program.

Anticipated research results include estimates of CFM Program's impacts on the landowner clients' knowledge levels and attitudes towards forest stewardship, estimates of the perceived credibility and value of the CFM program on the part of CFM clients and private sector foresters.

Desired outcomes include publication of peer-reviewed articles, presentation of results and discussion in association meetings, and an MS Thesis.

Partners will be: Stephen H. Broderick (provides forestry expertise); and Farhed Shah (provides the expertise in resource economics and experience in contingency evaluation survey). Dr. Tsoung-Chao Lee is contributing to solving statistical sampling problem and econometric analysis of the survey results. The project has a budget of \$21,800 for the period of February 1, 1999 to January 31, 2000.

Key components of the project are: (1) estimate the CFM Program's impacts on the landowner clients' knowledge levels and attitudes towards forest stewardship; (2) develop and test a methodology for estimating the CFM Program's impacts on forest resource economic value and productivity using direct survey data, contingent valuation and/or cost/benefit analysis; (3) quantify the extent to which clients have acted on advice received, the type of actions taken and the resource impacts that have results; and (4) estimate the perceived credibility and value of the CFM program on the part of CFM clients and private sector foresters.

The methods involve designing questionnaires for getting information from private forest landowners, private foresters, and CFM foresters. A random sample of 1,000 forest landowners, 200 private foresters and 3 CFM foresters will be surveyed. The returned data will be analyzed to determine the value of forest service and so on.

Target audiences will be the CFM clients and private sector foresters as well as general public in the awareness of the return to society from the CFM program, in the form of market externalities.

The best evaluation technique is based upon the response and the high rate of return of useful questionnaires. The well-received response of outcome publications would be an indication of the successful project. The future citations of the outcome publications are another indicator.

#### Forest Woody Debris and Remote Sensing

The focus of this group will be to detect and quantify woody debris using remote sensing techniques. Compared to on-the-ground quantification of woody debris, remote sensing enables rapid assessment over extensive areas. Woody debris serves as habitat for plants and animals; it may help stabilize soils on sloping sites when forest cover is removed; and it is a component of the natural fuel loading on forested sites. The group will establish the relationship between the remotely sensed presence of woody debris and the (actual) on-the-ground presence.

An important measure of success involves receiving grant dollars for innovative use of remote sensing devices.

Outcome products desired include peer-reviewed articles.

The resources and partners have not yet been explicitly identified.

A key component of the research project is the detection and quantification of CWD with remote sensing. Target audiences for the research effort include foresters and remote sensing equipment users.

#### Forestry

The forested land area of the state of Connecticut provides numerous benefits to the quality of life and economy of the state. Protecting public and private water supplies, supporting a 300+ million dollar annual forest products industry, providing the backdrop for a growing recreational and tourist industry, and wildlife habitat are just some of the benefits to identify. The bulk of this forestland (almost 90%) is owned by private individuals and groups. These private holdings comprise more than one-half the land area of Connecticut. The continued health and productivity of the forest is threatened by population pressures resulting in conversion and fragmentation, as well as other natural factors, bringing about a decline in the collective and individual benefits provided by forest resources. Because private forest lands comprise the bulk of the land area available for wildlife habitat and watershed protection, education private forest landowners about the management of their land will benefit the biodiversity and water quality in Connecticut.

Anticipated impacts are based upon stewardships and changes in the knowledge and behavior of the target audiences. In addition to the numbers of private Forest Stewardship Plans developed and implemented, the encouragement of individuals to become active within their communities, through hosting meetings, assisting others individually or working with their local governments is a behavior change desired. Inspiring community governments to work together to achieve natural resource protection goals is another anticipated impact.

Outcome products desired include: detailed Forest Stewardship Plans for non-industrial private forestlands; GIS-based Stewardship Plan Maps; mapping database; and formal agreements between town governments. Other desired outcomes include presentation materials such as: poster exhibits; video productions; and programs hosted by workshop attendees and other volunteers. In addition, fact sheets and technical bulletins, articles, planning manuals, and evidence of habitat enhancement work accomplished. Resources include USDA-Forest Service, which provides base funding for the program and technical assistance (MS); CT DEP Forestry Division, which provides administrative assistance and field implementation; US Fish and Wildlife Service and Ruffed Grouse Society, both of which provide funding support (MS). Other resources include: Connecticut Forest Stewardship Committee; Connecticut Forest and Park Association; CT Farm Bureau; Farm Service Agency; USDA-NRCS; CT Audubon Society; and private consultants and industry members.

Forest Stewardship Program is an on-going program, supported by federal funds and the role of Coordinator involves the following: providing educational opportunities for landowners and forestry professionals; promoting the Forest Stewardship Program to target audiences and the general public; cooperating with partner groups and agencies to accomplish stewardship goals; networking with individuals and groups to provide services and build new partnerships; and supporting and participating where possible with other Extension programs when mutual goals and audience contact can be enhanced, such as with watershed and wildlife projects.

Key components of the program involve the use of workshops, field days, direct mail, one-on-one visits, articles, surveys and video productions.

The target audience includes non-industrial private forest landowners, municipal officials, property managers, community leaders and activists, members of the forestry profession, land-use decision-makers and the general public.

Record keeping is an important evaluation technique. Records are kept of the successful completion and implementation of Forest Stewardship Plans for private landowners. Numbers of acres treated, habitat and erosion projects accomplished, and numbers of trees planted, are examples of the types of statistics evaluated. Stewardship Plan quality is also a factor in maintaining funding support. Attendees and referrals from volunteer-sponsored programs, requests for technical assistance and actions taken by municipal land-use decision-makers are also tracked.

#### Geographic Information Science and Natural Resources Management

Focus: 1) Patagonia Biology - Provide ground control, maps, and GIS databases to support the on-going biological research effort in the Torres del Paine National Park, CHILE. This team is lead by Dr. Isaac (Morty) Ortega and has research projects in fisheries, amphibians, botany, ornithology, mammalogy, and (proposed) climatology. This faculty member will provide the spatial infrastructure needed by these projects to do their work. 2) Madagascar Deforestation - Work is currently being done with a team of biologists and statisticians on a deforestation study of Madagascar, Africa. This faculty member has been recruited to help sort of the complicated compilation of spatial data required for the analyses and the statistical models. 3) Swaziland Biology - Dr. Meyer, Dr. Ortega and Mr. Robert McCleary will travel to Swaziland, Africa, next year to assist with Mr. McCleary's masters degree field research. A GIS will be created before going to Africa so that to input data directly into the database for analysis in situ. 4) Woody Debris - Work is being done by Dr. Thomas Meyer and Charlotte Pyle who are trying to detect and quantify coarse woody debris within a forest using remote sensing techniques. Woody debris is a fuel source for forest fires, provides important habitat for many forest species, and is a natural erosion control mechanism. 5) LIDAR - Negotiations are being held with the Connecticut-based company, Technology Services Company, to procure and analyze LIDAR data for the purpose of creating advanced digital terrain models (see personal research report). These data might also be used for climatic modeling with Dr.'s Miller and Yang and the thesis research of Mr. William Slavin. Dr. Thomas Meyer is a co-recipient of a NASA EPSCoR Preparation Grant. These grant monies will be used to develop contacts at NASA with whom to conduct LIDAR research. 6) UConn Woody Plant Census - Dr. Thomas Meyer, Dr. Carol Auer (Plant Science) and Dr. Kristin Schwab (Landscape Architecture) are collaborating on creating a UConn campus census of woody plants. This database will include spatial content (the location of the plants) and attribute content (what kind of plant it is, historical and sparsity significance, taxonomic information, etc.). 7) Hydrology - Dr. Thomas Meyer, Dr. Glenn Warner (NRME) and Dr. Fred Ogdan (Civil Engineering) creating high-accuracy digital terrain models for novel hydrology modeling. 8) Continually Operation Reference Station (CORS) - Dr. Thomas Meyer, Dr. Roger Ferguson (Civil Engineering) and Dr. John (Central UConn) are currently working to establish a GPS community base station. The station is currently located and operating in the W.B. Young Building and is named, NRME. They plan grant to upgrade the installation to become part of the national CORS network. The CORS network is administered by the National Geodetic Survey and is used for GPS survey control, geophysical research, GIS research and training, and navigation. 9) Geodesy Garden - Dr. Thomas Meyer and Dr. Alexopolous (Landscape Architecture) collaborated in designing a garden space on campus that could be used as an instructional tool for teaching geodesy and cartography. It would also provide surveyors, mappers, and remote sensing personnel with an A-class survey marker for use in calibrating their equipment and conducting their work. It was proposed that this work was to be funded by an USDA Challenge Grant, but no suitable site on campus could be identified. This project is on hold pending the determination of a suitable site.

An important measure of success is based upon grant dollars received. If awarded, the Challenge Grant will provide \$80K for the design and construction of the geodesy garden. If the NASA EPSCoR Preparation Grant proceeds as desired, it will be followed by larger grants whose duration will span several years or be ongoing. If awarded, the CORS grant will purchase additional GPS receivers and ancillary support equipment (computers, cables, radios, etc.).

Outcome products desired include peer-reviewed publications, a geodesy garden, maps and GIS databases, a census of UConn woody plants, (at least) two masters theses and possible software patents.

Partners of the program include team leaders and co-principal investigators. For example, Dr. Roger Ferguson is the CORS project leader, Dr. Morty Ortega is the Patagonia and Swaziland team leader, Dr. Charlotte Pyle is the Co-Principal Investigator for Woody Debris Study, and Dr. John Alexopolous is the Co-Principal Investigator for Geodesy Garden.

Key components of the program include: Travel to Patagonia, Swaziland, and Madagascar as necessary to conduct mapping (GPS/GIS) fieldwork. Woody debris: Obtain suitable LIDAR data. Perform ground-truthing fieldwork. Develop and evaluate models/analyses. LIDAR: travel to NASA installations to meet with their scientists and technicians. Possibly oversee the collection of data. Woody Plant Census: teach students how to collect the necessary measurements, help in the data processing and assimilation into the GIS and ancillary databases. Hydrology: Collect and correct a high-accuracy topographic data set to serve as the input of a digital terrain model. This involves using survey-grade GPS receivers in RTK mode. CORS: create the antenna mount on the W.B. Young building. Monitor and service the base station as necessary. Participate in the monument survey. Geodesy Garden: Survey the monument, develop its design.

The target audiences for the program effort consist of the GIS, remote sensing, and land surveyor communities.

Evaluation techniques used to assess if results occurred include peer-reviewed publications, patents and grants received.

#### Land Use and Water Quality/Geographic Information Systems (NEMO and NAUTILUS Projects)

Cooperative Extension System Focus: One programmatic area of focus is land use and water quality. In addressing these topics through inventory, description and assessment, geographic information system (GIS) technology will be used. Outreach efforts are focused on the use of GIS as an effective tool for better land use planning and water quality management, especially at the local level. Land use/water quality issues are of primary concern to a large portion of the state's population.

Measures of success are based upon a number of factors. For example, denoting success are increases in the numbers of: educational presentations prepared and presented to local government groups and NGOs; towns implementing and using GIS for land use/water quality planning; school programs implemented; users of sponsored GIS discussion lists; research grants awarded; and outcome of research aimed at using GIS to models links between land use and water quality. The last measures of success are the development of interactive education materials for the internet and CD-ROM and the number of visitors to the web page.

This work will result in: web pages; interactive computer models; interactive GIS applications; published research results; PowerPoint computer slide presentations; GIS workshops; and awards.

Internal linkages include: the Laboratory for Earth Science Information Systems - NEMO/NAUTILUS supported research activities; Maps and Geographic Information Center (MAGIC) - GIS outreach; Dan Civco; and graduate students. External linkages include: NASA - NAUTILUS research grant (MS); Connecticut DEP - Imperviousness/ water quality GIS research; The Nature Conservancy - watershed project support; and the EPA - funding support of NEMO workshops in tier 5 National Estuary Projects (MS).

The NEMO and NAUTILUS Projects both make extensive use of GIS and related technologies to educate local officials about GIS technology, land use and water quality. NAUTILUS is funded by NASA for a period of three years. It focuses on creating locally useful land use and land cover data from remote sensing systems that can be used to characterize forest fragmentation, sprawl and watershed imperviousness. NEMO is ongoing with funding from USDA, DEP, EPA and other sources. Activities on these projects focus on outreach education, GIS applications development, coordination of GIS activities among various project participants, WWW development, oversight of several research projects. Collaborations will be formed with team colleagues in the following areas: education outreach with CT municipalities; research design and coordination; and NAUTILUS partners in ME, MA, CT and NJ.

The primary audience will include local government officials and staff, NGOs and the general public. Informational workshops and seminars will be designed and offered that inform participants of GIS and its use in land use and water quality management. Both NEMO and NAUTILUS have research and multi-state components. Audiences that will be interested in research results will include the above and state/federal agency staff and NEMO/NAUTILUS collaborators in other states. In addition to workshops and seminars, other venues for disseminating educational information and research findings will be the Internet and journal articles. The plan is to submit articles to GIS journals that describe NEMO and NAUTILUS research and its results. Another part of the plan is to work with secondary school educators and librarians. Schools offer an opportunity to work with and educate future scientists and local officials; librarians have a unique role as points of contact for all types of information available to the general and official publics.

The idea of offering GIS technical training courses designed for local officials and NGOs is currently being explored. To date, workshops have been focused on educating people about what GIS is and how it can be used to support land use and water quality planning and assessment. It may be appropriate for CES to offer technical training in this area. Technical training should and will be coordinated with other CES and NRME GIS faculty. A

decision should be forthcoming. Obviously, initiating such a program will significantly alter my plans. It will result in the creation of printed training materials, exercises, workbooks, etc.

The target audiences for the program effort include local government officials, NGOs, state and federal staff (NASA, EPA, Connecticut and other states), secondary schools, librarians and the general public.

The evaluation technique used consists of a workshop survey form, which will be developed in order to obtain feedback on workshop content and presentation. This will be used to fine tune presentations and to solicit input for future workshops. Impacts can be evaluated by annual surveys to identify GIS adoption in CT towns, creation of GIS databases, and changes in local land use plans.

#### Land Use Education in the Quinebaug-Shetucket Heritage Corridor

Northeastern Connecticut is often referred to as the "Last Green Valley" between Boston and Washington, DC because of its natural, historic and cultural resources. In recognition of the unique value of Northeastern Connecticut, Congress designated a 25 town, 850 square mile area as the Quinebaug and Shetucket Rivers Valley National Heritage Corridor in 1994. Suburban sprawl, loss of farmland and the abandonment of historic mills are threatening the character of the area. The group will work to develop educational programs and methodologies that will not only prove beneficial to towns in the Quinebaug-Shetucket Heritage Corridor, but also to the state as a whole. This multi-town approach will urge municipalities to begin thinking regionally and across political borders, further working toward the greater goal of preserving the region's natural, cultural and historic resources. The group will stay abreast of the latest planning methods and technologies in order to provide the most up-to-date education to municipal CEOs, planning, zoning, conservation and economic development commissions, and other key decision makers in the region. Resources: Quinebaug-Shetucket Heritage Corridor Management Plan, Quinebaug-Shetucket Heritage Corridor Action Plan, a Study of the Quinebaug-Shetucket Region of Connecticut (National Park Service), a Historical Overview of the Quinebaug-Shetucket Region (National Park Service), New England ArcView listserv and CT GIS users listserv.

The anticipated success of this program will be most apparent through the change in knowledge and subsequent behavior of program participants. Examples of these anticipated behavior changes include the formation of Conservation Commissions, natural resource inventories, open space plans, historic preservation plans, increased grant dollars received by Quinebaug-Shetucket Heritage Corridor towns, changes to subdivision and/or zoning regulations to promote farmland preservation and open space protection, and the incorporation of new technologies (ex. GIS) into the municipal governance system.

The outcome products desired will be publications detailing effective educational models and planning methodologies that will best serve to educate the target audience on the importance of regional thinking when working to preserve natural, cultural and historic resources.

Internal partners include the UConn College of Agriculture and Natural Resources. Specifically, the Natural Resources Department assists in GIS training workshops and the Water Resources Team assists with NEMO workshops and other land use and water quality workshops. Finally, the Economic Viability Team provides information on appropriate economic development for rural communities.

External resources include the Quinebaug-Shetucket Heritage Corridor, which provides monetary and resource support in addition to sponsoring workshops. If Congress approves expansion, then will become multi-state. Other external resources are regional councils of government, which sponsor workshops and promote the importance of regional thinking in natural, cultural and historic resource protection.

The group will work together to develop educational programs and methodologies that will not only prove beneficial to towns in the Quinebaug-Shetucket Heritage Corridor, but also to the state as a whole. This multi-town approach will urge municipalities to begin thinking regionally and across political borders, further working toward the greater goal of preserving the region's natural, cultural and historic resources. The topics of these programs will focus on ways for towns to work together regionally through their individual Plans of Conservation and Development, the Regional Plan of Conservation and Development and through other watershed level planning efforts.

The educational method utilized will be presentations with supplemental written information. The number of attendees is likely to vary by topic, town, and region.

The target audience will be planning and zoning commissions, conservation commissions, historic preservation organizations, economic development commissions, boards of selectmen, and other groups in Connecticut concerned with incorporating a regional approach into land use planning, historic preservation, and resource conservation.

An immediate evaluation of the program will be assessed through the attendees after the educational program has concluded. A six month and one year follow-up with the program organizer will be conducted to help

assess any changes which have occurred as a result of efforts. These changes could be in the form of inventories, plans, regulation updates or new committees formed.

### Land Use and Water Quality

Nonpoint source water pollution is the number one water resource impairment in the United States, and urban stormwater runoff is the number one water quality problem for the nation's coastal areas, according to the Environmental Protection Agency<sup>1</sup>. Nonpoint source pollution is generated by land use, which is decided at the county and municipal levels of government, by local land use officials. This critical audience must be educated on the causes, impacts, and remedial measures associated with the control of nonpoint source pollution.

Measures of success will be based upon a number of factors. For instance, success is measured by increases in the numbers of: Connecticut communities hosting educational programs; communities composing watershed management plans and/or open space plans; and school or research projects related to natural resource-based land use planning and environmental stewardship of water resources. Impact is also measured by changes to town plans and regulations.

This work will result in: educational workshops; PowerPoint presentations; peer-reviewed journal articles; fact sheets; technical papers; abstracts and proceedings from regional and national conferences; web sites and awards.

Partners include internal linkages located at the University of Connecticut's Department of Natural Resources Management and Engineering (NRME) and the Plant Science Department. Specifically, Dan Civco, NRME faculty, provides remote sensing data and expertise. Also from NRME are Jack Clausen and Glen Warner, both of which provide water pollution remediation expertise. The Plant Science/Landscape Architecture faculty provide landscape and subdivision design expertise. Another internal linkage is the Cooperative Extension System (CES). CES Forestry staff conduct complementary forest stewardship programs within watershed context. In addition, CES Family and Community staff provide home-based water quality programs. Resources include external linkages such as the US Fish and Wildlife Service, the Environmental Protection Agency (EPA), the National Aeronautics and Space Administration (NASA) and the Connecticut Department of Environmental Protection (CT DEP). The U.S. Fish and Wildlife Service provides funding for work in Lower Connecticut River watershed. EPA Region One provides funding for work in Southwestern Connecticut and Westchester County, NY (MS). Additionally, the EPA Office of Water provides support for national workshops (MS). NASA provides funding and data for expanding work related to the effects of sprawl on water and forest resources (MS). Lastly, CT DEP provides funding for educational workshops and research in Connecticut.

The Nonpoint Education for Municipal Officials (NEMO) Project conducts educational programs targeting local land use officials throughout Connecticut. The project has seven staff involved in developing and conducting educational presentations, writing educational publications, creating methods for using remote sensing, geographic information system and World Wide Web technologies for educational purposes, and interacting with local officials. In addition, NEMO is working with groups in other states to adapt NEMO to their region.

NEMO project strategies revolve around increasing educational coverage of Connecticut communities, reaching 100 of the state's 169 towns within this planning period. Nationally, it is planned to help local partners adapt NEMO in 25 of the nation's 50 states during this planning period. One role within the NEMO Team is liaison with state agencies, production of educational materials, presenter of educational programs -- both to Connecticut and national target audiences, and oversight of national activities.

Target audiences for the program effort include local land use decision makers in Connecticut and natural resources professionals in other states.

Evaluation techniques consist of yearly surveys in order to assess if learning and the desired results occurred. Principal project contacts in Connecticut communities will be surveyed yearly to ascertain attitudinal changes, changes to town documents and policies, and initiation of related research, education, watershed management, and open space planning initiatives. These changes will also be documented through commission minutes, newspaper articles, letters and memos. Project contacts in other states will be surveyed yearly to ascertain the progress and extent of NEMO adaptations: number of partner agencies; number of presentations; number of local officials reached and funding.

### Land Use and Water Quality/Geographic Information Systems (NEMO and NAUTILUS Projects)

The programmatic area of focus is land use and water quality. In addressing these topics through inventory, description and assessment, the geographic information system (GIS) technology is used. Outreach efforts are focused on the use of GIS as an effective tool for better land use planning and water quality management, especially at the local level. Land use/water quality issues are of primary concern to a large portion of the state's population.

Measures of success are based upon increases in the numbers of: educational presentations prepared and presented to local government groups and NGOs; towns implementing and using GIS for land use/water quality planning; school programs implemented; users of sponsored GIS discussion lists; research grants awarded and outcome of research aimed at using GIS to models links between land use and water quality. Other measures of impact are based upon the anticipated development of internet-based educational materials and the number of hits on the web site.

This work will result in web sites; interactive computer models; interactive GIS applications; published results from research; PowerPoint computer slide presentations; GIS workshops and awards.

Partners include internal linkages such as the Laboratory for Earth Science Information Systems - NEMO/NAUTILUS supported research activities, Maps and Geographic Information Center (MAGIC) - GIS outreach, Dan Civco and graduate students.

Resources include external linkages such as the National Aeronautics and Space Administration (NASA) and the Environmental Protection Agency (EPA), both of which are sources of external funding. NASA has provided the NAUTILUS research grant (MS) and the EPA has funded support of NEMO workshops in tier 5 National Estuary Projects (MS). Another important resource is the Connecticut Department of Environmental Protection for their support on imperviousness/water quality GIS research. Lastly, the Nature Conservancy provides watershed project support.

The NEMO and NAUTILUS Projects both make extensive use of GIS and related technologies to educate local officials about GIS technology, land use and water quality. NAUTILUS is funded by NASA for a period of three years. It focuses on creating locally useful land use and land cover data from remote sensing systems that can be used to characterize forest fragmentation, sprawl and watershed imperviousness. NEMO is ongoing with funding from USDA, DEP, EPA and other sources. Activities on these projects focus on outreach education, GIS applications development, coordination of GIS activities among various project participants, WWW development, oversight of several research projects. As a member of the NEMO/NAUTILUS team, collaboration with team colleagues will focus on the following areas: education outreach with Connecticut municipalities; research design and coordination; and collaboration with NAUTILUS partners in Maine, Massachusetts, Connecticut and New Jersey.

The primary audience will include local government officials and staff, NGOs and the general public. Informational workshops and seminars will be designed and offered that inform participants of GIS and its use in land use and water quality management. Both NEMO and NAUTILUS have research and multi-state components. Audiences that will be interested in research results will include the above and state/federal agency staff and NEMO/NAUTILUS collaborators in other states. In addition to workshops and seminars, other venues for disseminating educational information and research findings will be the Internet and journal articles. Articles will be submitted to GIS journals that describe NEMO and NAUTILUS research and its results. Secondary school educators and librarians will also be involved. Schools offer an opportunity to work with and educate future scientists and local officials; librarians have a unique role as points of contact for all types of information available to the general and official publics.

It's worth noting that at this time offering GIS technical training courses designed for local officials and NGOs is being explored. To this point in time, workshops have been focused on educating people about what GIS is and how it can be used to support land use and water quality planning and assessment. It may be appropriate for CES to offer technical training in this area. Technical training should and will be coordinated with other CES and NRME GIS faculty. A decision should be forthcoming. Obviously, initiating such a program will significantly alter my plans. It will result in the creation of printed training materials, exercises, workbooks, etc.

Targeted audiences for the program effort include local government officials, NGOs, and the general public; state and federal staff (NASA, EPA, Conn. and other states); secondary schools; and librarians.

In order to assess if learning and/or results occurred, a workshop survey form will be developed and used to obtain feedback on workshop content and presentation. This will be used to fine tune presentations and to solicit input for future workshops. Impacts can be evaluated by annual surveys to identify GIS adoption in CT towns, creation of GIS databases, and changes in local land use plans.

#### International Environmental Degradation

Many expect that as Third World nations undergo economic growth and economic development they will increasingly contribute to global economic degradation, especially atmospherically. Moreover, some experts have expressed concern that the measures imposed on debt ridden nations by the International Monetary Fund (e.g. land consolidation, agricultural production for export, cuts in the minimal environmental monitoring) may actually be aggravating the situation. Questions have also been raised about the role of multinational corporations operating in

the Third World in increasing pollution there and globally. Firm answers to these speculations are essential to understand, prepare for and possibly minimize the local and global impact of environmental degradation occurring in developing countries.

Measures of impact are based upon a change in the understanding of the role of Western agents (IMF, MNCs) in environmental degradation in developing regions. In addition, citations to research would serve as a measure of success.

Desirable outcomes include peer reviewed articles.

An important partner is the Clark University Sociology Department (MS).

During the next two years, environmental, economic and demographic data will be assembled from secondary sources for approximately 80 developing nations; analyze relationships among these variables; and publish the results.

One strategy is the use of standard quantitative analyses using lagged multiple regression models.

Target audiences for the program effort include sociologists and economists specializing in environmental and/or developmental studies as well as policy makers.

The only evaluation technique possible in this case is whether the research results are accepted for publication in a peer reviewed journal.

### Program of Landscape Architecture

There are many groups that influence the design of the built environment. While many of these bring significant specific knowledge, they do not have the knowledge or training to bring together the myriad of issues related to development. The landscape architect's training and practice allow them to understand a wide range of issues related to development, conservation and resource management and develop coherent solutions that address the concerns of many stakeholders.

Measures of success include an improvement in knowledge and behavior with respect to land use, significant research results and additional funding. The primary impact of involvement in community planning and design would be better land use and land design decisions throughout the state. Some significant research results could come from studies of past land use decisions and their impacts. There are many sources of funding for community scale planning including: the communities themselves, regional planning groups, watershed based groups, the state and foundations interested in wise-use of the land.

Outcome products desired include studies, which influence community planning, Extension publications and community workshops.

Resources and partners include communities, foundations such as the Pew Charitable Trusts and the Charles Stewart Mott Foundation and others within CANR working on related projects.

A key component of the program is that it provides an ongoing resource for the state that would address the diverse issues of community planning and community design.

Strategies include workshops for professionals including (15-20 attendees), workshops for community officials (15-20 attendees), present results at state and regional conferences (40-60 attendees) and publish results.

Targeted audiences for the program effort include professionals (landscape architects and community planners) as well as community officials.

Evaluation techniques include changes in professional methodologies and possibly follow up studies to see if changes have occurred.

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Outcome products desired include studies that influence community planning, Extension publications and community workshops.

Resources and partners include communities, foundations such as the Pew Charitable Trusts and the Charles Stewart Mott Foundation, and others within CANR working on related projects.

This program provides an ongoing resource for the state that would address the diverse issues of community planning and community design.

Strategies include workshops for professionals (15–20 attendees), workshops for community officials (15–20 attendees), presentations of results at state and regional conferences (40–60 attendees), and published results.

Target audiences include professional landscape architects, community planners and community officials.

Evaluation techniques include changes in professional methodologies and possibly follow up studies to see if changes have occurred.

#### Program of Landscape Architecture/Community Planning and Design

There are many groups that influence the design of the built environment. While most of these bring significant specific knowledge to the process, they do not have the knowledge or training to bring together the myriad of technical, aesthetic, cultural and economic issues related to development. Landscape architects' training and practice allow them to understand a wide range of issues related to community development, conservation, and resource management and to develop coherent solutions that address the concerns of many stakeholders.

The primary impact of involvement in community planning and design would be more sustainable land use and design decisions throughout the state. These would result both in strengthened cultural qualities of communities, as well as increased ecological health of communities in a variety of scales and settings. Specific types of impact would be in the areas of open space planning, transportation planning, neighborhood revitalization, village protection, watershed protection, and riparian corridor management, among others. Some significant research results could come from studies of past land use decisions and their impacts, studio-based community design projects involving students and community members, and studies of public perceptions of community quality.

Outcome products desired include: published studies, which influence community planning; Extension publications; presentations at professional conferences and meetings; community workshops; and professional workshops.

Resources and partners include: communities; non-profit agencies such as Quinnebaug-Shetucket Heritage Corridor; regional chapters of the American Society of Landscape Architects; and granting organizations such as the Pew Charitable Trust, the Charles Stewart Mott Foundation, and state and federal agencies.

This program is proposed as an ongoing resource for the state that would study and address the diverse interests of sustainable community planning and design.

The work of this program would be carried out in two major ways: development of new knowledge, methodologies and insight about community planning through basic and applied research; and active application and dissemination of community planning and design strategies through workshops and community planning and design assistance. Each member of the group would develop the program through his or her own specific interests and experience, in addition to comprehensive efforts involving all group members.

Target audiences include: professional landscape architects and planners; community officials; community members; and students.

Evaluation techniques consist of surveying changes in professional methodologies, community development patterns and specific community quality over time.

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#### Natural Resources/Earth Resources Information Systems

The overall goal for this faculty member over the next five years (and beyond) is to continue to build the earth resources information systems program in NRME and the research conducted within LERIS (Laboratory for Earth Resources Information Systems). The program has begun to receive national, and, in fact, international recognition. This faculty member plans to increase that visibility and aspires to make this program the leading one of its type in the northeastern United States, if not the country.

There are several research fronts currently engaged in and will continue into the next millennium. The first is related to a major NASA-sponsored grant entitled: "Better Land Use Planning for the Urbanizing Northeast: Creating a Network of Value-Added Geospatial Information, Tools, and Education for Land Use Decision Makers." [Co-Principal Investigator (with Chester Arnold and Sandy Prisloe). NASA Regional Earth Science Applications Center (RESAC), NRA-98-OES-08. January 1, 1999 – December 31, 2001. \$1,100,000.]. The Regional Earth Science Application Center being developed is named NAUTILUS, for Northeast Access to Useable Technology in Land Use planning for Urban Sprawl. NAUTILUS will focus on improving the technology for land-cover mapping and GIS (Geographical Information Systems) applications, with an emphasis on Urban Sprawl, Impervious Cover and Forest Fragmentation. This is a three-year project with expectations for continued funding beyond the initial contract period.

A second long-term research area is the development of improved methods for remote sensing image and other geospatial data processing. The intent is to investigate innovative technologies for the integration and analysis of earth resources data from a variety of sources (airborne and satellite, optical and radar, DEM, GPS, and others) and with vastly different properties (resolution, measurement space, time scale, etc.). This area of research will be supported in part by the NASA RESAC grant, but will also be expanded through the NASA-funded Experimental Program to Stimulate Competitive Research, or EPSCoR. Connecticut has just been designated an EPSCoR state, and remote sensing is one of the five research thrust areas, of which this faculty member is the leader. One share of the EPSCoR preparation grant will be used to establish contacts with colleagues at NASA centers (Goddard Space Flight Center, Stennis Space Center) over the next year to help develop long-term NASA-sponsored remote sensing research. Specifically, it will be proposed to continue research into the development of improved earth resource information for both terrestrial and aquatic systems. In particular, high spatial and spectral resolution imagery will be investigated for their use in detailed land cover mapping. These data include Landsat 7 ETM+; ASTER; SIR-C Dual-band, Synthetic Aperture Radar (SAR); ADAR 5500 1-meter multispectral imagery; IFSARE 2.5 meter imagery and DEM; and SI Ikonos 1-meter Panchromatic and 4-meter Multispectral satellite image data. Techniques to be investigated include genetic algorithm neural network classification, wavelet-based data fusion, integration of optical and microwave remote sensing data, and inclusion of non-remote sensing data, such as terrain, soils, anthropogenic features, and others, in the classification process. This remote sensing topic area is closely aligned with the objectives of the Land Cover and Land Use Change (LCLUC) interdisciplinary scientific theme within NASA's Earth Science Enterprise (ESE). This research area will have contacts at both NASA (William Campbell, Head, Applied Information Science Branch, GSFC, Greenbelt, MD and Fritz Policelli, Stennis Space Center, MS) and the EROS Data Center (Susan Maxwell, Raytheon, EROS Data Center, Sioux Falls, SD).

A product of this research will be the development of a set of integrated tools for the assimilation, integration, and analysis of digital earth resources data for the purpose of land cover characterization. These tools will be made available to the remote sensing user and land use decision-making communities, as well as ported to specific commercial software systems. As satellite and computer technology improve, so will the techniques being developed here continue to evolve.

If the second submission (in Spring 2000) of the EPSCoR grant is successful, \$500,000 annually will be made to Connecticut, with a share of this coming to this faculty member to continue remote sensing research.

The NRME Department's Earth Resources Information Systems program has been successful in attracting first-class graduate students. This faculty member currently advises, directly, two doctoral degrees and four masters degree students. It is anticipated that graduate enrollment will continue to be from 6 to 10 students at any given time.

Attendance of professional society meetings provides a forum for the delivery of research results. This faculty member has historically attended at least two meetings annually. This number, too, will increase over the next five years given the NASA RESAC and EPSCoR projects.

This work will result in publications for research results. Typically, this faculty member authors or co-authors two to four refereed journal articles and four to eight full-length conference proceedings papers annually. This level is expected to be maintained, or in fact increased, given the numbers of graduate students conducting geoprocessing research. Delivery of research results will include not only traditional print medium, but also electronic media including CD-ROM and the Internet. The new server being established in LERIS as part of the NASA RESAC project will facilitate the latter. The research publications from NRME/LERIS have received several national awards including: ASPRS ESRI Award (1<sup>st</sup> Place) for Best Scientific Paper in GIS, 1998; ASPRS ERDAS Award (2<sup>nd</sup> Place) for Best Scientific Paper in Remote Sensing, 1999. The quality of the research and the publications stemming from that research will continue to be competitive for such awards and recognition in the future.

Partners will include close relationships with scientists from NASA and USGS to help foster an improved research collaboration with federal agencies and their programs within NASA, the Earth Science Enterprise (formerly Mission to Planet Earth) and within USGS, the Global Land Cover Characterization Program. This faculty member plans on becoming more involved with the Federal Geographic Data Committee (FGDC) as part of its metadata standards and earth cover classification programs. Partners in the University include colleagues in the Cooperative Extension System, especially the NEMO project. The NASA RESAC grant establishing NAUTILUS is an example of that collaboration. Partners at UConn and elsewhere in Connecticut include those investigators at other educational institutions that are participating in the EPSCoR Remote Sensing Thrust Area. Those include faculty from: Departments of Civil and Environmental Engineering, Geography; Ecology and Evolutionary Biology, The University of Connecticut - Storrs; Southern Connecticut State University, New Haven, CT; Department of Biology and Environmental Science, University of New Haven; Department of Engineering, Trinity College, Hartford, CT; Department of Electrical Engineering, University of Hartford, West Hartford, CT; Department of Civil Engineering, The University of Hartford, West Hartford, CT.

Key components of the project include: audiences; remote sensing and geospatial data user community; land use and land cover mapping scientists; land management professionals; traditional and non-traditional students in higher education; teachers and students from K-12 education; educational strategies; series of integrated hands-on workshops with 12-15 participants each on the principals and applications of remote sensing, geographic information systems, global positioning systems; a strategy for a long-term series of offerings is being coordinated with colleagues from the Cooperative Extension Service; web-based curriculum development i.e. ASPRS Remote Sensing Core Curriculum; enhancement of undergraduate and graduate curriculum in earth resources information systems to be facilitated with education and training-oriented grants e.g. Curriculum Development, Implementation, and Internet-based Distribution for Introductory and Advanced Remote Sensing. Connecticut Space Grant College Curriculum Development Award, May 1999 - April 2000, \$ 4,100.

For EPSCoR, for example, quarterly reports and semi-annual meetings will assist in documenting research results and plans; for the NASA RESAC research, applications, and outreach, quarterly reports and regular meetings among the investigators; for workshops developed and delivered, an assessment tool consisting of pre- and post-surveys will assist in documenting the effectiveness (success) of the workshops in terms of delivering the message.

Given the very dynamic fields of remote sensing, GIS, and GPS, CANR (NRME, CES, and other units) faculty and staff need to be abreast of the latest developments and applications. This will require attendance of regional and national professional society conferences (e.g., ASPRS), national users' group meetings (e.g., ESRI), and participation in short courses and workshops offered by geoprocessing software developers (e.g., ArcInfo, ArcView, Imagine, ER Mapper, etc.). Release time and financial support is needed, perhaps in the order of \$10,000 to \$15,000 annually.

### Natural Resources and Land Use

Connecticut's 1.8 million acres of forest provide the raw material for over 350 forest products processing and manufacturing firms, which collectively employ 3,600 citizens and contribute over \$400 million annually to the state's economy. They also clean air and water, provide habitat for wildlife, and provide recreational opportunities for nearly a million citizens each year. Research shows that Connecticut is losing some 11,000 acres of forest annually to development, and that forest fragmentation has caused the average forested parcel size to decline 34% over the past 20 years. Municipalities have many new G.I.S. and other spatial data tools available to them to assist in resource protection planning, but lack expertise in their use.

Measures of success include: municipalities with effective plans for natural resource management and protection; municipal and regional officials knowledge gained; forested acres under stewardship plans; forested acres enhanced for wildlife, forest products production and other benefits; important forested acres protected from conversion to other uses; knowledge gained by forest owners, natural resource professionals and forest products harvesters.

Outcome products desired include: model plans; workshops and short courses; comprehensive continuing education program involving UConn upper-class student projects; and Extension publications.

Resources/partners of the program effort include QSHC, Inc. (MS), regional councils of governments and the University of Massachusetts Extension (MS).

Comprehensive outreach program including municipal level workshops, regional workshops, hands-on training at UConn College of Agriculture and Natural Resources and branch campuses and internet based outreach efforts.

Municipal officials, regional and municipal planners and land trusts make up the target audience for the program effort.

Evaluation techniques consist of pre and post evaluations as well as lag-time follow-up to measure the extent of adoption into municipal planning processes and plan implementation.

### Patagonia Project Partnership

The focus is to carry out natural resources research at Torres del Paine National Park, Chile.

Measures of success are based upon anticipated research results and grant dollars received. Areas considered are herbivore-vegetation relationship and fisheries. Many questions will be answered in relation to guanaco's (South American camelid) social behavior and vegetation. Research studies on the native fish species at the park has been limited, thus any information gathered will be highly valuable for their management, specially their relation with the sport-introduced fish species. Both will be highly benefited by the work done with Geographic Information Systems.

With respect to grant dollars received, \$20,000 was obtained through a research expedition that helped us to visit and conduct research for two weeks in January 1999. The Research Foundation provided airfare funding for two researchers, while one researcher and two graduate students were paid with research expedition funding.

Any research conducted by UConn teams at the Torres del Paine National Park will be more than welcome since this is a remote and abandoned area of Chile. The research done at this park is critical considering that this is one of the nine worldwide reserves of the biosphere under the UN program.

Desired outcomes include the publishing of research results. Scientific as well as popular papers will be published once the information has been accumulated. For now scientific and popular slide presentations have been done based on the knowledge accumulated during the last research expedition.

There are both internal and external partners of the research effort. Internal linkages include Margaret Rubega and Chris Elphick, located in the Ecology and Evolutionary Department. External Linkages include: Claudio Venegas, Universidad de Magallanes, Chile; Rick Relyea, University of Pittsburgh; Michael Bank, University of Maine; Melissa Grigione, Defenders of Wildlife; and Ron Sarno, Cancer Research Institute;

In the summer of 1999, a major research proposal will be submitted to public and private organizations to establish a long-term research at the Torres del Paine National Park.

Research has been conducted with guanacos for the past 20 years at the park. Park managers are in need of a broader research that will include other wildlife species (mountain lion, small mammals, and waterfowl) fish species and vegetation communities. There is also need for the building of park maps with the help of GIS. This research project should have a minimum duration of ten years.

Important methods include field research and lab research, both of which will be conducted. Lab research will be conducted at the University of Connecticut or at the Universidad de Magallanes, Chile. Although Torres del Paine National Park will receive most of the research attention, some research will be conducted in private rangelands located adjacent to the park. Research conducted at these sites will have to do with wildlife-livestock relationships.

In order to assess if results occurred, Masters and Ph.D. theses, in addition to, scientific and popular publications will serve as the evaluation techniques.

### Branford River Stewardship Project

Many Connecticut residents are unaware of environmental and health concerns related to water. This is particularly true as it relates to individual actions and how they impact water quality. The focus of these efforts is nonpoint source pollution as it relates to individual decisions and actions in the home environment. A major focus

of the CT CES water quality education is the adoption of appropriate landscape management practices. In addition to landscape practices, however, the programs will address care and maintenance of septic systems, household hazardous waste management, pet waste management and others as relevant to target audience. With respect to the Branford River Stewardship Project there is both an education and research component to further provide data on the actual impact of residential education model.

Anticipated measures of success and impact are based upon a number of factors such as research results, external funding and knowledge gained. Research Results - Paired Watershed Study - impact of implementation of residential Best Management Practices; Grant Dollars Received - 319 (preproposal submitted 1/31/99); Knowledge gained, behaviors changed, sustainable landscape designs adopted; Presentations Made - State and National Meetings (St. Louis); Collaboration with School of Education: Educational Psychology - Curriculum Development and support funding (Grant applications to NSF and others).

Among the desired outcome products are peer reviewed articles, Extension publications and residential stewardship property assessment tools. Hopefully, the peer reviewed articles will be focus on the educational format (volunteer), teaching neighborhood concept and paired watershed study. Also desired are CD ROMs and an exhibit designed for use at professional conferences.

There are both internal and external linkages associated with the project. The internal partners are located at the University of Connecticut. UConn collaborations are with the College of Agriculture and Natural Resources' Department of Plant Science and Department of Natural Resources Management and Engineering. Another UConn collaboration is with the Department of Educational Psychology, which is part of the School of Education. External Partners include the Branford River Project and the Department of Environmental Protection (if 319 funded).

This will continue to be an ongoing program. Volunteer training has been completed; water quality base data is being collected and the training for the teaching neighborhood in the paired watershed study will begin in summer 1999.

Residential best management practices will be taught by the volunteers and implemented by residents receiving the information. Education will continue through local volunteers via direct education, exhibits and the media. This project will serve as a model for other efforts, beginning with the Residential Water Quality Stewardship Project funded under USDA Water Quality Initiative funds.

Audiences will include Branford community-at-large, residents within the Paired Watershed Study area and area schools (teachers and students). Methods will include direct education (group presentations and exhibits); one-on-one education with residents in study neighborhood and working with local teachers and students. The volunteers trained will provide most of the education. On-going educational opportunities will be provided by faculty from the University of Connecticut. An estimated 1,500 Branford residents will participate in educational program/opportunities.

The target audiences include residential consumers, teaching neighborhood residents (paired watershed study), students and teachers.

Evaluation techniques consist of pre/post test of volunteers trained, interview of volunteers (contracted with Educational Psychology Dept.), pre/post surveys of residents in Paired Watershed Study and post program evaluations to assess knowledge gained and skills learned by program participants.

#### Fund for Rural America Project: Agriculture in New England

Within New England, the dairy industry is the major commodity group affected by changes in federal agricultural programs. The dairy industry is the most significant agricultural sector in the region with almost \$1 billion in sales annually. However, the profitability and long-term viability of this sector is a matter of growing concern. The industry is declining in terms of number of farms and land in farms.

Anticipated measures of success are based upon the change in knowledge or behavior of the program participants. For instance, the agricultural community, political leaders, and the public at large will learn about general trends in agricultural and natural resource based industries, particularly dairy. Moreover, at least 100 dairy farmers will benefit from assistance in analyzing profitability of alternative management strategies and on-farm income generating opportunities.

Desired outcomes from research efforts include journal articles, abstracts, conference presentations, workshop presentations, M.S. thesis, Extension publications and fact sheets.

Partners of the research project consist of governmental agencies and graduate students at the University of Connecticut. Specifically, the USDA, CT Department of Environmental Protection and the CT Department of Agriculture are valuable resources. Also valuable resources/partners are the Farm Bureau and the Advisory Board for Fund for Rural America Project. Lastly, graduate research assistants.

The emphasis here is on analyzing potential alternative on-farm income generating opportunities for dairy farmers. The overall objective is to develop research and outreach programs that will provide assistance to individual producers and farmers who are seeking to expand or diversify into new agricultural enterprises such as agritourism, aquaculture, or specialty crop production. Project Duration: 1998-2001.

Important strategies or methods include survey development and implementation, analysis of survey data, development of case studies, workshops for dairy producers on alternative activities and the preparation of technical report and journal articles.

Target audiences for the research effort includes government agencies (CT DOA; CT DEP; USDA), state legislature, faculty at the University of Connecticut and other universities (MS), environmental organizations, and the Farm Bureau.

The evaluation technique for this project is the use of surveys. Industry members and others who deal with the industry in an official capacity will be surveyed to determine knowledge gained and number of producers starting new on-farm income generating opportunities.

### Sustainable Landscapes

America's landscaping and gardening tradition as well as suburban land development has increasingly impacted remaining natural ecosystems. To reconnect as many plant and animal species as possible and to rebuild suburban ecosystems requires restoring the ecology of one's own backyard. Sustainable landscapes and cultural landscape ecology techniques and practices are systems of gardening that use many of the same principles that natural ecosystems utilize. Basically they are about reducing waste, energy and materials. Actions that are taken at the individual level can have positive environmental consequences including sustainable landscapes. Cooperative Extensions focus will be statewide with consumers as the major audiences.

Measures of success will include implementation of new plant varieties, changed design approach within the landscape and utilization of new landscape management practices. The anticipated impact will be designing and creating sustainable landscape systems that imitate nature and turn the problems into solutions.

Desired outcomes include a slide set as well as two new Extension publications on sustainable landscapes.

The internal resource is the University of Connecticut's Department of Plant Science. External resources are the Connecticut Nurserymen's Association and Connecticut Groundskeepers Association.

This will be an ongoing program. The major thrusts of this program will be to establish and promote environmentally sustainable management guidelines for use in urban, suburban and rural location. Practices utilizing sustainable management guidelines include: recycling of existing organic material such as leaves (instead of purchased bark mulch), utilizing xerophytic plants on dry sites, utilizing disease, insect and deer resistant plants, utilizing plants to attract pollinators, butterflies and wildlife, and utilizing slow release organic fertilizers that produce less leachate runoff.

Audiences will be primarily consumers, residential properties and interested individuals. Methods will include presentations to consumers, industry meetings, master gardener programs and training. 5,000 consumers will be reached. Research strategy will include design and development by this author, consultation with CANR faculty, literature review and professional conference attendance.

Target audiences include residential consumers, gardeners and landscape service providers.

Evaluation techniques consist of surveys with respect to the knowledge gained by program participants.

### Water Quality

Nonpoint source water pollution is the number one water resource impairment in the United States, and urban stormwater runoff is the number one water quality problem for nation's coastal areas, according to the Environmental Protection Agency<sup>1</sup>. Nonpoint source pollution is generated by land use, which is decided at the county and municipal levels of government, by local land use officials. This critical audience must be educated on the causes, impacts, and remedial measures associated with the control of nonpoint source pollution.

One measure of success is based on the number of Connecticut communities hosting educational programs. Also reflecting success are the numbers of communities composing watershed management plans and/or open space plans and the numbers of school projects and research projects related to natural resource-based land use planning and environmental stewardship of water resources. Other measures are the changes made to town plans and regulations.

Desired outcomes include educational workshops, PowerPoint presentations, peer-reviewed journal articles, fact sheets, technical papers, abstracts and proceedings from regional and national conferences, web sites and awards.

There are both internal and external resources/partners that are associated with this program. Internal resources/partners are located at the University of Connecticut's Department of Natural Resources Management and Engineering (NRME), the Cooperative Extension System (CES) and other UConn faculty. Specifically, NRME faculty (Dan Civco) provides remote sensing data and expertise. NRME faculty (Jack Clausen, Glen Warner) also provides water pollution remediation expertise. Plant Science/Landscape Architecture faculty provide landscape and subdivision design expertise. CES Forestry staff conduct complementary forest stewardship programs within watershed context. Lastly, CES Family and Community staff provide home-based water quality programs. External partners consist of state and federal agencies such as the Connecticut Department of Environmental Protection (CT DEP), the United States Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service and the National Aeronautics and Space Administration (NASA). For instance, CT DEP provides funding for educational workshops and research in Connecticut. EPA Region One provides funding for work in Southwestern Connecticut and Westchester County, NY (MS). EPA Office of Water provides support for national workshops (MS). The U.S. Fish and Wildlife Service provides funding for work in Lower Connecticut River watershed. NASA provides funding and data for expanding work related to the effects of sprawl on water and forest resources (MS).

The Nonpoint Education for Municipal Officials (NEMO) Project conducts educational programs targeting local land use officials throughout Connecticut. The project has 7 staff involved in developing and conducting educational presentations, writing educational publications, creating methods for using remote sensing, geographic information system and World Wide Web technologies for educational purposes, and interacting with local officials. In addition, NEMO is working with groups in other states to adapt NEMO to their region.

NEMO project strategies revolve around increasing educational coverage of Connecticut communities, reaching 100 of the state's 169 towns within this planning period. Nationally, the plan is to help local partners adapt NEMO in 25 of the nation's 50 states during this planning period. One role within the NEMO Team is overall coordination of team activities, grant writing and administration, liaison with federal and state agencies, production of educational materials, presenter of educational programs - both to Connecticut and national target audiences, and oversight of national activities.

Targeted audiences for the program effort include both local land use decision makers in Connecticut as well as natural resource professionals/peers in other states.

In order to assess if learning and results occurred, surveys will be used as evaluation tools. Principal project contacts in Connecticut communities will be surveyed yearly to ascertain attitudinal changes, changes to town documents and policies, and initiation of related research, education, watershed management, and open space planning initiatives. These changes will also be documented through commission minutes, newspaper articles, letters and memos. Project contacts in other states will be surveyed yearly to ascertain the progress and extent of NEMO adaptations: number of partner agencies; number of presentations; number of local officials reached; funding.

### Water Quality

Nonpoint source water pollution is the number one water resource impairment in the United States, and urban stormwater runoff is the number one water quality problem for nation's coastal areas, according to the Environmental Protection Agency<sup>1</sup>. Nonpoint source pollution is generated by land use, which is decided at the county and municipal levels of government, by local land use officials. This critical audience must be educated on the causes, impacts, and remedial measures associated with the control of nonpoint source pollution.

Anticipated measures of success are based upon: the number of Connecticut communities hosting educational programs; changes to town plans and regulations; the number of communities composing watershed management plans and/or open space plans and the number of school projects and research project related to natural resource-based land use planning and environmental stewardship of water resources.

Outcome products desired: educational workshops; PowerPoint presentations; peer-reviews journal articles; fact sheets; technical papers; abstracts and proceedings from regional and national conferences; web sites and awards.

There are both internal and external partners that are associated with this program. Internal resources/partners are located at the University of Connecticut's Department of Natural Resources Management and Engineering (NRME), the Cooperative Extension System (CES) and other UConn faculty. Specifically, NRME faculty (Dan Civco) provides remote sensing data and expertise. NRME faculty (Jack Clausen, Glen Warner) also provides water pollution remediation expertise. Plant Science/Landscape Architecture faculty provide landscape and subdivision design expertise. CES Forestry staff conduct complementary forest stewardship programs within watershed context. CES Family and Community staff provide home-based water quality programs. Lastly, UConn

Civil Engineering faculty (Dr. Norman Garrick) and graduate students will provide design for alternative surfaces to promote infiltration.

External partners consist of state and federal agencies such as the Connecticut Department of Environmental Protection (CT DEP), the United States Environmental Protection Agency (EPA), the US Fish and Wildlife Service and the National Aeronautics and Space Administration (NASA). For instance, CT DEP provides funding for educational workshops and research in Connecticut. EPA Region One provides funding for work in Southwestern Connecticut and Westchester County, NY (MS). EPA Office of Water provides support for national workshops (MS). The US Fish and Wildlife Service provides funding for work in Lower Connecticut River watershed. NASA provides funding and data for expanding work related to the effects of sprawl on water and forest resources (MS).

The Nonpoint Education for Municipal Officials (NEMO) Project conducts educational programs targeting local land use officials throughout Connecticut. The project has 7 staff involved in developing and conducting educational presentations, writing educational publications, creating methods for using remote sensing, geographic information system and World Wide Web technologies for educational purposes, and interacting with local officials. In addition, NEMO is working with groups in other states to adapt NEMO to their region.

NEMO project strategies revolve around increasing the educational coverage of Connecticut communities, reaching 100 of the state's 169 towns within this planning period. One role within the NEMO Team is overall coordination of Connecticut municipal programs, grant writing and administration, liaison with state agencies, production of educational materials, presenter of educational programs. This involves management of a DEP grant to conduct NEMO programs for the Quinnipiac River watershed towns that will likely develop into a multi-year effort. A project is being co-managed with Sandy Prisloe to produce an impervious surface buildout for the Litchfield Hills Council of Elected Officials. The information will be folded into educational presentations for the land use boards and commissions in the member towns, this will also likely develop into a multi-year effort.

The target audience for the program effort consists of local land use decision-makers in Connecticut.

In order to assess if learning and results occurred, surveys will be used as evaluation tools. Principal project contacts in Connecticut communities will be surveyed yearly to ascertain attitudinal changes, changes to town documents and policies, and initiation of related research, education, watershed management, and open space planning initiatives. These changes will also be documented through commission minutes, newspaper articles, letters and memos. Project contacts in other states will be surveyed yearly to ascertain the progress and extent of NEMO adaptations: number of partner agencies; number of presentations; number of local officials reached; funding.

### Water Quality

The Watershed Projects in the lower Connecticut River valley are an action in accordance with the President's Clean Water Action Plan (CWAP). These watershed projects implement the Federal Government's "Four Action Tools" by: working within a watershed approach; working to strengthen federal, state and local water quality standards based on a watershed view; promoting natural resource stewardship and educating citizens and officials.

This watershed work combines the efforts of two Cooperative Extension groups, Nonpoint Education for Municipal Officials (NEMO) and Forest Stewardship. Work with the Forest Stewardship program includes all issues involved with land protection in the watersheds. These projects also involve the Sea Grant Clean Waters program.

Work with the NEMO project focuses on Nonpoint source pollution education. Nonpoint source water pollution is the number one water resource impairment in the United States, and urban stormwater runoff is the number one water quality problem for nation's coastal areas, according to the Environmental Protection Agency. Nonpoint source pollution is generated by land use, which is decided at the county and municipal levels of government, by local land use officials. This critical audience must be educated on the causes, impacts, and remedial measures associated with the control of nonpoint source pollution.

Impacts and outcomes of these projects over their project lives will include working with each town within the watersheds toward adapting planning and zoning measures to protect their natural resources while permitting development where it will be least harmful to water resources. Anticipated results include: changes to town plans and regulations; work with watershed communities in composing watershed management plans and open space plans; a number of school projects and research projects related to natural resource based land use planning; and environmental stewardship of water resources.

Forest Stewardship impacts and outcomes will be measured by a preliminary and follow-up survey mechanism based on changes in behavior toward a land owner's property, the number of stewardship plans within

the watersheds, the number of contacts with state and certified foresters and the amount of land permanently protected as open space during the projects.

Desired outcomes include: educational workshops; PowerPoint presentations; presentations to and proceedings from state, regional and national conferences; web sites and awards. Also desired are publications aimed toward residents in the watersheds.

There are both internal and external partners associated with the program. The internal linkages are located at the University of Connecticut's Department of Natural Resources Management and Engineering (NRME) and the Cooperative Extension System (CES). Specifically, NRME faculty (Dan Civco) provides remote sensing data and expertise. CES Forestry staff conduct complementary forest stewardship programs within watershed context. CES Family and Community staff provides home based water quality programs. External partners consist of state and federal agencies such as: the Connecticut Department of Environmental Protection (CT DEP); the U.S. Environmental Protection Agency; the Nature Conservancy and potentially the National Park Service. In addition to those listed, the projects are currently funded by the U.S. Fish and Wildlife Service.

The watershed projects, located in the lower Connecticut River valley, focus on community outreach and non-regulatory actions as described by their Committee goals. The projects inventory the water, land, and cultural resources of the watershed using GIS technology, and analyze that information in order to identify priority areas best suited for conservation and growth. The Projects work with local officials and the public to pursue their goals, and direct information and education to key audiences in the watershed. Understanding that watershed boundaries do not recognize town boundaries, is a key element of this project. CES staff educates town residents and municipal officials so they understand that decisions made in each town - by residents and officials alike - affect the shared resources of each watershed.

Perhaps the most important strategies or methods are information and education. Knowing that watershed boundaries do not recognize town boundaries, watershed committee members work toward balancing conservation and development within the watershed in order to preserve their communities' sense of place and their rivers' water quality. Information about the condition, location and significance of cultural and natural resources helps land use decision-makers and landowners know what they have. Education helps them know what their options are and how they can make a difference.

Target audiences for the program effort include municipal officials, forest land owners and riparian homeowners, which are local non-profit organizations.

In order to assess if learning and results occurred, surveys will be used as evaluation tools. Principal project contacts in watershed communities will be surveyed yearly to ascertain attitudinal changes, changes to town documents and policies. The local watershed committees' work will be documented at each watershed committee meeting to ascertain progress in the watershed work. Also, initiation of related research, education, watershed management, and open space planning initiatives will be documented on a yearly basis. These changes will also be documented through commission minutes, newspaper articles, letters, memos, and year end reports.

### Residential Water Quality

Excess nitrogen in Long Island Sound produces eutrophication conditions in many areas of the Sound in the spring and summer. The Long Island Sound Comprehensive Management Plan calls for a 58.8% reduction in nitrogen loading to the Sound. Some of the excess nitrogen in the Sound comes from nonpoint sources such as fertilizer applied to lawns. There is little information about the amount of nitrogen fertilizer applied to lawns in Connecticut by homeowners and commercial lawn care providers. Information about the nitrogen fertilizer practices of homeowners and commercial lawn care companies is needed to develop an educational program for the use of best management practices for application of nitrogen fertilizer to lawns.

Measures of success are based upon the anticipated results of a survey of residential and commercial nitrogen-fertilization practices on lawns.

Desired outcomes includes publications and Extension bulletins. For example, a peer-reviewed publication of the survey results of residential and commercial nitrogen-fertilization practices on lawns is desired. Also desired are Extension bulletins about best management practices for management of lawns to minimize nitrogen pollution of Long Island Sound.

In order to assess if learning/results occurred, pre and post tests will be given to volunteers who will be trained to provide education about best management practices for nitrogen fertilization of lawns. Pre and post tests will be given to homeowners and commercial lawn care providers who will be trained by the volunteers to implement best management practices for nitrogen fertilization of lawns.

## Water Quality

Nonpoint source water pollution is the number one water resource impairment in the United States, and urban stormwater runoff is the number one water quality problem for nation's coastal areas, according to the Environmental Protection Agency. Nonpoint source pollution is generated by land use, which is decided at the county and municipal levels of government, by local land use officials. This critical audience must be educated on the causes, impacts, and remedial measures associated with the control of nonpoint source pollution.

Anticipated measures of success or impact are based upon: the number of Connecticut communities hosting educational programs; the number of communities composing watershed management plans and/or open space plans; the number of school projects and research project related to natural resource-based land use planning and environmental stewardship of water resources and changes to town plans and regulations.

Desired outcome products include: educational workshops; PowerPoint presentations; peer reviewed journal articles; fact sheets; technical papers and abstracts and proceedings from regional and national conferences. Also desired are web sites, computer programs to assist end user and awards.

There are both internal and external partners that are associated with this program. Internal resources/partners are located at the University of Connecticut's Department of Natural Resources Management and Engineering (NRME), the Cooperative Extension System (CES) and other UConn faculty. Specifically, NRME faculty (Dan Civco) provides remote sensing data and expertise. NRME faculty (Jack Clausen, Glen Warner) also provides water pollution remediation expertise. Plant Science/Landscape Architecture faculty provide landscape and subdivision design expertise. CES Forestry staff conduct complementary forest stewardship programs within watershed context. Lastly, CES Family and Community staff provide home-based water quality programs. External partners consist of state and federal agencies such as the Connecticut Department of Environmental Protection (CT DEP), the United States Environmental Protection Agency (EPA), the US Fish and Wildlife Service and the National Aeronautics and Space Administration (NASA). For instance, CT DEP provides funding for educational workshops and research in Connecticut. EPA Region One provides funding for work in Southwestern Connecticut and Westchester County, NY (MS). EPA Office of Water provides support for national workshops (MS). The US Fish and Wildlife Service provides funding for work in Lower Connecticut River watershed. NASA provides funding and data for expanding work related to the effects of sprawl on water and forest resources (MS).

NEMO project strategies revolve around increasing educational coverage of Connecticut communities through technical presentations and interactive web sites. One role within the NEMO Team is overall coordination for the web site design, publications and graphics, production of educational materials, computer programming, presenter of educational programs. Additional projects include education on natural landscaping and low impact development.

The target audiences for the program effort consist of local land use decision makers in Connecticut as well as natural resource professionals/peers in other states.

In order to assess if learning and results occurred, surveys will be used as evaluation tools. Principal project contacts in Connecticut communities will be surveyed yearly to ascertain attitudinal changes, changes to town documents and policies, and initiation of related research, education, watershed management, and open space planning initiatives. These changes will also be documented through commission minutes, newspaper articles, letters and memos. Project contacts in other states will be surveyed yearly to ascertain the progress and extent of NEMO adaptations: number of partner agencies; number of presentations; number of local officials reached; funding.

## Water Resources

Nonpoint source pollution remains as the primary cause of water quality problems in the United States, including Connecticut (US EPA, 1998). The primary sources of nonpoint source pollution are agriculture and urban stormwater runoff. Agriculture is the leading source of impairment in the Nation's waters, contributing to impairment of 25% of river miles, and 19% of lake acres assessed. Urban runoff contributes to impairment of 5% of river miles, 8% of lake acres, 18% of estuaries, and 7% of wetlands. Various management practices are used and proposed to reduce nonpoint source pollution but the effectiveness of such measures is largely unknown. The citizens of the U.S. stand to gain from water quality improvements resulting from the implementation of nonpoint source controls.

Success will be measured by the adoption of nonpoint source control strategies developed through this program and ultimately by improvements in water quality.

Desired outcomes of the program effort include publications and presentations. For instance, this program will generate one peer-reviewed article every two years. In addition, Extension documents and presentations will be prepared.

Externally, the primary partners will be the Branford River Alliance, the town of Branford, the Connecticut Department of Environmental Protection and the U.S. Environmental Protection Agency and all groups currently cooperating, and will continue to cooperate, in nonpoint source research projects.

The Branford River Project (1998-2001) includes educational, soils, and water quality monitoring components.

The techniques used in this project are water quality and quantity monitoring to test if education is effective on reducing stormwater impacts from residential developments. Education will be used to teach nonpoint source pollution control to Extension audiences.

The target audiences are primarily the state and federal agency personnel in Connecticut and elsewhere in the nation. Secondly, the citizens of the state of Connecticut as they contribute to nonpoint source pollution are also target audiences.

In order to assess if results occurred, results in this research are obtained through water quality

### Wildlife Diseases

Botulism is a recurring cause of severe die-offs of waterfowl each summer. Cases occur here in Connecticut on small lakes and ponds and on larger lakes of the mid-west and west where thousands of birds sometimes die. The organism *Clostridium botulinum* is carried from place to place in the GI tract of migrating birds. Great progress could be had if one understood how to treat the soil where the organism occurs to kill the agent or to generate an oral vaccine that could be distributed in the form of pelleted feed.

The measures of success are based upon anticipated research results and possible external funding. Ducks Unlimited or Pfizer might fund this research; however, real success would be finding a means to provide an oral vaccine at low cost that would be effective and not destroyed in the gut. The public relations from being able to prevent losses at local ponds would be great.

Desirable outcomes of this work include the invention of a commercial vaccine as well as the publication of peer-reviewed articles.

Some of the partners of this research project include: Larry Silbart - immunologist; Pfizer, Inc.; Antonio E. Garmendia - microbiologist; and Steven Geary - microbiologist.

The key components of the five-year (2000-2005) research project description are as follows. First and foremost is to generate a killed *Cl botulinum*. Next, it will need to be incorporated in feed so as to test it in ducklings. After, testing it in ducklings, it will be tested in other waterfowl.

The strategy is to grow *Cl botulinum* in flasks, test various ways to kill the organism and harvest the toxin, test doses or alteration required for safety and to induce oral vaccination, vaccinate birds and then challenge them with live bacteria in feed.

Target audiences are the public who would be very happy to know that a vaccine could be distributed to protect the waterfowl in their lakes and ponds. Audubon, Ducks Unlimited and waterfowl hunters would benefit.

Evaluation techniques are based upon anticipated research results. Results will have occurred if a vaccine can be fed and it protects against challenge, then the distribution of pellets could be done as field testing, where the disease commonly occurs.

### Wildlife Ecology and Management

Research Focus: The Wildlife Conservation Research Center (WCRC) was established by the University of Connecticut Board of Trustees in February 1997 to conduct state-of-the-art research of benefit to wildlife conservation. The Center blends research mission with education and outreach goals, drawing upon resources of the land grant university plus the flexibility of private support. State, federal, and private partnerships are created to achieve mutual research objectives. The Center aspires to become self-sustaining through gifts and endowments. The mission is to provide a proactive research program for addressing wildlife conservation concerns, often outside the scope of traditional mandates, by means of scientific research, outreach and education.

Anticipated measures of impact include: 1) conducting scientific research which addresses ecological needs of wildlife populations and their habitats; 2) using scientific research in fostering enlightened stewardship of wildlife resources; 3) assisting landowners, organizations, state and federal wildlife resource agencies, and others in conservation of wildlife resources; 4) enhancing public knowledge of wildlife values, conservation principles, and sound management practices by providing access to high quality information and products; and 5) promoting cooperation and high professional standards for wildlife research and conservation among resource users, managers, agencies, educators and the public.

The Wildlife Conservation Research Center has been established to conduct research on the ecology and management of wildlife, primarily in Connecticut and the Northeast, and to help address concerns arising from

interactions between people and wildlife. WCRC is a unique, privately supported wildlife research program established as an integral component of a public land grant university in the Northeastern United States. Ignorance of wildlife habitat requirements, apathy for conservation problems, and failure to appreciate the many values of wildlife require new and better information applied effectively. With increasing numbers of species in decline, especially in this rapidly urbanizing region, support for focused wildlife research has never been more important. The Wildlife Conservation Research Center is committed to assuring that wildlife resources and their values remain integral, functional, components of landscapes.

Basic Wildlife Conservation Research interests include: Habitats - 1) effects of habitat fragmentation on bio-diversity, habitat quality and carrying capacity; 2) characteristics, values and applications of wildlife corridors linking natural areas; 3) status and management of breeding, migration and winter habitats of migrating species; 4) contaminant residue levels in wildlife and habitat components (e.g. sediment, foods); 5) maintaining productive terrestrial and aquatic habitats for wildlife; 6) monitoring and improving biotic diversity and productivity in natural ecosystems; 7) identifying, maintaining and restoring critical habitats.

Population Ecology - 1) assessing status, trends and factors in the decline (or unusual growth) of populations; 2) devising management strategies to address needs of game and non-game species; 3) determining effects of contaminants on wildlife reproduction, survival and behavior; 4) evaluating risks to wildlife from diseases (e.g. distemper) of pets, livestock, or humans. Human Dimensions - 1) improving perspectives on uses and management of wildlife resources; 2) understanding consequences of introducing non-native species; 3) wildlife diseases (e.g. rabies) or parasites (deer tick) - risks to humans, pets, livestock; 4) resolving economic losses from wildlife damages to crops, roads, facilities, etc.; 5) how to include wildlife in landscape design plans, development and management; 6) reduction of wildlife losses, human injuries and costs- collisions with vehicles, etc.

As more wild species decline or disappear, or new exotics flourish, it will be necessary to see the connections between them and human populations. The positive accomplishments will be used as learning what works better. Continued habitat fragmentation, persistent chemicals, contaminants in air or water, loss of productive soils and waters, inadequate planning, and sacrifice of undeveloped landscapes reduce options for wildlife, plants and people who recognize the values. These are serious matters but not inevitable. Corrective efforts by regulatory agencies, special interest groups and the public can modify or eliminate faulty mandates. Insufficient resources, political inertia, and lack of commitment to answers through research can be reversed. Each of these concerns can be addressed constructively, given basic information, willing partners and determination. The Wildlife Conservation Research Center has been established as a proactive program to help others in meeting these needs.

Strategies include: Research - WCRC conducts scientific, peer reviewed, collaborative research involving scientists, resource specialists, technicians and local partners. The Center also serves as advocate for wildlife conservation, functioning as a catalyst, information clearinghouse, organizer and focal point for wildlife research needs. WCRC can assemble specialized research teams via contract or sub-contract. Additionally, Center personnel conduct their own research individually or with graduate students and others. Employment of undergraduate and graduate students in research roles provides valuable hands-on training. Research locations vary according to project needs but reflect investigator, state and regional interests. Outreach - The Wildlife Center disseminates reports, fact sheets and research publications to private landowners, conservation organizations, resource management agencies, and other audiences. Center personnel work with the Cooperative Extension System, participating in workshops and conferences, appearances on radio and television, preparing news releases, or granting interviews in coordination with College and University communications offices. When appropriate, hard copy materials also will be available electronically. WCRC staff can present audiovisual programs, provide displays and disseminate information on the mission and work of the Center. Specialist may be contacted for wildlife conservation research results, priorities and management applications. On-site visits occasionally may be arranged with sufficient notice. Education - Wildlife faculty work closely with, and serve as advisors to, graduate and undergraduate students. Faculty may teach wildlife courses at graduate and undergraduate levels. Undergraduate intern positions and work-study opportunities can provide meaningful hands-on experience. WCRC staff participation in secondary school education programs have included Envirothon Workshops, UConn Mentor Connection for talented high school students, and other research related experience.

Resources and partners include: Integration of research activities with local or regional wildlife management programs is encouraged, with focus on goals not adequately addressed otherwise. Multidisciplinary projects are typical when adequately funded. Available funds are used to initiate new research or enhance ongoing projects. Governance - The Center is administered by the Director, facilitating interaction with others in the department, between departments and Colleges, other institutions, and with public agencies or private interests. The Wildlife Conservation Research Center is housed within the Department of Natural Resources Management and Engineering

(NRME), College of Agriculture and Natural Resources. The Director is aided by an appointed Advisory Council which meets at least annually. AC members include the Dean, Department Head, affiliated wildlife faculty, a faculty member at large, Director (or representative) of the Regional Office, U.S. Fish and Wildlife Service; Director of Connecticut DEP Wildlife Bureau, Director of Environmental Research Institute (ERI, UConn), a Connecticut landowner/sportsman, a science representative of a conservation organization, a recognized conservationist with research expertise, and one or more wildlife scientists from outside the university. Principal investigators with WCRC projects serve as ex officio members. Non-profit status - The WCRC is certified non-profit, within the same IRS designation as the University. Tax deductible charitable contributions are a vital component of Center functions. WCRC and Development Foundation staff can advise on a variety of options available to donors. WCRC Structure - Staffing and operations are supported by WCRC, Department, College and University resources. Staffing includes: Director; Secretary; Graduate Research Assistants - M.S., Ph.D.; Volunteers; Part-time undergraduate interns, work study assistants, volunteers; Affiliated research faculty - with departmental appointments. Future positions - Assistant Director/Fund Raising/Public Relations; Communications/Wildlife Extension Specialist; Research Associate - post doctorate; Research Technicians - Master of Science. Research priorities, active projects and funding needs evolve constantly.

#### INDIVIDUAL PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

##### Water Quality

Cooperative Extension Focus: The Watershed Projects in the lower Connecticut River valley are an action in accordance with the President's Clean Water Action Plan (CWAP). These watershed projects implement the Federal Government's "Four Action Tools" by: Working within a Watershed Approach; Working to strengthen Federal, state and local water quality standards based on a watershed view; Promoting natural resource stewardship; and Educating citizens and officials.

This watershed work combines the efforts of two Cooperative Extension groups, Nonpoint Education for Municipal Officials (NEMO) and Forest Stewardship. Work with the Forest Stewardship program includes all issues involved with land protection in the watersheds. These projects also involve the Sea Grant Clean Waters program.

Work with the NEMO project focuses on Nonpoint source pollution education. Nonpoint source water pollution is the number one water resource impairment in the United States, and urban stormwater runoff is the number one water quality problem for nation's coastal areas, according to the Environmental Protection Agency<sup>1</sup>. Nonpoint source pollution is generated by land use, which is decided at the county and municipal levels of government, by local land use officials. This critical audience must be educated on the causes, impacts, and remedial measures associated with the control of nonpoint source pollution.

Impacts of these projects over their project lives will include working with each town within the watersheds toward adapting planning and zoning measures to protect their natural resources while permitting development where it will be least harmful to water resources. Results will include: changes to town plans and regulations; work with watershed communities in composing watershed management plans and open space plans; a number of school projects and research projects related to natural resource -based land use planning; and environmental stewardship of water resources.

Forest Stewardship impacts will be measured by a preliminary and follow-up survey mechanism based on changes in behavior toward a land owner's property, the number of stewardship plans within the watersheds, the number of contacts with state and certified foresters, and the amount of land permanently protected as open space during the projects.

Desirable outcomes include: educational workshops, PowerPoint presentations, presentations to and proceedings from state, regional and national conferences, web sites, awards and publications aimed toward residents in the watersheds.

Partners of the program include both internal and external linkages. Internal linkages consist of NEMO, NRME and CES. The NEMO project provides assistance with web sites, municipal education programs, land use planning expertise. Dan Civco, NRME faculty, provides remote sensing data and expertise. CES Forestry staff conduct complementary forest stewardship programs within watershed context. CES Family and Community staff provides home based water quality programs.

Other partners fall under the category of external linkages. They include the Nature Conservancy, DEP, EPA, and potentially the National Park Service.

An invaluable program resource is the U.S. Fish and Wildlife Service, which currently funds the projects.

The watershed projects, located in the lower Connecticut River valley, focus on community outreach and non-regulatory actions as described by their Committee goals. The projects inventory the water, land, and cultural

resources of the watershed using GIS technology, and analyze that information in order to identify priority areas best suited for conservation and growth. The Projects work with local officials and the public to pursue their goals, and direct information and education to key audiences in the watershed. Understanding that watershed boundaries do not recognize town boundaries, is a key element of this project. CES staff educates town residents and municipal officials so they understand that decisions made in each town - by residents and officials alike - affect the shared resources of each watershed.

Knowing that watershed boundaries do not recognize town boundaries, watershed committee members work toward balancing conservation and development within the watershed in order to preserve their communities' sense of place and their rivers' water quality. Their tools are: information and education. Information about the condition, location and significance of cultural and natural resources, to help land use decision makers and land owners know what they have. Education, to help them know what their options are, and how they can make a difference.

Target audiences include municipal officials, forest landowners, riparian homeowners, local not for profit organizations.

Principal project contacts in watershed communities will be surveyed yearly to ascertain attitudinal changes, changes to town documents and policies. The local watershed committees' work will be documented at each watershed committee meeting to ascertain progress in the watershed work. Also, initiation of related research, education, watershed management, and open space planning initiatives will be documented on a yearly basis. These changes will also be documented through commission minutes, newspaper articles, letters, memos, and year end reports.

#### Land Use and Water Quality/Geographic Information Systems (NEMO and NAUTILUS Projects)

Cooperative Extension System Focus: The programmatic area of focus is land use and water quality. In addressing these topics through inventory, description and assessment, one role makes use of geographic information system (GIS) technology. Outreach efforts are focused on the use of GIS as an effective tool for better land use planning and water quality management, especially at the local level. Land use/water quality issues are of primary concern to a large portion of the state's population.

Measures of success are based upon increases in the numbers of: educational presentations prepared and presented to local government groups and NGOs; towns implementing and using GIS for land use/water quality planning; school programs implemented; users of sponsored GIS discussion lists; research grants awarded and outcome of research aimed at using GIS to models links between land use and water quality. Other measures of impact are based upon the anticipated development of internet-based educational materials and the number of hits on the web site.

This work will result in web sites; interactive computer models; interactive GIS applications; published results from research; PowerPoint computer slide presentations; GIS workshops and awards.

Partners include internal linkages such as the Laboratory for Earth Science Information Systems - NEMO/NAUTILUS supported research activities, Maps and Geographic Information Center (MAGIC) - GIS outreach, Dan Civco and graduate students.

Resources include external linkages such as the National Aeronautics and Space Administration (NASA) and the Environmental Protection Agency (EPA), both of which are sources of external funding. NASA has provided the NAUTILUS research grant (MS) and the EPA has funded support of NEMO workshops in tier 5 National Estuary Projects (MS). Another important resource is the Connecticut Department of Environmental Protection for their support on imperviousness/water quality GIS research. Lastly, the Nature Conservancy provides watershed project support.

The NEMO and NAUTILUS Projects both make extensive use of GIS and related technologies to educate local officials about GIS technology, land use and water quality. NAUTILUS is funded by NASA for a period of three years. It focuses on creating locally useful land use and land cover data from remote sensing systems that can be used to characterize forest fragmentation, sprawl and watershed imperviousness. NEMO is ongoing with funding from USDA, DEP, EPA and other sources. Activities on these projects focus on outreach education, GIS applications development, coordination of GIS activities among various project participants, WWW development, oversight of several research projects.

The primary audience will include local government officials and staff, NGOs and the general public. Informational workshops and seminars will be designed and offered that inform participants of GIS and its use in land use and water quality management. Both NEMO and NAUTILUS have research components. Audiences that will be interested in research results will include the above and state/federal agency staff. In addition to workshops and seminars, other venues for disseminating educational information and research findings will be the

Internet and journal articles. Articles will be submitted to GIS journals that describe NEMO and NAUTILUS research and its results. It is also planned to work with secondary school educators and librarians. Schools offer an opportunity to work with and educate future scientists and local officials; librarians have a unique role as points of contact for all types of information available to the general and official public.

It's worth noting that at this time offering GIS technical training courses is being explored designed for local officials and NGOs. To this point in time, workshops have been focused on educating people about what GIS is and how it can be used to support land use and water quality planning and assessment. It may be appropriate for CES to offer technical training in this area. A decision should be forthcoming. Obviously, initiating such a program will significantly alter plans. It will result in the creation of printed training materials, exercises, workbooks, etc.

The target audience for the program effort is made up of local government officials, NGOs, and the general public; state and federal staff (NASA, EPA, Conn. and other states); secondary schools; and librarians.

In order to assess if learning and/or results occurred, a workshop survey form will be developed and used to obtain feedback on workshop content and presentation. This will be used to fine tune presentations and to solicit input for future workshops. Impacts can be evaluated by annual surveys to identify GIS adoption in CT towns, creation of GIS databases, and changes in local land use plans.

### Urban and Community Forestry

Cooperative Extension System Focus: The Urban and Community Forestry Program for UConn Cooperative Extension System, the Connecticut Department of Environmental Protection, and several other state agencies and private nonprofit organizations, is based on needs assessment surveys conducted and reported by UConn Cooperative Extension System Urban Forester. These include the 1991 State-wide urban forestry survey report of tree care practices in all Connecticut municipalities, the 1991 and 1996 surveys of Connecticut Tree Wardens, and the 1998 survey of Hartford. These reports that Connecticut cities and towns under-fund and under-staff their municipal tree care/urban forestry efforts. In 1991 only eight towns had shade tree ordinances, more than 81 towns provided no funds to tree care, there were only four volunteer shade tree commissions, towns removed more public trees than were replaced, and Tree Wardens were untrained and unsupported. Since 1991 no agency provided support for urban and community forestry volunteers and Tree Wardens. All work in isolation from one another.

Measures of success are based upon the number of new shade tree ordinances passed, number of volunteers engaged in community forestry service, number of public trees planted versus number of public trees removed, and number of members in the Tree Wardens' Association of Connecticut, Inc.

Post event evaluations will be conducted at the conclusion of each event. Meskwaka Tree Project cooperators (volunteers) will report their community accomplishments annually. The Connecticut Department of Environmental Management will monitor annually number of trees planted, number of tree removed, and number of new urban and community forestry programs begun.

Outcome products desired include published research results, books, fact sheets and newspaper articles. The UConn Cooperative Extension System Cooperative Extension Urban Forester regularly publishes research results in both peer-reviewed and popular publications. The UConn Cooperative Extension System Cooperative Extension Urban Forester serves as the Urban Forestry Editor on the editorial board for the Journal of Forestry. A forestry web site exists and will be maintained and regularly updated. Books, booklets, fact sheets, slide shows and newspaper articles will be published.

Partners of the program include various organizations such as: American Forests; Connecticut College Arboretum; Connecticut Department of Environmental Protection, Division of Forestry; Connecticut Forest and Park Association, Inc.; Connecticut Tree Protective Association, Inc.; and the Connecticut Urban Forest Council, Incorporated. Other partners include Federated Garden Clubs of Connecticut, Inc., Knox Park Foundation, Michigan State University, Department of Forestry (MS) and Northeastern Forest Experiment Station, USDA Forest Service located in Burlington, Vermont (MS). Continuing with the list of partners are the Society of American Foresters, Tree Wardens' Association of Connecticut, Inc. and the USDA Forest Service, State and Private Forestry. Concluding the list of partners are numerous urban forestry municipal organizations such as Stamford Tree Foundation, Inc., Hartford Trees, Inc., Wethersfield Shade Tree Commission, etc.

Key components of the program description involve conducting training programs, annual state conferences and assessment research. The UConn Cooperative Extension System Cooperative Extension Urban Forester will: conduct an annual Tree Wardens school (in cooperation with the Tree Wardens' Association of Connecticut, Inc., which was founded by the UConn Cooperative Extension System Cooperative Extension Urban Forester in 1992), imparting new knowledge to 30 Tree Wardens each year. These graduated Tree wardens then must obtain 35 continuing education units over three years to maintain their Tree Warden School certification. In

addition, the plan is to conduct an annual training program (called the Meskwaka Tree Project and founded in 1991 by the UConn Cooperative Extension System Cooperative Extension Urban Forester) for urban and community forestry volunteers and elected and appointed municipal officials. Twenty-five new people will be trained each year and will perform volunteer services in their community for at least one year. Moreover, the plan is to conduct an annual state Urban Forest Conference for volunteers, professionals and elected and appointed officials. Approximately 140 people attend this conference and to conduct needs assessment research on a regular basis. Concluding the list of strategies is the research on relevant topics such as "Attitudes of foresters to city dwellers" and "Tree Pruning Practices, Tree Health and Cultural Biases in Quebec, Canada."

Program methods includes lectures to local groups, presentations at state, regional and national conferences, Extension publications, web site, slide shows and answering questions from telephone callers, letters and email requests. The methods will be directed towards municipal volunteers, tree wardens, elected officials, appointed officials, arborists, foresters and landscapers, totaling 2,250 people annually.

Research strategies are to work with research scientists who possess different skills (i.e., geography, social sciences, communications) than those possessed by the UConn Cooperative Extension System Cooperative Extension Urban Forester to perform needs assessment surveys of target audiences and conduct survey research of targeted clients.

Targeted audiences include municipal volunteers, tree wardens, elected officials, appointed officials, arborists, foresters and landscapers.

Evaluation techniques consist of post-event assessments, which will be conducted at the conclusion of each event. Meskwaka Tree Project cooperators (volunteers) will report their community accomplishments annually. The Connecticut Department of Environmental Management will monitor annually number of trees planted, number of tree removed, and number of new urban and community forestry programs begun.

### Environmental Landscape Science

Environmental protection is one of the most successful areas of public policy in this generation. In Connecticut the challenges and consequences of managing both human needs and environmental protection are a priority. Recent years have seen strong support for continued improvement in the natural environment and the positive consequences it can have on community development and values. Actions that are taken at the individual level can have positive environmental and community consequences. The nature of the challenges are considerable, including pollution of ground and surface waters due to improper septic system management and inappropriate lawn and grounds management, declines in bee, bird and mammal populations, soil contamination, reduced plant species variety due to invasive plant species, inappropriate plant selection and unwise landscape management practices. Cooperative Extension focus will be statewide, with two major audiences – consumers and commercial operations.

Measures of impact will be the implementation of a holistic approach to management of residential and associated landscapes in order to protect water quality, enhance wildlife and other natural habitats, and improve community values. Specific measures of success will include implementation of changed design approaches, selection of appropriate plant and other material selection, and utilization of better landscape management practices.

Outcome products desired include six new Extension publications on environmental landscapes, with a particular focus on site assessment procedures, on-site composting, and landscape design techniques.

Partners are both internal and external linkages. Internal linkages are located within the College of Agriculture and Natural Resources (CANR); specifically, the Departments of Plant Science, Natural Resources Management and Engineering, and Agricultural and Resources Economics. External linkages include the Bartlett Arboretum, Connecticut Agricultural Experiment Station, Department of Environmental Protection, and the University of Rhode Island.

This will be an ongoing program that is tied in closely with activities of the Home and Garden Education Center. A key aspect of this program will be to establish and promote guidelines for environmentally friendly management of residential and associated landscapes in Connecticut. Collectively called Environmental Landscape Management, they will be implemented across the state through the combined efforts of three major programs – the Master Gardener Program, the Home and Garden Education Center's ongoing programs, and the Coastal Residential Water Quality Project.

Methods will include short courses, presentations at industry meetings, listings on HG Ed Ctr Web Page, Master Gardener programs, train-the-trainer courses. Attendees will vary depending upon educational techniques, but ultimately will reach over 10,000 consumers. A particular research strategy includes collaboration with CANR faculty in research design development, literature research, and professional conference attendance.

The target audience consists of residential consumers and residential landscape service providers.

Evaluation techniques include one short term (6 month) and one mid term (12 month) survey of Master Gardener knowledge in addition to train-the-trainer activities through the Coastal Residential Water Quality efforts.

### Land Use Economics and Policy

Cooperative Extension System and Research Focus: A Blue Ribbon Task Force on Open Space appointed by Connecticut Governor John Rowland in June of 1997 recently recommended that land in state-owned forests and parks be increased by 110,000 acres, and the State Legislature has adopted this goal. Of particular concern is the conversion of farmland in the state. Connecticut lost about 20,000 acres of prime farmland from 1982 to 1992, and this trend is continuing in spite of an active, statewide Farmland Preservation Program enacted in 1978. In addition to the Farmland Preservation Program, which is based on Purchase of Development Rights, Connecticut has a program under Public Act 490 (legislated in 1963) which provides preferential tax policies for land in farms, forest, and open space. A number of land trusts sponsor private programs for open space and ecosystem preservation, and individual towns have local zoning regulations that can be used for conservation purposes. Although these programs have been in existence for many years and have involved significant expenditures of public and private funds, there has been little analysis of them. Such information will be crucial in choosing and designing appropriate programs for the increase in land preservation efforts, which will occur in Connecticut over the next several years.

Measures of success will be at least 2,000 citizens gaining knowledge in the process of developing public policies and programs related to land use. At least 200 town officials, state agency personnel, law-makers and their staff members increase their understanding of how economic factors can shape land-use decisions and the impacts of these decisions.

This work will result in journal articles, abstracts, conference presentations, workshop presentations, M.S. thesis, Extension publications and fact sheets.

Partners will be: USDA; Connecticut Department of Agriculture; members of Regional Research Project, W-133: "Benefits and Costs of Resource Policies Affecting Public and Private Land" (MS); graduate research assistants; and the Farm Foundation (MS).

This program will analyze public and private policies for preserving land. A decision framework for assessing the performance of public and private policies and programs for preserving land, both farm and non-farm will be developed. Two states, Maine and Georgia, are utilizing a similar methodology for analyzing farmland conversion programs in the urban-rural fringe. Benefits estimation will include both non-market and private benefits. The contingent valuation method will be used in estimating amenity and other non-market values and existing land records and a landowner survey will provide information for estimating private benefits. Estimated benefits will then be compared to program costs and the distribution of benefits and costs will be analyzed. Recommendations will then be made regarding the efficiency and equity of existing programs for preserving land. These results will enable policy-makers to determine whether existing programs and policies are appropriate or if modification or new approaches are needed. Not only will land owners benefit, but also all citizens who enjoy the benefits of open space (Project Duration: 1998-2002).

Methods include: conduct applied research on land issues, develop decision-making frameworks, presentations on land-use issues at conferences and workshops, preparation of technical report and journal articles.

Target audiences are: government agencies (CT DEP; CT DOA; USDA); state legislature; faculty at UConn and other universities (MS); National/Public Policy Group of the Farm Foundation (MS); members of Regional Research Project W-133; Environmental organizations (American Farmland Trust).

The project will be evaluated by monitoring state and local programs on land use for changes that are a result of efforts.

### The Economic Viability of Agricultural Biotechnology

Focus: Academic Program.

The measures of success will be to: provide professional education at the forefront of each field, with particular emphasis on those professions of importance to Connecticut and the nation; an understanding among UConn students of the importance of agricultural biotechnology; an increase in the number of ag biotech patents produced by UConn; an increase in the geographic economic development coming from those patents produced.

This work will result in scholarly articles, courses taught to UConn students and the creation of 5 new start-up companies in the biotech field in the state.

Partners will be: the Food Marketing Policy Center, University of Connecticut, Ron Cotterill, Director; Office of Technology Transfer, University of Connecticut, Charles Goodman Director; Jerry Yang, Professor, Animal Science Department, University of Connecticut; and Bradford Barham, Professor, Agricultural Economics, University of Wisconsin-Madison.

Many land grant institutions are in the process of investing heavily in research and education efforts in agricultural biotechnology as part of an effort with state and local support to assist in developing a vibrant and proximate biotechnology sector. This study seeks to go beyond the current work in the field by providing an empirical examination of the importance of university research in the agricultural biotechnology industry. An understanding of these linkages will be used to generate teaching opportunities for students, faculty, and university administrators. This can further the development of the ag biotech sector in the state of Connecticut.

The main strategy or method used is the teaching of classes to both undergraduates and graduate students at the University of Connecticut.

Naturally, the target audiences for this effort are both undergraduate and graduate students of UConn.

The evaluation provided by students at the end of each semester will provide regular feedback on the success of the plan.

### Resource Preservation

**Research Focus:** Land trusts have emerged in recent decades as an important element in environmental conservation and preservation efforts. Collectively, land trusts are credited with protecting almost three million acres of private land from development in the U.S. In the situation of increasing environmental concern and faced with the limitations of governmental actions, citizens have formed land trusts in order to act upon these concerns to preserve and protect their local land resources. Any steps that can be taken to enhance the effectiveness of land trusts will serve the public interest by helping to assure that local environments will be protected for the benefit of this and future generations. The fundamental objective of this research is to attempt to understand, and thereby to enhance the effectiveness of these important organizations.

Measures of success will be an increased collaboration among Connecticut trusts and between land trusts and governmental (e.g. DEP) and non-governmental (e.g. The Nature Conservancy) organizations; increased acreage preserved; citations.

The most desired outcomes of this project are peer-reviewed articles.

A valuable resource, The Nature Conservancy, has provided mailing lists of Connecticut land trusts.

The key components over the next three years are to: develop a mailed questionnaire, analyze the responses, interview respondents from selected land trusts and document the results for publication.

The strategy employed contains a mix of quantitative (survey) and qualitative (interviews) methods aimed at identifying structural and interorganizational characteristics, which are associated with highly effective land trusts. On that basis, means will be proposed by which less effective land trusts might enhance their effectiveness.

Target audiences include both Connecticut land trusts and environmental sociologists.

Evaluation and assessment of the project will be derived from the feedback of land trust officials and the publication of the results in peer reviewed journals.

### Environmental Regulations and Competitiveness

There is clear concern in developed, developing, and transition economies that new and proposed changes in environmental policies will increase imports and reduce exports of specific sectors of the economy. The existing 'trade and environment' literature, however, provides little practical guidance for policy makers in these countries to evaluate the trade impacts of specific environmental policy changes. To assist with such analysis, this program of research will continue to develop and implement appropriate microeconomic frameworks to estimate the impact of specific environmental regulations on production levels and exports. The program will provide clear empirical guidance to understand under which conditions the impact of environmental policy changes are likely to be relatively small and under which conditions the impact are larger. For references, such issues are currently on the agenda as part of USDA activities (e.g. livestock waste management), regional trading arrangements (e.g. NAFTA), and a variety of process and product method issues (including the proposed U.S. organic standard) that are also related to GATT and various activities of the WTO.

Measures of success include at least 5-10 analyses completed throughout the world using the theory and methods developed as part of this program along with various citations of program work in the literature. At least one cooperative agreement granted through USDA (e.g. ERS).

This work will result in about 5 articles completed as part of the program (of which at least 2 are refereed journal articles), and presentations in at least 2 national or international conferences.

The partners/resources associated with this project include: Harvard University, the World Bank and USDA (ERS) through collaborative research and publications (MS).

Key components are joint research on a variety of topics related to environmental regulations and international competitiveness. The initial stage of this program will last though about August 2003.

Strategies and methods include research, publications and presentations.

Target audiences include: the academic community (U.S. and foreign), USDA, other governmental organizations such as USAID, the World Bank, the WTO and the UNEP.

### Economic Viability

Cooperative Extension System Focus: Connecticut farmers and small businesses need timely and accurate tax advice in order to maintain economic competitiveness in the Connecticut and national economy.

Participating tax professionals receive 16 hours of CPE credits under this Tax School Program. The measure of success translates into more effective and accurate tax advice to Connecticut businesses. Comments from participating Connecticut tax professionals are used to revise and update the University of Connecticut Income Tax Workbook used for the program each year.

The Hartford/Rhode Island District of the Internal Revenue Service co-sponsors the school and provides 25% of the program. The Connecticut Department of Revenue Services provides instructors for 25% of the program. Private tax accounts and attorneys provide the remaining instruction. The workbooks for the program are provided under a cooperative effort with the University of Illinois Cooperative Extension System.

A tax school for Connecticut tax professionals is held for two days each year in November.

A lecture/discussion format is used during the tax school. The school is typically fully enrolled at 230 attendees.

The target audiences are Connecticut CPA's, tax practitioners, enrolled agents, tax attorneys and tax advisors.

A workshop evaluation form is completed by the attendees and used to formulate changes in future workshops.

### Econometric Analyses of Competitive Northeast Agriculture

Analyses of Factors Affecting Northeast Agriculture - High technology industries such as telecommunications, software, and biotechnology begin to boost in southern New England, off farm job opportunity increases. Northeast agriculture is facing competition with other sectors of the economy for the use of labor force. Also, the poultry and dairy productions in the Northeast region rely heavily on feed grains produced in the Midwest states. Modern transportation, highways, and refrigerated trailer trucks, and communication systems coupled with market news services through Internet result in strong interregional competition. The government policies and provisions of GATT also result in significant international competition in trade. The trade affects the domestic and regional prices, consumption, and henceforth production.

Anticipated measures of success are based on new research methodology and models that can be used in broader area of economic applications that are being developed. In particular, useful results regarding factors directly or indirectly affecting competitive Northeast agriculture will be measured and the empirical model will serve as a basis of answering questions regarding the competitiveness of Northeast, New England, and Connecticut.

The plan is aiming for publication of peer-reviewed articles, presentation of results and discussion in association meetings, publication of proceedings of meetings in a form of abstract or book Chapters.

Partners will be well known researchers in other states such as Dr. George Judge, a well-known econometrician in Berkeley, Dr. Arnold Zellner an internationally well known Bayesian econometrician at University of Chicago. Other researchers in the area of econometrics include Dr. Bill Griffiths of Australia and Dr. Carter Hills at Louisiana State University.

The basic objective of this research is to analyze the factors that directly and indirectly affect the Northeast Agriculture. Published data will be used on mathematical models in estimating the parameters of equations that explain economic phenomena. The causal effects of economic variables will be identified and measured. This Hatch project CONS00655 has duration till 2002. Continued effort will be placed to extend the research into future.

The approach is to investigate the degree of the effect of agricultural commodity trade regionally and internationally on the changes of agricultural activities in the Northeast region. Specifically, the growth or decline of selected agricultural industries pertinent to the Northeast agriculture will be studied with respect to the import and export of the final outputs such as poultry and dairy, and the inputs such as feed grains. Alternative models of interregional and international trade will be used to measure the impact of the changes in input costs or changes in trade volume as a result of policy changes or trade barrier removal, or implementation, on the selected agricultural industries. Models considered include spatial equilibrium, and aggregate partial equilibrium models. Homogenous versus differentiated products can be considered where the data are available and allowed.

Target audiences will be the readers of journal articles, technical bulletin, or book chapters.

The best evaluation technique is the response of readers in the form of book reviews of your work, citations of your papers or books, and number of requests of software you created, and the number of visits of your web pages.

#### Wildlife Ecology and Management (Ecotoxicology – Waterfowl)

Since 1987 the status and investigating causes of decline in scaup duck populations has been monitored, particularly greater scaup (*Aythya marila*), a circumpolar Northern Hemisphere diving duck which nests in Alaska and winters in Long Island Sound. Lesser scaup (*A. affinis*) are also declining and have been included in this work as well. Greater scaup, which feed primarily on small benthic invertebrates, particularly bivalves and snails, bioaccumulate some contaminants which are passed on to future generations through the eggs, or are ingested by humans and other predators. The work has confirmed the presence of contaminants and pathways, and demonstrated that the species has been in decline throughout North America for more than 40 years. Scaup has been shown to be useful bioindicators of environmental contamination, but now it will be investigated how contaminants are linked to population decline. For example, are contaminants associated with a new species of kidney parasite discovered in over 30% of the greater scaup examined? The research has gained international attention, and the plight of both scaup species has become one of the most important waterfowl concerns on this continent. The research has attracted \$400,000 in support, provided training for 8 graduate students and a dozen undergraduates, 50 volunteers in a dozen states, 5 state and three federal agencies, and led to 4 journal publications, 10 reports, 22 conference papers on population status, food habits, contaminants and genetics of scaup. The work has triggered new questions about relationships of contaminants to waterfowl population genetics, pathology, reproduction and survival. New ecotoxicological research dimensions on breeding and wintering waterfowl habitats in North America, Europe and Asia need to be developed.

The measures of success will be implementation of management procedures by agencies to benefit scaup populations, sustained improvement in scaup populations, public interest and support for program – volunteers, queries, reports distributed, funding, and media coverage.

This work will result in project reports, refereed journal manuscripts, comprehensive data base, papers presented at conferences and video on ecology of greater scaup and the impact of contaminants.

Partners will be: US Fish and Wildlife Service (Office of Migratory Birds, Refuge Div., Ecological Services Div.); U. S. Envir. Pro. Agency, Canadian Wildlife Service, U.S. Geological Survey; 22 states and provinces esp. CT, RI, NY, NJ, MI, WI, AK, NW Terr., Ontario and Quebec; and volunteers.

Project description includes: a) contaminants as endocrine disrupters in greater scaup reproduction, 5 year; b) life cycle of renal trematode, 3 year – with R. French; c) genetic characteristics of breeding greater scaup populations, 3 year – North America and Europe (with A. Abbott, Clemson University); and d) Lake Ontario Habitat Quality for Migrating Greater Scaup, 2 year – with New York DEC and USFWS

Strategies include: a) assemble research team – 1999-2000; b) initiate Alaska research components (greater scaup reproduction) in 2000, 3-5 year; c) sabbatical: develop working relationships with European counterparts – year 2000; c) work closely with state, federal and private waterfowl biologists.

Target audiences are: a) user groups - Native groups in AK and Canada, Ducks Unlimited, Conn. Waterfowl Association, Valley Shore Waterfowlers; and b) bird clubs and organizations, e.g. Connecticut Audubon and National Audubon

#### Natural Resources/Earth Resources Information Systems

Research Focus: The overall goal for this faculty member over the next five years (and beyond) is to continue to build the earth resources information systems program in NRME and the research conducted within LERIS (Laboratory for Earth Resources Information Systems). The program has begun to receive national, and, in fact, international recognition. This faculty member plans to increase that visibility and aspires to make this program the leading one of its type in the northeastern United States, if not the country.

There are several research fronts currently in progress and will continue into the next millennium. The first is related to a major NASA-sponsored grant entitled: Better Land Use Planning for the Urbanizing Northeast: Creating a Network of Value-Added Geospatial Information, Tools, and Education for Land Use Decision Makers. [Co-Principal Investigator (with Chester Arnold and Sandy Prisloe). NASA Regional Earth Science Applications Center (RESAC), NRA-98-OES-08. January 1, 1999–December 31, 2001. \$1,100,000.]. The Regional Earth Science Application Center being developed is named NAUTILUS, for Northeast Access to Useable Technology in Land Use planning for Urban Sprawl. NAUTILUS will focus on improving the technology for land-cover mapping and GIS (Geographical Information Systems) applications, with an emphasis on Urban Sprawl, Impervious Cover and

Forest Fragmentation. This is a three-year project with expectations for continued funding beyond the initial contract period.

A second long-term research area is the development of improved methods for remote sensing image and other geospatial data processing. The intent is to investigate innovative technologies for the integration and analysis of earth resources data from a variety of sources (airborne and satellite, optical and radar, DEM, GPS, and others) and with vastly different properties (resolution, measurement space, time scale, etc.). This area of research will be supported in part by the NASA RESAC grant, but will also be expanded through the NASA-funded Experimental Program to Stimulate Competitive Research, or EPSCoR. Connecticut has just been designated an EPSCoR state, and remote sensing is one of the five research thrust areas, of which this faculty member is the leader. One share of the EPSCoR preparation grant will be used to establish contacts with colleagues at NASA centers (Goddard Space Flight Center, Stennis Space Center) over the next year to help develop long-term NASA-sponsored remote sensing research. Specifically, research will continue into the development of improved earth resource information for both terrestrial and aquatic systems. In particular, high spatial and spectral resolution imagery will be investigated for their use in detailed land cover mapping. These data include Landsat 7 ETM+; ASTER; SIR-C Dual-band, Synthetic Aperture Radar (SAR); ADAR 5500 1-meter multispectral imagery; IFSARE 2.5 meter imagery and DEM; and SI Ikonos 1-meter Panchromatic and 4-meter Multispectral satellite image data. Techniques to be investigated include genetic algorithm neural network classification, wavelet-based data fusion, integration of optical and microwave remote sensing data, and inclusion of non-remote sensing data, such as terrain, soils, anthropogenic features, and others, in the classification process. This remote sensing topic area is closely aligned with the objectives of the Land Cover and Land Use Change (LCLUC) interdisciplinary scientific theme within NASA's Earth Science Enterprise (ESE). This research area will have contacts at both NASA (William Campbell, Head, Applied Information Science Branch, GSFC, Greenbelt, MD and Fritz Policelli, Stennis Space Center, MS) and the EROS Data Center (Susan Maxwell, Raytheon, EROS Data Center, Sioux Falls, SD).

Measures of success will be: 1) The development of a set of integrated tools for the assimilation, integration, and analysis of digital earth resources data for the purpose of land cover characterization. These tools will be made available to the remote sensing user and land use decision-making communities, as well as ported to specific commercial software systems. As satellite and computer technology improve, so will the techniques being developed here continue to evolve. 2) If the second submission (in Spring 2000) of the EPSCoR grant is successful, \$500,000 annually will be made to Connecticut, with a share of this coming to this faculty member to continue remote sensing research. 3) The NRME Department's Earth Resources Information Systems program has been successful in attracting first-class graduate students. This faculty member currently advises, directly, two doctoral degree and four masters degree students. It is anticipated that graduate enrollment will continue to be from 6 to 10 students at any given time. 4) Attendance of professional society meetings provides a forum for the delivery of research results. This faculty member has historically attended at least two meetings annually. This number, too, will increase over the next five years given the NASA RESAC and EPSCoR projects.

This work will result in publications which have been a principal outlet for research results and will continue to be so. Typically, this faculty member authors or co-authors two to four refereed journal articles and four to eight full-length conference proceedings papers annually. This level is expected to be maintained, or in fact increased, given the numbers of graduate students conducting geoprocessing research. Delivery of research results will include not only traditional print medium, but also electronic media including CD-ROM and the Internet. The new server being established in LERIS as part of the NASA RESAC project will facilitate the latter. The research publications from NRME/LERIS have received several national awards including: ASPRS ESRI Award (1<sup>st</sup> Place) for Best Scientific Paper in GIS, 1998; ASPRS ERDAS Award (2<sup>nd</sup> Place) for Best Scientific Paper in Remote Sensing, 1999. The quality of the research and the publications stemming from that research will continue to be competitive for such awards and recognition in the future.

Partners will be: 1) Close relationships will be developed with scientists from NASA and USGS to help foster an improved research collaboration with federal agencies and their programs - Within NASA, the Earth Science Enterprise (formerly Mission to Planet Earth) and within USGS, the Global Land Cover Characterization Program. 2) Also, this faculty member plans on becoming more involved with the Federal Geographic Data Committee (FGDC) as part of its metadata standards and earth cover classification programs. 3) Partners in the University include colleagues in the Cooperative Extension System, especially the NEMO project. The NASA RESAC grant establishing NAUTILUS is an example of that collaboration. 4) Partners at UConn and elsewhere in Connecticut include those investigators at other educational institutions that are participating in the EPSCoR Remote Sensing Thrust Area. Those include faculty from: Departments of Civil and Environmental Engineering, Geography and Ecology and Evolutionary Biology, The University of Connecticut-Storrs; Southern Connecticut State University, New Haven, CT; Department of Biology and Environmental Science, University of New Haven;

Department of Engineering, Trinity College, Hartford, CT; Department of Electrical Engineering, University of Hartford, West Hartford, CT; Department of Civil Engineering, The University of Hartford, West Hartford, CT.

Target audiences are: remote sensing and geospatial data user community, land use and land cover mapping scientists, land management professionals, traditional and non-traditional students in higher education, Teachers and students from K-12 education.

Educational strategies are: a) Series of integrated hands-on workshops with 12-15 participants each on the principals and applications of remote sensing; geographic information systems, global positioning systems, a strategy for a long-term series of offerings is being coordinated with colleagues from the Cooperative Extension System. b) Web-based curriculum development i.e. ASPRS Remote Sensing Core Curriculum. c) Enhancement of undergraduate and graduate curriculum in earth resources information systems to be made facilitated with education and training-oriented grants e.g., Curriculum Development, Implementation, and Internet-based Distribution for Introductory and Advanced Remote Sensing, Connecticut Space Grant College Curriculum Development Award. May 1999 - April 2000. \$4,100.

Evaluations will be: 1) For EPSCoR, for example, quarterly reports and semi-annual meetings will assist in documenting research results and plans; 2) For the NASA RESAC research, applications, and outreach, quarterly reports and regular meetings among the investigators; 3) For workshops developed and delivered, an assessment tool consisting of pre- and post-surveys will assist in documenting the effectiveness (success) of the workshops in terms of delivering the message.

Given the very dynamic fields of remote sensing, GIS, and GPS, CANR (NRME, CES, and other units) faculty and staff need to be abreast of the latest developments and applications. This will require attendance of regional and national professional society conferences (e.g., ASPRS), national users' group meetings (e.g., ESRI), and participation in short courses and workshops offered by geoprocessing software developers (e.g., ArcInfo, ArcView, Imagine, ER Mapper, etc.). Release time and financial support is needed, perhaps in the order of \$10,000 to \$15,000 annually.

#### Water Resources

Nonpoint source pollution remains as the primary cause of water quality problems in the United States, including Connecticut (US EPA, 1998). The primary sources of nonpoint source pollution are agriculture and urban stormwater runoff. Agriculture is the leading source of impairment in the Nation's waters, contributing to impairment of 25% of river miles, and 19% of lake acres assessed. Urban runoff contributes to impairment of 5% of river miles, 8% of lake acres, 18% of estuaries, and 7% of wetlands. Various management practices are used and proposed to reduce nonpoint source pollution but the effectiveness of such measures are largely unknown. The citizens of the U.S. stand to gain from water quality improvements resulting from the implementation of nonpoint source controls.

Success will be measured by adoption of nonpoint source control strategies developed through this program and ultimately by improvements in water quality.

Desired outcomes of the program include two peer reviewed articles per year.

The primary partners will be the CT Department of Environmental Protection, US Environmental Protection Agency, and the USDA Natural Resources Conservation Service. All three groups currently cooperate in nonpoint source research projects and can be expected to continue in the future.

Continuing research includes the Jordan Cove Urban Watershed study (1995-2006), the Stormwater Treatment Devices Project (1997-2001), and the Branford River Project (1998-2001).

The primary techniques used in this research are water quality and quantity monitoring to test hypotheses regarding the effectiveness of select management practices.

The target audiences are primarily the state and Federal agency personnel in Connecticut and elsewhere in the nation. Secondly, the citizens of the state of Connecticut as they contribute to nonpoint source pollution are also target audiences.

Results in this research are obtained through water quality and quantity monitoring at the field sites where the research projects are located.

#### Extension and Teaching

Extension and Education Focus: Invited Talks - 1) Connecticut High School Teachers were introduced to GIS and GPS (December 1998). 2) Landscape Architecture Department was presented with a talk entitled, "What landscape architects need to know about GIS" (April 1999). Workshops and Conferences: Program committee for the Northeast Arc-Users GIS conference. David Doyle of the National Geodetic Survey will present the geodesy and cartography material at the conference and to provide a special interest, all day session for Connecticut

surveyors and geodesists. Summer workshops participation to be coordinated with the Haddam Extension Office wherein either an introductory GPS class, geodesy class, or both will be offered.

Collaboration with Government agencies on technical guidance and language for the Y2000 Connecticut Department of Environmental Protection's five-year photo reconnaissance missions.

Mapping: A trail map was created for the Connecticut Audubon Society. A site map was created for Connecticut 4-H camp near Norwich. A town parcel map was created for the Land Preservation Alliance of northeastern Connecticut. Students in NRME 252 created these maps as class projects.

It is expected future Extension and teaching efforts to continue much the same as this year. Many mapping projects are suitable as student exercises. These exercises provide the students with a unique opportunity to experience a "real" mapping project first-hand. This always entails finding their way through a morass of unexpected obstacles and technical challenges that are difficult, if not impossible, to provide in a "cooked-up" laboratory situation. Also, the organizations for which the maps are created are non-profit and cannot afford to have maps made on their own. Thus, needed cartographic materials are provided to worthy causes while given the students valuable experience.

Measures of success will be increased knowledge and improved technical skills for my students and increased awareness and improved knowledge for the Connecticut GIS community at large.

This work will result in well-educated students, enriched programs for the organizations and maps and GIS data sets.

Partners will be: Connecticut Audubon Society; Connecticut 4-H; Connecticut Department of Environmental Protection; Land Preservation Alliance; Haddam Cooperative Extension Office.

Methods include invited talks have a total audience of less than 40 people (to date). NRME 252 had 19 enrolled students.

Target audiences for the program consist of the GIS and remote sensing community.

Evaluation techniques are examinations and practicum evaluation for students enrolled in NRME 252 and demonstrable competence on the part of workshop participants.

### Spatial Data Structures and Algorithms

Research Focus: Introduction - Geographic information systems use digital computers to create models of the world and to perform analyses with those models. Geographic information tends to be voluminous and complex. Both of these characteristics create data storage and retrieval challenges, challenges that are addressed by computer data structures and algorithms. A data structure is a logical arrangement of the data that enables efficient storage and manipulation of those data. An algorithm is a sequence of instructions for accomplishing a task. Different data structures and algorithms have different properties, some are better than others. Research is focused on developing new and improved data structures and algorithms to meet the challenges facing current and future geographic information systems.

Specifics: Dissertation [Meyer 98] research laid a foundation for study of digital terrain models (DTM) [Doyle 1978, Weibel and Heller 1990]. A digital terrain model is a mathematical representation of the shape of the surface of the Earth, its topography. More so than most applications, DTMs require vast amounts of data storage. Consider that a relatively small state such as Connecticut, if sampled at a nominal sampling density of 30 meters would require roughly 450,000,000 samples. This is a large data set by current standards. Work is currently being done on seven peer-reviewed papers (one submitted [Meyer et al, review], others are in various stages of preparedness ranging from conceptual to being written) dealing with data structures and algorithms to handle such data. Significance: Digital terrain models are a fundamental input for hydrological modeling, climate modeling, ecological studies, forest management, warfare simulations, natural hazards assessment and planning, radio-based communication planning, archeology, and others.

The success of this project is based on the anticipated research results. Research Results - develop new ways of estimating geomorphometrics such as gradient, curvature, and roughness; develop new spatial data structures supporting the efficient storage and manipulation of large point sets and the construction of Voronoi Diagrams; develop new digital terrain models and demonstrate their accuracy and data-thinning properties.

Desirable outcomes include peer-reviewed publications, grants and possibly patents. 1) Research Results - peer-reviewed publications. b) Grants - Relationships are currently being developed with the Connecticut-based, remote sensing company: Technology Services Company. Funding opportunities and mutual areas of interest are currently being explored. An application for support from NASA has been submitted and other venues will be pursued. 3) Patents - It is possible that this research will result in software patents.

A resource for the project is a UConn equipment grant competition: Funding to purchase a Javad Global Positioning System for the creation of survey-level accuracy digital terrain models.

Partners will be: Technology Services Company, Trumbull, CT, to provide remote sensing hardware and engineering expertise; Dr. Daniel Civco to provide remote sensing expertise; Dr. Glen Warner to provide hydrology expertise; Dr. Fred Ogden to provide hydrology expertise.

Key components of the project include: 1) Geomorphometrics: Estimation of gradient and curvature from irregularly spaced data sets (to be finished this year); 2) Spatial Data Structures and Algorithms: Barycentric Coordinate Systems, Voronoi Trees. Software being written and tested (ongoing); Spatial Analysis Algorithms: On the discontinuous nature of kriging surfaces, On the relational algebra as a spatial analysis language (ongoing); 3) Digital Terrain Models: Tangent Plane Surfaces, Higher-order surfaces and digital terrain modeling (ongoing).

Target audiences for the project consist of the GIS and remote sensing community.

The project will be evaluated by peer-reviewed publications and whether or not patents are obtained.

#### NRME - Atmospheric Resources - Pesticide Application Technology

Research Focus: Prescription pesticide use, as proposed by Coble et al. (1998), is the most realistic approach to change in the United States as the grower and regulator communities react to general public concerns over chemical exposure. This approach, or any other, which attempts to balance pest control and the public's concern for safety, will require a new level of infrastructure and technology. Assessment of the exposure and risk from the drift of pesticides presents many unanswered questions, especially in the suburban-rural settings of southern New England. Quantification techniques (computer models and field measurements) developed during this research period will provide low cost, real-time information which will help growers and spray equipment manufactures make improvements and reduce off orchard and off field exposures to pesticides.

Measures of success will be: 1) to publish an average of two reviewed journal articles per year on research results. Outside funding for this work is highly likely from USDA competitive grants, the U.S. Army Research Laboratory and the Connecticut DEP. 2) to develop a complete coupled system to control spray during spray operations. The system will consist of three parts: A remote sensing LIDAR for real time measurement of spray drift, weather sensors including air turbulence and stability, and a computer model.

Internal partners are 1) the IPM team members and their cooperators who will provide grower cooperation for spray trials and drift measurements in various orchard, ornamental and agriculture crops and 2) the plant science research farm - personnel help and spray equipment to help with experiments. External partners are 1) Dr Don Aylor, CAES New Haven. Provide portion of the numerical modeling of spray aerosols in vegetation canopies; 2) MS - USEPA Pesticides research group at RTP NC. - Provided past funding and will use results in developing recommendations for national legislation; 3) MS - Pesticides Industry Spray Drift Task Force. - possibly incorporate modeling work into the spray drift minimization system which the SDTF is developing together with USEPA.

Education methods are: 1) Complete development of coupled model of spray movement in heterogeneous plant canopies and verify model with field tests (3 years); 2) Develop specifications for remote sensing portions of system by repeated trials with the UConn experimental LIDAR (2 years); 3) Build user-friendly prototype system (2 years).

Target audiences are growers and applicators, USEPA

Evaluation techniques will be the development of a successful prototype and its demonstration.

#### Fisheries Management (Natural Resources Management and Engineering)

Fishes and other living aquatic resources have served as a source of food, commerce, and recreation for people since ancient times (Ross 1997). Today, in addition to their commercial and social value, fishes are the focus of an ever-growing recreation base. A fishery has three primary components: biota, habitat, and human users. Because of the growing demand for fishes, fisheries need to be successfully managed to avoid overharvest, user conflicts, and to provide sustainability. There is also a great need to protect, enhance, and restore fishery habitat. In addition to the biota and habitat, the human user component of a fishery includes socioeconomic values and impacts. Maximizing the benefits of a fishery for humans is one primary goal of fisheries management. Fisheries management education, research, and management are required to maintain sustainability of fisheries for future generations. In Connecticut, approximately 300,000 residents fish in freshwater each year, with another 200,000 fishing in saltwater. The direct expenditures by resident anglers in Connecticut in 1996 was over \$300 million dollars (USDI 1996).

From 2000-2005, the success of the fisheries management program will be measured in educational, research and service products. The program will strive to improve the fisheries education that undergraduate and graduate students receive. During this period, one additional undergraduate course (lower division) is planned to be offered. Graduate students will benefit from Graduate Research Assistantships funded through extramural grants.

The quality of students exiting the program will also serve as a measure of success. From a research perspective, grant funds received and the number of peer-reviewed articles published should be greater in 2000-2005 than during the previous five years. Research results should have an impact on the knowledge base required for successful management of fisheries resources. From a service perspective, one faculty member plans to become more active in leadership roles in the American Fisheries Society, as well as in the Fisheries Advisory Council for CT. Further development of productive working relationships with the CT DEP and other agencies will also serve as a measure of success. One primary goal is to develop a research program focusing on fisheries of the Connecticut River.

This work will result in publishing at least three peer-reviewed articles annually and developing a consistent line of funding through state, federal, and private organizations. Other outcome products desired include continuous output of quality undergraduate and graduate students, leadership roles in professional society, and productive working relationships with agencies and other organizations. During this period, a book chapter in Fisheries Population Assessment will be authored, which is currently in the planning stages.

Partners will be: Connecticut Department of Environmental Protection - contribute financially and through staff; Connecticut Department of Public Health - contribute financially and through staff; (MS) Hudson River Foundation - contribute financially; U.S. Fish and Wildlife Service - contribute financially; (MS) American Fisheries Society - contribute through information transfer, education, professional development; and organizations dedicated to fisheries conservation in the Connecticut River.

Fisheries Management Program - To provide education, research, and service related to fisheries management. Key components include education, research, service (duration: 2000-2005).

Strategies include: 1) Education: To further develop fisheries curriculum for undergraduate and graduate students; to further provide quality educational experiences outside of the classroom (including university resources, partnerships, and research). 2) Research: To further increase and expand a funding base for research activities. 3) Service: To increase involvement in leadership roles in the American Fisheries Society.

Target audiences will be: 1) Education: Students; 2) Research: Students, citizens, other researchers; 3) Service: American Fisheries Society.

Evaluation techniques are: 1) Education: Formal student evaluations, personal evaluations, student quality, job placement. 2) Research: Grant dollars received, reputation of funding agency, peer-reviewed articles. 3) Service: Productivity in professional society.

#### Natural Resources Management: Wildlife Ecology

Academic Program Focus: UConn students have the need for learning about wildlife management and ecological issues, not only at the local (Connecticut), but also at the regional (New England) and at the national levels.

The increased knowledge and awareness of Natural Resource students measures the success of the program. They will have a better understanding of wildlife management and ecological issues. Teaching about wildlife issues to NRME major students help them to have a better understanding of how these natural resources, including wildlife and their habitat, need to be managed.

Interaction with other wildlife, foresters and in general natural resources faculty help in the teaching of wildlife issues while at UConn campus. A wildlife class field trip is taught from Connecticut to Colorado visiting National Wildlife Refuge during the last two weeks of May. Many wildlife professionals, including wildlife refuge managers, wildlife biologists, agronomists, foresters, and many others, share the management philosophy and plans of the National Wildlife Refuge with the UConn students participating in the class. At least eight National Wildlife Refuges, two National Monuments, two Field Research Stations and one National Park are visited. Thus, 13 to 15 natural resources professionals interact with students.

Key components are: North American Wildlife - introductory class - fall semester; Wildlife Management - advanced class, mostly for seniors - spring semester; Wildlife Management in Public Lands, field trip - mostly for seniors - last two weeks of May.

Educational methods used: lectures, group activities, field trips. Number of attendees: 15 to 50 students  
Students at the University of Connecticut make up the target audience for this program.

Exams, quizzes, papers, and field notebooks will serve as evaluation techniques in order to assess if learning has occurred.

#### Forest Ecology - Coarse Woody Debris (CWD)

Research Focus: Coarse woody debris (CWD; also known as LWD [large woody debris]) is defined as pieces of dead wood at least 1.5 m long and 10 cm in diameter and includes forest floor wood and standing dead

trees. CWD is increasingly recognized as an important component of forest ecosystems. It serves as both habitat and a nutrient source. Very little research has been done on CWD in the oak-dominated forests of New England. One program focuses on the study of decay classes of CWD – rates of decay and variation in the use of different decay classes (and size classes and log species) by plants and animals. (Reference: Pyle, C., and M.M. Brown. 1999. Heterogeneity of wood decay classes within hardwood logs. *Forest Ecology and Management* 114:253-259.) As New England forests become more intensively managed (with greater utilization of previously unmarketable trees and parts of trees), and intensive utilization becomes more widespread, it will be important to have data on the use of CWD by organisms of forest ecosystems and information on rates of decay. This information will allow forest managers to determine how much wood (and what piece sizes) should be left intentionally on a logged site to serve the function of habitat and nutrient source.

Measures of success: a) Results anticipated - data on log decay rates and factors than influence decay rate and the use of logs by forest-dwelling organisms. b) changes in knowledge/behavior - 1) research results will provide practical information for site-specific prescriptions for CWD management (as opposed to blanket prescriptions such as "leave 2-3 logs/acre") and 2) results will become part of a worldwide body of knowledge concerning the role of CWD in forest ecosystems.

Desirable outcomes include peer-reviewed articles and Extension publications.

Program plans are tentative at this point; therefore, resources and partners have not yet been identified.

The key component of the program description involves the study of CWD decay and habitat value in components suited to master's and Ph.D. graduate student research projects (3-5 years duration).

Target audiences of the program include both field foresters and (academic) forest ecologists.

American forest managers reached through Society of American Foresters meetings and Extension publications; broad academic forest ecology community reached through peer-reviewed publications.

The number of requests for publications will serve as an evaluation tool.

#### Landscape Ecology - Reserve Design

Research Focus: In comparison to the study of forest stands, the unique thing about studying forested landscapes is the idea that the spatial pattern of the forested stands within the landscape matters. Aspects of forests (or any habitat type) that can be studied only at the landscape level include: a) connectivity among non-contiguous tracts of like habitat; b) edge effects (effects of adjacent tracts of non-like habitat upon a particular type of habitat); c) habitat fragmentation. (The introduction of new land uses that cause the breaking up of large tracts of one habitat type into smaller disjunct tracts - causes overall loss of habitat and creates needs for planning for connectivity and prevention of negative edge effects.) Habitat fragmentation is an important issue in landscapes undergoing dramatic changes in land use (e.g. in Connecticut, the suburbanization of rural landscapes). The research focus is on using theoretical understanding of the effects of landscape pattern on ecological processes to explore: a) ways to plan for patterns of reserved land that will promote the retention of natural habitat quality in landscapes where forest fragmentation is occurring; b) ways of assessing landscape habitat quality relative to landscape pattern. The importance of landscape ecological studies in reserve design goes well beyond Connecticut.

Success of this project is best measured with anticipated research results. Specifically, results on topics such as: 1) the relationship of landscape pattern to land trust objectives and effectiveness; 2) evaluation of potential habitat quality of reserve lands; 3) habitat corridors and local community conservation; 4) peer-reviewed articles are perhaps the most desirable outcome.

Partners will be the state, individual towns, and social scientists on application of this research – but no relationships or resources have been developed yet.

Key components of the program - landscape pattern and reserve design: 1) protection of natural habitat values; 2) analysis of landscape spatial pattern; and 3) accomplished through graduate student projects.

Educational methods include: 1) production of general guidelines for landscape scale evaluation of habitat quality and patterns; and 2) production of site-specific maps.

Target audiences: local groups whose lands are used in case studies; academic community of landscape ecologists.

Evaluation techniques are if articles are accepted for publication in peer-reviewed journals and if local groups make changes in policies or practices related to reserve placement in the landscape of their planning areas.

#### Multi-Media Transport Processes in Agricultural and Natural Resources Systems

Research Focus: Research will focus on coupling the transport processes across soil, water, plant canopy, and the atmosphere. The main objective is to develop a holistic model that is useful in examining the causation of multi-media environmental problems. To date, the understanding of the environmental problems have been limited

in distinct fields of climate, hydrology, and biology. Problems in each field are studied with closed pre-defined boundaries. Interactions with other systems are treated as known input parameters or simple boundary conditions. For example, most of the global circulation models for climate studies only have a one-way interaction with the surface. The air quality models take surface emission as an independent input variable. On the other hand, hydrologic models assume precipitation and atmospheric depositions are known or provided quantities. The ecosystem models, focusing on biological processes, consider climatic and soil environments as boundary conditions. Although studies in these fields have generated a knowledge base of many control mechanisms within each domain, coupling between various models at the interfaces is an unsolved problem in studying cycling of energy, water, and chemicals through the entire system. In the next five years, one faculty member is planning to study, experimentally and theoretically, the cross-media transport processes to parameterize the exchanges with cross-media parameters for developing an open frame for environmental modeling.

The success of this project will be measured in two ways: 1) Support from Federal and State funds to conduct and continue the research (proposals are out or in preparation); 2) Theoretical breakthrough in environmental modeling.

This work will result in peer reviewed journal articles and computer-run model for research and environmental regulatory purposes.

Partners will be: 1) USEPA Models-3 group: technical support in atmospheric modeling; 2) CTDEP Air and Water Bureaus: inventory data, validation data, experimental support; 3) UConn ERI: data analysis; 4) Dr. Hugo Thomas, CTWRI: coordination with government partners; 5) Dr. Dave R. Miller, NRME: co-PI Connecticut River.

The project has five phases: core model development, parameterization, spatial Extension, coding or programming, and validation. The theoretical development of the cross-media transport processes is the first step of the study. In principle, all the components of the entire system, including soil, water, plant canopy, and the atmosphere, will be included in the frame. All the pertinent state variables will be identified and modeled based on the newest understanding of the processes. With a floating coordinating system that defines the boundaries between different media or subsystems, the transport processes across each the every boundary will be described by cross-media parameters. For example, the flux of water vapor across a soil-air interface will be a direct function of both soil and air properties. Experiments will be conducted to parameterize the exchange processes. Each media then will extend to its full scale with available models. By joining all the models from well-parameterized interfaces, the Extension of the model will integrate the atmospheric, hydrologic, and ecological components into a holistic model without difficulties of system coupling. Validation of the model will be conducted with independent data sets collected from experiments and literature. The final product will be delivered in approximately 5 years, around 2005.

Experimental parameterization will be conducted in wind tunnel with an accurate weighing lysimeter. CAQM (Connecticut Air Quality Model) from UConn NRME, CRWM (Connecticut River Watershed model) from UConn Environmental Engineering Program, and RMVD (Regional Model of Vegetation Dynamics) from UConn NRME will be adopted in the model Extension. Data for parameterization and validation will be obtained through experimentation, ERI long term monitoring, and EPA databases.

Target audiences include the scientific community and government agencies (environmental, agricultural, etc.).

The success of the study will be evaluated by the deliverables, including theses, reports, papers and models.

### Program of Landscape Architecture

Water quality and site planning are inextricably linked. Engineering and ecological methods used to reduce pollutants in runoff have direct effects on site design. Resolving the interplay of these various aspects will be more important as years go by.

Success is measured by better and more sustainable landscapes. Further, cleaner ground water and a greater sense of the natural environment in urban and suburban developments indicate success.

The work will result in presentations at professional conferences and peer reviewed articles.

Partners will be: NRME hydrologists, University of Connecticut Extension System programs; University of Connecticut landscape architecture group; town planners, engineers, ecologists, landscape architects.

A key component of the project is to prepare information resulting from case studies and real projects.

Strategies include short courses for continuing education credits (15-20 attendees), national professional conferences (80-100 attendees) and professional journals (5,000-10,000 readers).

Target audiences are practicing landscape architects, civil engineers, town planners and students in landscape architectural programs.

Evaluation techniques include follow-up studies to monitor changes in zoning ordinances, subdivision regulations or in landscape architectural designs.

### Agronomy

Academic Program Focus: Teaching - An effort has been expended in the past year developing the turf curriculum and in recruiting students. This is a new area and is already showing growth. The number of Agronomy majors has increased during the past two years from 8 to 18-20. The growth is almost entirely attributable to the initiation of the turf program. Research Focus: For the past decade research has centered about pasture utilization. The field aspect of this work has come to an end and efforts are now being made to publish the findings that have been generated. A second ongoing research area involves estimating nitrogen under perennial grasslands. This work could result in improved means of recommending nitrogen fertilizer needs in grassland and turf areas. A third, and new area, is the evaluation of grass species for ornamental use. Particular attention will be focused on the potential of natal grass as a new ornamental species.

Measure of success will be changes in the agronomy curriculum should result in increases in student majors and course enrollments. Research activities are largely conclusionary and should be refreshed in paper presentation and publications.

This work will result in: Teaching - student evaluations, enrollment, number of majors, growth of associated course enrollments resulting from increased numbers of majors. Research - presentations at regional and national research meetings, publications in both research and commodity journals (peer reviewed).

Partners will be K. Guillard - Turf Program and Sr. A. Collins - Graduate student - N Research.

### Sustainable Nursery Production

Cooperative Extension System Focus: The Connecticut nursery industry is valued at over \$200 million. Nursery crop production is the leading agricultural sector in most of the northeastern United States. Herbaceous perennials are a critical nursery crop that continues to gain market importance. As a relatively new and varied crop, new information about efficient perennial production is needed. Another emerging problem for nursery producers is invasive exotic plants. New, native plant alternatives need to be identified and developed as nursery crops for Connecticut and the region.

The measures of success will be to: train three graduate students; receive grant support of at least \$40,000; improve grower knowledge of perennial production; and change crop composition to include more native trees and shrubs.

Outcome products desired are four peer reviewed articles, ten Extension articles and one production manual.

Partners will be: 1) the Connecticut Nurserymen's Association who will provide plant materials, input as to critical needs and opportunities for information dissemination. SARE program and provide grant funds to conduct research on native tree and shrub alternatives to invasive exotic plants. 2) New England Grows, Inc. who provide grant funds to conduct research on perennial production methods. 3) Storrs Agricultural Experiment Station who support the research necessary to develop perennial and native plant production methods.

Evaluate effects of shade, pH, division size and fertility on the ornamental grass *Hakonechloa*. Examine the effectiveness of benzyladenine sprays on propagation and growth of 4 species of *Epimedium*. Set up demonstration plantings of native trees and shrubs to ascertain which species have potential for commercialization. Develop efficient nursery propagation and production methods for native species with landscape potential. Produce written, Internet and presentation materials to educate producers and the public about native plant alternatives.

Target audiences will include nursery producers, landscape designers, master gardeners, Extension educators and the general public.

Evaluations will be examination of grower catalogs for evidence of increase production of native species; pre-and post-tests of trained master gardeners, Extension educators and the public; increased numbers of growers able to profitably produce *Hakonechloa* and *Epimedium*. Surveys will also be used when appropriate

### Controlled Environment Agriculture

Academic Program Focus: Controlled Environment Agriculture is essential component of the Green Industries in Connecticut and the Northeast. It is essential that students in CANR have the opportunity to learn how controlled environment structures work, and to learn how controlled environment structures work, and to learn the techniques of producing specific crops in controlled environments.

### Program of Landscape Architecture

Vice-President Al Gore has been discussing livable cities. One program is about making livable communities. Urban and suburb sprawl has devastated the countryside and urban fabric alike. Shaping appropriate development begins by identifying lands of unique value and then protecting the lands' characteristics.

The primary impact would be to influence the methods used by towns to develop their, "Plans of Conservation and Development".

Outcome products desired are "Lands of Unique Value" Plans for towns and community workshops.

Partners will be communities, Quinebaug and Shetucket heritage corridor, others within the College of Agriculture and Natural Resources working on related projects, other similar programs in other states.

A key component of the program is to develop a methodology for landscape architects to systematically develop land-use plans for towns.

Educational methods include: workshops for professionals including (15-20 attendees); workshops for community officials (15-20 attendees); present results at state and regional conferences (40-60 attendees); and publish results.

Target audiences are professional (landscape architects and community planners) and community officials.

Evaluation techniques are primarily through changes in professional methodologies and possibly follow up studies to see if changes have occurred.

### Environmental Phosphorus Recommendations

Research Focus: A majority of agricultural fields test high for P in areas where animal agriculture is the primary type of agricultural activity. Traditional agriculture in Connecticut is mainly animal based, either dairy or poultry, and a majority of the agricultural fields in Connecticut also test high for P. The USEPA is concerned about fields with high soil test P values. A nationwide strategy is being developed by the EPA to stop the increase in the number of fields testing high for P and to reduce the amount of P in fields that already test high for P. The biggest problem with developing a program to manage soil P is the lack of data about what amount or concentration of P in the soil causes environmental problems. The concentration of soil P above which environmental problems occur and below which little or no environmental problems are expected, is called the environmental critical concentration. Critical concentrations have been established for plant availability of soil P. Before any program to manage soil P can be successful, an environmental critical concentration for P is needed.

Success is measured by the amount of grant dollars received. Ideally, \$75,000 in grant funds if proposals are accepted.

Desired outcome products include two peer-reviewed publications and one Extension publication about environmental critical concentrations for soil phosphorus.

A valuable resource for the research project is a graduate student.

A quick test is being developed for use as a routine soil test for estimating the potential for a soil to supply phosphorus to leachate and runoff water. The duration of the project should be 3-4 years.

Research strategy: Find a quick test for soil phosphorus that is related to the desorption of phosphorus from soil to leachate or runoff water. Laboratory data developed to estimate the potential of a soil to desorb phosphorus will be tested in the field by collecting runoff water from small plots. The concentration of phosphorus in the runoff water will be determined and compared with the estimated value from the laboratory data.

Dairy farmers make up the target audience for the research project. Statements on each limestone and fertilizer recommendation sheet will be provided for corn silage about the potential for the soil in the field to release phosphorus to leachate and runoff.

Evaluations will include surveying dairy farmers who have received the new fertilizer recommendation form with the information about the potential for their soils to release phosphorus about the usefulness of the information.

### Landscape Architecture/Sustainable Landscape Design

Research Focus: Sustainability is an issue of critical interest to the field of landscape architecture. As ecological and cultural health of the environment becomes increasingly threatened by suburban sprawl and wasteful land and resource use practices, landscape architects have the potential to effect positive change by creating innovative, artful, and accepted alternatives that give functional form to regenerative ecological and cultural processes. While regions such as the Western and Southwestern United States have felt more direct pressure to develop sustainable design practices and aesthetics, design in the Eastern states has been less perceptibly influenced by resource pressure. The ecological and cultural context for sustainable design, while global in some aspects, indicates a much different set of criteria and needs for landscape sustainability at the regional level. One research

plan for the next five years will concentrate on identifying, analyzing, synthesizing and developing contemporary examples of iconic sustainable site design in the Northeastern region of the United States. It will also work towards a greater understanding of the regional context for sustainability by analyzing design for critical resource issues of major landscape regions of the United States.

Students and practitioners alike have an increasing need for an understanding of theory and form of sustainable landscape design. One of the anticipated measures of impact for this research will be an increase in the application and visibility of ecological design principles in built landscapes of the region. Another measure of impact will be increased acceptance of and demand for such landscapes by the general public. A third possible measure of impact will be increased collaboration between landscape architects and other design professionals such as engineers, artists and architects to develop comprehensive approaches to sustainable development.

This work will result in peer-reviewed articles – Landscape Journal, Places, Environment and Behavior, Landscape, monograph of nationally recognized landscape architects practicing regional sustainable design, presentations at professional conferences – Council of Educators in Landscape Architecture, American Society of Landscape Architecture, Environmental Design Research Association and built landscapes which exemplify principles of artful sustainability.

Partners will be: Granting agencies such as the Northeast Regional Center for Rural Development, the Huber Educational Trust, the Graham Foundation for Advanced Study of the Fine Arts or the Landscape Architecture Foundation; researchers working on related areas within the field of landscape architecture; researchers in related fields of natural resource management, architecture, planning, engineering, and art; Selected practitioners who are applying sustainable landscape design strategies in their work; Connecticut Chapter of the American Society of Landscape Architecture; federal, state or regional agencies such as the Department of Environmental Protection, HUD; Communities (municipalities); related Extension programs such as Master Gardeners and Integrated Pest Management.

This program of research will focus on developing: a) a theoretical model of sustainable landscape design based on artful interpretation of the relationship between ecology and culture; b) inventory and analysis of a body of built examples of sustainable landscape design (as defined in the model) for the Northeast Region of the United States; c) a comparative study of the application of the model in different landscape regions of the United States; d) development of curriculum materials which incorporate the above components into courses currently being taught in the landscape architecture program and a possible new course in sustainable landscape design; and e) development of short course curriculum for practicing landscape architects in the region.

The primary strategy used will be to develop a strong set of visual examples through case study methodology, which will communicate the proposed qualities and characteristics of sustainable design. The examples will be analyzed for their design process and performance over time to reveal critical transferable information and to stimulate dialogue and discussion about the nature of sustainability and the degree to which it can be designed for. The target audiences, identified below, will be encouraged to analyze and redirect their own work through the inspiration and understanding of the case studies.

Target audiences are practicing landscape architects, students of landscape architecture, related design professionals (architects, engineers, planners, artists and clients) and users of designed landscapes.

Evaluation techniques are surveying award-winning or otherwise recognized built landscapes, surveying the general body of work being built in the region, analysis over time of selected case studies of sustainable design and evaluation of student design and written work in the application and understanding of sustainable landscape design principles.

#### Program of Landscape Architecture

There are many computer applications related to land conservation, land development and land design that are used in the profession of landscape architecture. As with many other professions, the use of these tools plays a critical role in the impact of the profession. Understanding, expanding and integrating the abilities of these applications is critical to both the profession and wise use of the land.

The measures of impact will be better conservation, use and design of the land. This impact is both long-term and difficult to measure. There are several other measures that could be employed to measure impact. Primarily this would be changing the knowledge and abilities of both students and practicing professionals.

This work will result in presentations at professional conferences and peer reviewed articles.

Partners will be computer application developers, foundations interested in wise use of the land, others within CANR who work with computer applications and land (particularly GIS) and other researchers working on similar or related studies.

Strategies will develop a methodology for landscape architects to better understand and employ professional computer applications.

Key components of the program are: Short courses for continuing education credits (15-20 attendees); Regional professional conferences (40-60 attendees); National professional conferences (80-100 attendees); Professional Journal (5,000-10,000 readers).

Target audiences are practicing landscape architects and students in landscape architectural programs.

Evaluation techniques are primarily through changes in professional methodologies and possibly follow up studies to see if changes have occurred.

### Forest Stewardship

Cooperative Extension System Focus: The forested land area of the state of Connecticut provides numerous benefits to the quality of life and economy of the state. Protecting public and private water supplies, supporting a 300 plus million dollar annual forest products industry, providing the backdrop for a growing recreational and tourist industry, and wildlife habitat are just some of the benefits. The bulk of this forestland (almost 90%) is owned by private individuals and groups. These private holdings comprise more than one-half the land area of state. The continued health and productivity of the forest is threatened by population pressures resulting in conversion and fragmentation, as well as other natural factors, bringing about a decline in the collective and individual benefits provided by forest resources.

The Connecticut Forest Stewardship Program provides technical and financial assistance to private forest landowners, educating them as to the advantages of actively managing their forest holdings, and providing financial incentives for accomplishing certain management activities.

Measures of success will be: participation in the Forest Stewardship Program provides the landowner: Professional assistance in forest management planning; guidance in identifying management goals; information necessary to make ecologically sound decisions; an outline of suggested management activities and actions; eligibility for cost-share funding; education through guided action.

In addition to assisting forestland owners, the program provides benefits to forestry professionals as well, through workshops, CEU programs, GIS mapping assistance, fact sheets, plan reviews, etc.

The primary indicator of the success of the Forest Stewardship Program has been shown to be the number of forestland owners (and acreage) utilizing the benefits of the program to obtain a Forest Stewardship Plan for their property and actively engage in the management of their forest land. The numbers of professional foresters utilizing the program to provide clients with improved services is also tracked to provide a measure of success.

This work will result in: detailed Forest Stewardship Plans for non-industrial private forestlands; GIS-based Stewardship Plan Maps; stewardship Plan and Mapping database; poster exhibits; fact sheets and technical bulletins, video productions; articles and planning manuals.

Resources and partners include: USDA-Forest Service who provide base funding for the program, and technical assistance. (MS) CT-DEP Forestry Division who provide administrative assistance and field implementation; Connecticut Forest Stewardship Committee provide an advisory role, membership includes: Conn. Forest and Park Association - CT Farm Bureau, Farm Service Agency, NRCS, private consultants and industry members.

Forest Stewardship Program is an on-going program, supported by federal funds and the role of coordinator involves the following: providing educational opportunities for landowners and forestry professionals; promoting the Forest Stewardship Program to target audiences and the general public; cooperating with partner groups and agencies to accomplish stewardship goals; networking with individuals and groups to provide services and build new partnerships; supporting where possible other Extension programs when mutual goals and audience contact can be enhanced, such as with watershed and wildlife projects; educational methods involve workshops, field days, direct mail, one-on-one visits, articles, surveys, video productions.

The target audiences include non-industrial private forest landowners, members of the forestry profession, land-use decision-makers and the general public.

Evaluation techniques involve records that are kept of the successful completion and implementation of Forest stewardship Plans for private landowners. Numbers of acres treated, habitat and erosion projects accomplished, and numbers of trees planted, are examples of the types of statistics evaluated. Stewardship Plan quality is also a factor in maintaining funding support for the program.

## Water Quality

Cooperative Extension System Focus: Educating the public about natural resource issues is difficult. Complex information has to be explained in a short period of time, often after work hours or combined with community meetings. Addressing this issue with the latest technology is one method being used by the NEMO project. Harnessing the Internet, computer projection technology, and mapping tools will help convey the information to the audience.

Measures of success and impact include the increase of: requests for digital publications; requests for additional workshops; number of school projects and research project related to natural resource-based land use planning and environmental stewardship of water resources.

This work will result in educational workshops, PowerPoint presentations, peer-reviews journal articles, fact sheets, technical papers, abstracts and proceedings from regional and national conferences, computer programs to assist end user, interactive web sites and awards.

Internal partners are: NRME faculty/remote sensing (Dan Civco) provide remote sensing data and expertise. NRME faculty/water resources (Jack Clausen, Glen Warner) provide water pollution remediation expertise. Plant Science/Landscape Architecture faculty provide landscape and subdivision design expertise. CES Forestry staff conduct complementary forest stewardship programs within watershed context. CES Family and Community staff provide home-based water quality programs. External partners are: EPA Region One provides funding for work in Southwestern Connecticut and Westchester County, NY (MS). US Fish and Wildlife Service provides funding for work in Lower Connecticut River watershed. EPA Office of Water provides support for national workshops (MS). NASA provides funding and data for expanding work related to the effects of sprawl on water and forest resources (MS). CTDEP provides funding for educational workshops and research in Connecticut.

The Nonpoint Education for Municipal Officials (NEMO) Project conducts educational programs targeting local land use officials throughout Connecticut. The project has 7 staff involved in developing and conducting educational presentations, writing educational publications, creating methods for using remote sensing, geographic information system and World Wide Web technologies for educational purposes, and interacting with local officials. In addition, NEMO is working with groups in other states to adapt NEMO to their region.

One role within the NEMO Team is overall coordination for the web site design, publications and graphics, production of educational materials, computer programming, presenter of educational programs. Additional projects include education on natural landscaping and low impact development. NEMO project strategies revolve around increasing educational coverage of Connecticut communities through technical presentations and interactive web sites.

Target audiences include local land use decision-makers, natural resource professionals and landowners interested in learning about environmental issues in their towns or natural landscape issues.

Principal project contacts in Connecticut communities will be surveyed yearly to ascertain attitudinal changes, changes to town documents and policies, and initiation of related research, education, watershed management, and open space planning initiatives. These changes will also be documented through commission minutes, newspaper articles, letters and memos. Project contacts in other states will be surveyed yearly to ascertain the progress and extent of NEMO adaptations: number of partner agencies; number of presentations; number of local officials reached; funding.

## ALLOCATED RESOURCES - GOAL 4

Programs listed below reflect funding from all sources including Hatch funds, Smith Lever funds, Offset, University operating, grants and special projects.

Finding resources for new program areas as well as funding ongoing programs as traditional support has vanished is critical. In some areas, current support is adequate while additional resources would facilitate moving the research and Extension agendas along at a faster rate.

Financial resources needed for the completion of the above activities include the following:

- graduate assistants
- technical support staff
- clerical support for grant and publication editing and submission
- post doc positions
- Plant Science Farm personnel assistance

- Extension position to work in pesticide application technology
- technical support for computer trouble shooting
- match funds for the director position of the Institute of Water Resources
- staff to support proposal development
- funding to support program staff for the Master Gardener Program
- increased clerical staff in selected Extension centers (Haddam, Brooklyn)
- field technicians to support the urban gardening program
- funding to support visiting professors from other states

Additional non-staff support for programs includes:

- conference and annual symposium;
- Extension and undergraduate educational material development and distribution
- equipment maintenance and repair support
- renovated lab space, office and meeting space as programs experience growth
- yearly allocation for supplies, experimental animals and pathology costs
- geoprocesing related computers, software, and equipment
- funds needed to maintain current equipment, lab supplies and replacement items as needed
- improved lab facilities for wildlife undergraduate teaching
- support for the management of the UConn Forest
- computers for graduate students
- monetary support for continued access to computer software
- improvement of the simulation laboratory
- team wide interactive "virtual" access to various models, data and expertise
- additional electronic media delivery equipment
- in-house color copying capabilities
- faster internet access at Extension centers
- funds for Extension projects conducted on sabbatic leave
- return of indirect costs to Extension centers

Funds Spent in Support of Goal 4

	1999	2000	2001	2002	2003	2004
Total from all Sources	960,328	960,328	960,328	960,328	960,328	960,328

GOAL 5: Enhanced economic opportunity and quality of life for Americans. Empower people and communities, through research-based information and education, to address economic and social challenges facing youth, families, and communities. (1862 Research, 1862 Extension)

## COLLEGE PROGRAM TEAM PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

### 4-H YOUTH DEVELOPMENT TEAM

#### State 4-H Horse Program

Connecticut has the second highest number of horses per capita in the United States. There are over 1,500 registered 4-H members with horse projects in Connecticut. The State 4-H Horse Program serves this population by providing youth with leisure and academic educational opportunities within the 4-H horse project area. This program would have a Cooperative Extension Focus, and would be considered part of the national Animal and Plant 4-H emphasis area.

The anticipated measures of success will be: a) Continuation of the State 4-H Horse Advisory Committee, leading to: increased volunteer involvement and awareness of the opportunities in the State 4-H Horse Program; volunteers leaders having input and decision making opportunities on the state level; increased numbers of volunteers working at events. b) Participation in the State 4-H Horse Contests, leading to: increased academic knowledge in equine studies; better overall study habits that could be applied to school work; improved day to day equine practices – due to information learned; increased knowledge of equine selection. c) Continuation of the State 4-H Trail Ride, leading to: viewing riding as a life long physical activity; increased knowledge of trail riding, its challenges and benefits; better performance on evaluated trail obstacles; improved map reading skills. d) Continued participation in the New England 4-H Horse Program at the Eastern States Exposition, leading to: increased visibility of Connecticut's 4-H horse project members on the regional level; better horse management, horse judging, equine knowledge, time management, and show preparation skills; improved application submitting and interviewing skills.

Outcome products desired are increased numbers of participants/applicants/volunteers for each of the State 4-H Horse Programs and the State 4-H Horse Advisory Committee.

Partners will include Dr. Rhonda Hoffman, Horse Extension Specialist – Dr. Hoffman works to oversee planning and implementation of the State 4-H Horse Contests and the Eastern States delegation selection. She also participates in all State 4-H Horse Advisory Committee Meetings; State 4-H Horse Advisory Committee and its sub-committees and contest chair people – This committee works on event planning, academic contest material, handbook development, fundraising, the web site, and all other aspects of the program; and 4-H Horse Project Volunteer Leaders and Coaches – those who are not actively involved in the advisory committee often volunteer to organize or help at special events.

The State 4-H Horse Programs are ongoing. They are assessed after each event and changes are made to improve the events. The duration is endless, with a focus on yearly scheduled events and meetings. The key components are the State 4-H Horse Advisory Committee, State 4-H Horse Contests, State 4-H Trail Ride, and the New England 4-H Horse Program selection, orientation and participation at Eastern States.

The audience for State 4-H Horse Advisory Committee participation is 4-H volunteers. For the State 4-H Horse Contests it is any 4-H member between 7 and 19 years of age, and knowledgeable, skilled volunteers to act as coaches, judges and helpers. The educational methods include study sessions with coaches, mock contests, clinics and review of educational source materials. The number of attendees is approximately 140 with 110 of the attendees being 4-H participants. The audience for the Trail Ride is 4-H members their friends and family – as well as volunteers to coordinate the event and to judge. The educational methods include map reading, trail obstacle completion and evaluation, and recognition. Attendance has been approximately 60 people. For the New England 4-H Horse Program the audience is 4-H members 14 –19 as of January 1<sup>st</sup> of the current year, and volunteers to work within the program and on the New England level. Attendance is limited to 18 4-H members and around 10 volunteers who work on the delegation or regional level.

Each program will be evaluated differently. The State 4-H Horse Contest uses the following: auditory questioning; slide, diagram, and product/item identification; team problem solving; halter and performance judging; verbal reasons giving; written testing; written overall evaluation; meeting to assess overall quality of contests and suggestions; the trail ride uses written evaluation and judging of trail obstacles to evaluate the ride and its individual riders. The New England 4-H Horse Program (Connecticut Eastern States Exposition Committee) uses written evaluations for the orientation and the program participation.

#### 4-H Environmental Education and Earth Science

Involvement in an informal program of environmental education and earth science provides youth with challenges, experiences, support and help which foster a positive attitude toward the conservation of natural resources for today and for the future.

The measures of success will be: volunteer 4-H leaders, Extension educators/staff, 4-H camp staff and other formal and non-formal educators will increase skills and confidence in teaching and implementing programs and activities which emphasize environmental education and earth science. Youth will increase knowledge and skills in environmental education and earth science. An increase in the number of youth involved in 4-H environmental education and earth science projects.

The outcome products desired include: a Connecticut 4-H Environmental Education and Earth Science curriculum/module series; a 4-H Environmental Education and Earth Science local, county and state event established; a promotion plan for the 4-H Environmental Education and Earth Science emphasis area; publication/presentation of Connecticut 4-H Environmental Education and Earth Science training materials.

Internal partners include: Connecticut 4-H Environmental Education and Earth Science Team; College of Agriculture and Natural Resources Wildlife Resource Team; Connecticut 4-H Camps; 4-H Volunteers and Youth. External partners include: Department of Environmental Protection; Connecticut Department of Agriculture; Ragged Hill Woods (partnership between UConn, Windham County 4-H Foundation, Eastern Connecticut State University and Connecticut Audubon).

The 4-H Environmental Education and Earth Science Program assists youth in becoming competent, caring and contributing members of society by fostering respect for the environment and responsible stewardship of all natural resources and ecosystems.

Training in Environmental Education and Earth Science will be provided to volunteer leaders interested in incorporating environmental and earth science activities into club or specialized 4-H programs. Environmental Education training and resources will be made available to 4-H Camp outdoor education programs.

The Connecticut 4-H Environmental Education and Earth Science Program target audience is 4-H youth, all youth participating in 4-H camps or 4-H partnership programs and 4-H volunteer leaders interested in incorporating environmental and earth science activities into club or specialized programs.

Evaluation techniques will include: pre and post assessments for subject matter training's conducted for 4-H leaders; survey 4-H leaders about environmental education and earth science inclusion in on-going programs; record and track the number of Environmental Education and Earth Science record forms submitted on a yearly basis; establishment of a 4-H event judging system for environmental education and earth science projects.

#### Camp Resource

Cooperative Extension Focus: In order for youth to develop into adults of integrity who are coping, caring, competent and contributing members of society, they need the opportunity to interact with youth and adults in a variety of different settings. A safe quality educational camp experience enables youth to develop skills such as decision-making, cooperation with others, self-reliance and leadership. Many youth who do not flourish in a traditional school setting find success and feelings of accomplishment in the more informal camp setting. As the structure of the family continues to change, parents need a place where they know their children are getting what they need. In a survey conducted with 750 parents of youth who have attended a Connecticut 4-H camp in the past two years, parents have reported that they have seen a moderate or major change in their child in the following areas: 87.1% made new friends, 87.3% learned new skills/activities, 50.8% are more cooperative, 69.9% are more independent, 63.7% are more responsible, 65.2% are more accepting of others, 74.4% increased self esteem.

Many young adults of College age have the enthusiasm and desire to work with youth. When they receive experientially based training to develop an understanding of the needs of youth and skills to create programs which meet these needs, they most often develop into wonderful camp counselors and are able to explore career opportunities.

Volunteers who serve on 4-H camp boards are extremely dedicated and interested in doing what is best for youth and the camp. Most often they lack the skills needed to serve effectively on a volunteer board and the knowledge of camping standards. With training and support they can run exceptional programs.

Parents and campers at 4-H camps will report changes of behavior as a result of camp attendance. Staff will report skills learned and successes. Volunteers will feel more competent and be more effective. Through research the impact of the camp experience will be better understood.

The outcome products desired will include: Training curricula developed; research based articles published in peer reviewed journals; presentations at regional and national conferences

Target audiences include: Hartford County 4-H Camp Board, Middlesex County Camp, New London County 4-H Camp Foundation, Windham 4-H Foundation; American Camping Association; Extension 4-H Camp Specialists (MS)

Extension Educator will serve as a resource to the Connecticut 4-H camp program (volunteer board members, Extension camp liaisons, camp directors, staff) in areas of standards for the industry including program, site, human resources, health and safety, management. Camp staff training support will be made available to camps (primarily not-for-profit) and town recreation departments in areas such as teambuilding, communications, diversity, conflict resolution, supervision and leadership.

Strategies will include: regular updates and articles of interest and opportunity will be sent to camp board members and camp liaisons; periodic meetings with key contacts will be held to address concerns; and to plan and implement a staff training conference for staff of CT 4-H camps. Assistance in strategic planning, identification of resources, program development and other area of need will be provided as requested. Research projects on the values of the camp experience will be undertaken.

Target audiences are: youth attending 4-H camps in Connecticut; volunteers and staff involved with Connecticut 4-H camps; staff of camps run by town recreation departments and not-for-profit agencies; professionals in the camping field.

Evaluation techniques of the 4-H camp program will be conducted through parent/camper questionnaires, focus groups, and telephone interviews. Informal feedback from volunteers will be used to assess further needs. Written program evaluations will be received from participants in staff training programs. Research articles will be peer reviewed.

#### 4-H Youth Development

Cooperative Extension System Focus: Youth leadership is one of nine key areas of emphasis for the University of Connecticut's 4-H Youth Development Program. Involvement in a program of leadership education fosters important skills, knowledge and confidence required of all effective leaders. Being an educated and experienced leader will help youth make the best decisions for themselves and others and will prepare them for the adult roles they will assume in the home, community, workplace, state and nation.

Teens participating in leadership education programs, teens planning educational leadership programs, a functional leadership team, adequate resources for leadership education. A clearly defined teen leadership project.

The outcome products desired are leadership materials available in each office and revised 4-H leadership record sheets, the volunteer leader manual completed.

The internal partners include Extension Educators and program coordinators. The external partners include volunteer leaders, staff of other organizations, CT Development Fund. Materials will include publications developed in other states.

Leadership team and teen planning committees will work on developing opportunities for teens to learn leadership skills at club meetings, special interest groups, camps, fairs and special statewide activities

4-H and other teens and paid and adult volunteer staff. Methods include group meetings, conferences, workshops, camps and fairs. The research strategy is learning by doing.

Target audiences are number of teens volunteering, retroactive post-tests of knowledge gained. Number of programs in place and numbers reported involved on ES237 report.

Evaluation techniques include: teen issue forums are meeting needs in this area; need for staff to interact on a national basis to keep abreast of new materials and opportunities.

#### 4-H and Youth Development

Cooperative Extension Focus: The purpose of the 4-H and Youth Development Team is to foster the development of children in becoming adults of integrity who are coping, competent, caring and contributing members of society. This is done in a variety of ways, including club projects, volunteerism, leadership development through 4-H Fair Associations, project planning committees and more. 4-H youth directed projects and activities provide participants with opportunities for decision making and leadership. The 4-H and Youth Development Team will work in nine Program Emphasis Areas when working with youth. Each member of the team will work with other members in one specific area. The plan is to work with a group in the area of Communication and Expressive Arts.

The measures of success will be: 4-H volunteer leaders and youth will incorporate communication and expressive arts activities within their existing club or program structure; Youth members will apply improved communication skills in their lives; Youth will increase their knowledge and skills in one or more areas of Communications and Expressive Arts.

The outcome products desired are: a statewide 4-H Communication and Expressive Arts curriculum; revised 4-H record sheet for Communication and Expressive Arts; revised evaluation sheet for judges to use in Communication and Expressive Arts; leader training and/or youth workshop day focusing on Communication and Expressive Arts.

Partners will include: University of Connecticut Schools and Departments which relate to this area; 4-H Leaders and Advisory Boards; and additional 4-H Staff and Colleagues

The Communication and Expressive Arts program assists 4-H youth members in becoming competent, caring, coping and contributing members of society by fostering the development of avenues of self expression. The youth members also develop strategies for organizing and delivering public presentations, developing a public presence and becoming comfortable before a group. Participants will have opportunities to develop skills in areas which include writing, performance, drama, music, graphic arts, drawing and visual arts.

Educational methods to be used are training in Communication and Expressive Arts for leaders or volunteers; recruitment of skilled artisans (photographers, artists, sculptor, drama teacher, etc.) to provide workshops or act as project leaders for short amounts of time. Provide special workshops or training for specific areas of curriculum such as Public Presentations or Photography.

This program would benefit all enrolled Connecticut 4-H members.

Evaluation techniques are to: record and track the number of entries in Communication and Expressive Arts at all 4-H Fairs and Exhibitions; record and track the number of participants at county or statewide Communication and Expressive Arts workshops on a yearly basis.

#### 4-H Plant and Animal Science

Focus: Plant and Animal Science is one of the nine key areas of emphasis for the University of Connecticut's Cooperative Extension System 4-H Youth Development Program. Involvement in an informal program of plant and animal science provides youth with challenges, educational and social experiences and support which foster the development of life skills such as integrity, decision-making, record keeping, public presentation and animal and environmental responsibility. All of these skills have been recognized as critical for success in youths; future roles of citizen, employee and entrepreneur. Cooperative Extension Focus: CES will allocate human and financial resources to the 4-H Youth Development Program so that the following can occur: A Plant and Animal Science curriculum/module series will be identified and purchased for 4-H youth participants and volunteer leaders; Volunteer leaders will be trained to use Plant and Animal Science curricula; - Sources of support/recognition for the 4-H Plant and Animal Science program will be developed; Standardized record books and project evaluation forms for Plant and Animal Science projects will be developed.

Measures of success include: Volunteer 4-H Leaders, Extension Staff and other formal and non-formal educators will increase skills and confidence in teaching and implementing programs and activities which emphasize plant and animal science; Youth will increase knowledge and skills in plant and animal science projects; An increase in the number of youth involved in 4-H plant and animal science projects; An increase in the number of plant and animal science projects submitted at local, county and state 4-H events by non-traditional youth audiences.

The outcome products desired are: CT 4-H Plant and Animal Science curriculum/module series; 4-H Plant Science local, county and state event, fair or exhibit established; New 4-H Plant Science record sheet and evaluation form; New 4-H Animal Science record sheets and evaluation forms; A promotion plan for the 4-H Plant and Animal Science emphasis area; Continued successful CT 4-H Animal Science Project Clinics, expansion to include participants from other New England states; An increased awareness and respect for agriculture and its role in the community and the international economy; Increased concern for the environment and use of sustainable agriculture methods.

Internal partners will be: University of Connecticut CANR Departments of Animal Science, Pathobiology, Plant Science; Specialists and Educators in CANR/CES; 4-H Volunteers/Youth; New England 4-H Program Committees (Beef, Dairy, Sheep, Horse, Dog, Dairy Goat). External partners will be: Producer Groups and Organizations; Master Gardeners.

The Connecticut 4-H Program will include opportunities for youth to explore plant and animal projects in varied depths, in community 4-H clubs, after school settings, camps, CT 4-H Farm Resource Center, etc. Youth may participate in educational plant and animal science project clinics on a regional or state basis. The program will include education, support, evaluation and recognition.

Strategy includes training in Plant and Animal Science will be provided to volunteer leaders interested in incorporating these projects within on-going groups or who are interested in establishing 4-H programs with Plant and Animal Science as a primary focus. Youth will have an opportunity to participate in 4-H educational plant and animal clinics, judging events, quiz bowls and field days.

Target Audiences are: 4-H youth and volunteer leaders, primarily in Connecticut, with some from other New England states attending Connecticut 4-H animal science project clinics.

Evaluation techniques include pre and post assessments for subject matter trainings conducted for 4-H leaders; survey 4-H leaders about plant and animal science inclusion in on-going programs; record and track the number of Plant and Animal Science record forms submitted on a yearly basis; establishment of a 4-H Fair judging system for Plant Science.

#### 4-H Positive Youth Development

Science and Technology is one of the nine key areas of emphasis for the University of Connecticut's 4-H Youth Development Program. Involvement in an informal program of science and technology education provides youth with challenges, experiences, and support which fosters the development of science literacy skills recognized as critical for the workforce in the year 2000.

The outcome products desired are 4-H members understanding that science and technology have real connections to their worlds of academic study and potential careers, as evidenced by their involvement in experiences such as the Family Science Expo (rockets away demonstrations, computer science demonstrations, etc) and involvement in a Connecticut 4-H Tech Corps.

Internal partners include faculty members from within CANR and across campus, School of Education (instructional technology). External partners include members of the steering committee of the CPTV Family Science Expo and members of the National 4-H Curriculum Committee.

Audiences include 4-H members, elementary aged school children and their teachers.

#### 4-H

Cooperative Extension System Focus: The Cooperative Extension Youth Development Program fosters the development of children in becoming adults of integrity who are coping, competent, caring and contributing members of society. 4-H programs feature experiential learning opportunities, involvement over time with a caring adult, applications to current and future life, opportunities for evaluation, recognition and social interaction. 4-H participants have a responsibility for decision making and leadership. 4-H groups, projects and activities exist and are developed within this framework. Environmental Education and Earth Science and Plant and Animal Science areas will be emphasized as part of the 4-H Youth Development Team.

The measures of success will be: Youth with increased knowledge and skills in animal, plant, or environmental sciences and with increased respect for agriculture and the environment and its importance to the community; Youth with integrity, sportsmanship, decision making capability and public presentation skills; Volunteer 4-H leaders and Extension 4-H Educators with increased skills and confidence in teaching and coordinating animal, plant and environmental science projects.

The outcome products desired are: up to date curriculum in animal science, plant science and environmental science; an evaluation method/instrument for plant, animal, and environmental science program areas; increased number of youth and adults adopting new skills.

Partners will include various faculty and staff in the College of Agriculture and Natural Resources with expertise in environmental, plant and/or animal sciences, Extension 4-H educators, volunteer 4-H leaders, 4-H youth, Connecticut 4-H Development Fund, and other local (county) funding resources. Local or state based program advisory committees.

Environmental education, animal, and plant science projects and educational programs which develop knowledge and skills, incorporate experiential learning approaches, and which have a community service and career development focus.

Strategies include 4-H projects in which youth will learn basic principals of: animal science and management by owning and/or caring for and keeping records on one or more animals; plant science, conservation of natural resources, and environmental awareness; water quality.

Examples of specific programs include regional and state level conferences, educational workshops and field days, 4-H camps, summer recreation site programs, 4-H Fairs, New England 4-H Program at Eastern States Exposition, judging, quiz bowl and hippology events, and specific environmental educational programs.

The audience includes youth ages 7 through 19 in 4-H groups, also ages 5-7 in school age child care programs, and youth in 4-H Camp programs or summer recreation site programs, as well as adult volunteers.

Evaluation techniques will include program monitoring, evaluation of youth projects at state, regional and/or national events, participant interviews, participant questionnaires, selected longitudinal studies and review of records submitted.

#### 4-H Youth Development: Workforce Preparation

Cooperative Extension Focus: As the needs of the workplace become increasingly complex and technical, most educators and employers find that students are poorly prepared for work. Business and education leaders agree that how America fares in the new world economy will depend on how its workforce can respond. The SCANS (Secretary of Labor's Commission on Achieving Necessary Skills) found that to be successful in the workplace, workers need "foundation skills" such as personal qualities, basic and thinking skills, and "workplace competencies" such as interpersonal skills, and the effective use of resources, technology, systems and information. Workforce preparation is one of the nine key areas of emphasis for the University of Connecticut's 4-H Youth Development Program. Involvement in workforce preparation projects provide youth with challenges, experiences, support and help which promote positive and realistic outlooks on the world of work. Consistent with SCANS and other workforce initiatives, Connecticut youth involved in CES workforce programs develop skills that prepare them for entry into the world of work.

The measures of success will be: volunteers and staff will increase skills and confidence in teaching and implementing programs and activities which emphasize workforce preparation; youth will acquire knowledge, skills and attitudes that foster workforce preparedness; youth will apply requisite workforce knowledge, skills and attitudes within on-going 4-H projects; state 4-H program will be examined and areas will be identified where workforce concepts and skills can be reinforced; 4-H programs coordinated by volunteer partners, i.e. camps will be examined and areas will be identified where workforce concepts and skills can be reinforced; workplace skills learned in 4-H will be identified in select sample of CT 4-H alumni.

The outcome products desired are: New England 4-H Youth Entrepreneur curriculum series; 4-H Career Exploration curriculum; 4-H Workforce Preparation record sheet; Training workshops for adults; Publication/presentation of CT 4-H Workforce Preparation programs; Corporate sponsorship of 4-H Workforce Preparation; survey of 4-H alumni regarding workplace skills learned in 4-H

The internal partners include: UConn Schools/Departments of Business Administration, Business Development Center, Connecticut Small Business Development Center, Entrepreneur Institute; CT 4-H Development Fund/Extension Councils; New England Workforce Preparation Task Force (MS); 4-H Camps. External partners include: Schools, Family Resource Center, SCORE, businesses with statewide influence, Small Business Administration, Minority Business Association

Multi-disciplinary programs in career exploration, youth entrepreneurship, and employability. 4-H Workforce preparation program assists youth in becoming coping, competent, caring, and contributing members of society by fostering the development of positive employment and entrepreneurial skills and attitudes.

Audiences include camp directors, 4-H leaders, family agency staff and youth. Educational methods include fact sheets, direct program services, conference for youth, and training workshops. Anticipated audience is 200 youth and 50 adults.

Evaluation techniques will include pre- and post-assessments, surveys, and tracking of amount of dollars and in-kind support received will be conducted. Evaluation on key programs will be conducted at six months to determine educational impact.

#### 4-H Youth Development - Communication and Expressive Arts

Communication and Expressive Arts is one of the nine key areas of emphasis for the University of Connecticut's Cooperative Extension System 4-H Youth Development Program. Involvement in a program of communication and expressive arts fosters the development of important self-knowledge and self-expression skills, and promotes self-confidence. Data also suggest that a healthy and productive citizen in the 21st century will need to be (1) skillful in interpersonal communication skills; (2) confident in his/her ability to express themselves with people from diverse and divergent backgrounds; and, (3) able to utilize leisure time for both personal satisfaction and/or financial rewards.

The anticipated measures of success are: 4-H volunteers will incorporate more Communication and Expressive Arts activities within on-going 4-H programs; Youth will report an increase in knowledge and skills in one or more Communication and Expressive Arts areas; Youth will apply communication and expressive arts concepts within 4-H projects and record sheets.

The outcome products desired are: a 4-H Communication and Expressive Arts curriculum/module series; a Communication and Expressive Arts local and state event established.

Internal partners include: UConn Schools/Departments of Communication Sciences, Fine Arts, Dramatic Arts, Community School of the Arts, CIMT. External partners include: Organizations such as Toastmasters, performing artists and entrepreneurs within the Communication and Expressive Arts field.

The 4-H Communication and Expressive Arts program assists youth in becoming coping, competent, caring, and contributing members of society by fostering the development of important avenues of self-expression.

Strategies include 4-H volunteers interested in incorporating these activities within on-going groups or who are interested in establishing 4-H programs with Communications and Expressive Arts as a primary focus will receive training in this area.

The target audience will be 4-H Volunteers and 4-H youth.

Evaluation techniques will include conducting a survey of 4-H volunteers to determine the type and extent of Communication and Expressive Arts programming that is occurring, recording and tracking the number of Communication and Expressive Arts record forms submitted on a yearly basis; and recording and tracking the number of Communication and Expressive Arts projects submitted on a yearly basis to 4-H sponsored events.

## FAMILY AND COMMUNITY DEVELOPMENT TEAM

### Family and Community Development

Cooperative Extension System Focus: According to a February 21, 1999 Hartford Courant news article written by Sharon Langer, an Hartford Legal Services attorney, seven years ago Connecticut had the second lowest child poverty rate among the states. This year Connecticut is 29th. One of every five children under the age of six lives below the federal poverty limit despite the fact that Connecticut has been number one in per capita since 1985. A 1995 study with 944 students in 19 Connecticut public high schools (urban, rural, and suburban) showed the following results: 22% said they had carried a weapon during the past 30 days; 26% said that had used marijuana one or more times during the past 30 days; 30% considered themselves as slightly or very overweight; 24% said they thought seriously about attempting suicide in the past 12 months; 37% said they had sexual intercourse during the past three months, etc. In Welfare Reform Impact Study Executive Summary: The responding agencies reported that 56% of their clients found it harder to buy food than six months ago! An overwhelming number of interviewees indicated that every month they ran out of food before the end of the month. The correlation of incidence of childhood lead poisoning increases for children whose families have incomes that are below the poverty level because they are more likely to have poor nutrition and reside in older substandard housing. In addition, over the past 15 years the number of children afflicted with asthma has doubled to total six million. Minority children are disproportionately affected by asthma. Poor children experience a higher rate of death. Many children remain chronically impaired because they lack support systems that enable them to effectively manage their own disease or have access to medications.

The Family and Community Development Team will do knowledge and skill training as measured by post program evaluation in multi-disciplinary areas with family service providers and program participants. Measure of percent and number of credential C.E.U. obtained by participants. Follow-up surveys will be done on targeted populations. The team will conduct multi-disciplinary programs in the following areas: Childcare, Parenting, Health and Nutrition, Financial Management, Individual, Family and Community Development, Lead Poisoning Prevention, Indoor Air Quality (focused on asthma and secondhand smoke). A train-the-trainer, model will be used with some audiences.

Outcome products desired are fact sheets and program materials posted on web site, brochures (marketing), training curricula and exhibits.

Partners include the UConn School of Family Studies, CIT, Family Resource Centers, State Departments, Connecticut Charts-a-Course, local Health Departments, US EPA, USDA/CSREES.

The team will conduct multi-disciplinary programs in the following areas: Child care, Parenting, Health and Nutrition, Financial Management, and Individual, Family and Community Development. A train-the-trainer, model will be used with some audiences.

Audiences will include community staff, family resource centers staff and volunteers, 4-H volunteers, Extension Council members, child care providers, etc. Educational methods will include Train-the-Trainer Workshop series, fact sheets, web site, newsletters, etc.

The projected number of attendees for the team include 200 participants and 25,000 for newsletters, printed matter, etc.

Follow up evaluations will be conducted. Also, a representative sample of participants will participate in a follow-up study.

### Family and Community Development

These activities coordinate with the Food, Food Safety, and Health as well as the Family and Community Development Teams. Particular joint efforts are the development and maintenance of a web site, production of

consumer materials, the initiation of a statewide conference on iron-deficiency anemia, collaboration on grant submissions and testing of food safety materials for young children.

### Family Strengthening

Cooperative Extension Focus: Connecticut's child poverty rate ranks 29th in the U.S. One out of every five children under the age of six is living below the federal poverty limit despite the fact that Connecticut has been number one in per capita since 1985. Welfare reform has changed the economic picture for many CT families and has decreased the many safety nets that previously protected at-risk families, including income, education, housing, health care, childcare and nutrition benefits. At-risk families often live in isolation in unsafe neighborhoods. Families and family service providers will benefit from the educational programs and opportunities provided by this team.

Measures of success will be family service providers and program participants obtaining knowledge and skills as measured by post-program evaluations in multi-discipline areas. Follow-up surveys will be conducted on targeted programs. The number of participants receiving credentials will also be documented. Outcome products desired are: a web site with fact sheets and program; marketing brochure for the program; training curriculum; and exhibits.

Internal partners are the UConn School of Family Studies; CANR Office of Communications and Information Technology. External partners are the Family Resource Center; Connecticut Department of Income Maintenance; Connecticut Department of Children and Families; Connecticut Charts-A-Course; Danbury Commission on Child Care, Rights and Abuse; Infoline and Headstart.

Multi-disciplinary programs in the following areas: child care; parenting; health; financial management; individual, family and community development. May include train-the-trainer programs.

Audiences to include family agency staff, family resource center staff and clients, Extension Councils, and 4-H leaders. Educational methods will include train-the-trainer; workshop series; fact sheets; web sites; newsletter; and media outreach. Anticipated audience is 300 program participants and 25,000 newsletter and media contacts.

Evaluation techniques will include follow-up representative study of targeted programs to be conducted at six-months post-program to evaluate program impact.

### Family Strengthening

Though Connecticut has the highest per capita income in the country, nearly one in five Connecticut children lives in a family with an income below the poverty level. The overall rate of poverty in Connecticut has increased from 9.2% in 1992 to 10.7 percent in 1996. In this state, a very large proportion, about 72 percent of women with young children are in the workforce. Children living with only their mother are sixteen times more likely to be poor than those living with two parents. Families living at the federal poverty level of \$13,330 per year for a family of three do not earn enough to pay for an average two-bedroom apartment anywhere in the state. These women are largely removed from the political process. The ratio of women's earnings to men's is ranked 29th in the nation. Over 46 percent of single females with children are living in poverty, considerably more than the national poverty level for this family type.

Cooperative Extension System Focus: Multi-disciplinary programming will include such areas as parenting, child care, financial, individual, family and community development. Train the trainer workshops will also be conducted.

Service providers and other participants will gain knowledge in a variety of discipline areas relating to building family strengths.

Outcome products desired are brochures to market program; material posted on web site, training curricula and exhibits.

Partners will be local Family Resource Centers for program delivery and the School of Family Studies.

Educators will develop a listing of topics/programs that will be offered on a community basis. The goal is to try to determine specific communities on which to focus.

A variety of educational methods will be used.

Audiences are likely to include community and agency staff, child care providers, 4-H volunteers, Extension councils and various state departments.

Follow-up evaluations (six months later) will be conducted on targeted programs. A random sample study will be conducted to evaluate the program.

### Workforce Preparation for Teens

Workforce preparation is one of the nine key areas of emphasis for the University of Connecticut's 4-H Youth Development Program. Involvement in workforce preparation projects provide youth with challenges, experiences, support and help which promote positive and realistic outlooks on the world of work. It also fosters the development of skills recognized as critical for entrance into the workforce in the 21<sup>st</sup> century.

Cooperative Extension Focus: CES will allocate human and financial resources to the 4-H Youth Development Program so the following activities can occur: 1) A Workforce preparation curriculum/module series will be developed/adapted/adopted for 4-H; 2) Youth Volunteer Leaders; 3) Volunteer leaders will be trained to use Workforce preparation curriculum materials; 4) Sources of support/recognition for the 4-H Workforce preparation program will be developed; 5) A standardized record book and project evaluation form for Workforce preparation projects will be developed.

Anticipated measures of success include: volunteer 4-H leaders, Extension educators and other formal and non-formal educators will increase skills and confidence in teaching and implementing programs and activities which emphasize workforce preparation; youth will acquire knowledge, skills and attitudes that foster workforce preparedness; youth will apply requisite workforce knowledge, skills and attitudes within on-going 4-H projects and record sheets; increased participation of 4-H members in local, county and state career fairs and expositions.

Outcome products desired are a Connecticut 4-H Workforce Preparation curriculum/module series to include the subject matter areas of money management, consumer education, communication skills, conflict resolution, team building, managing resources and decision making; web site with educational materials and resource links is developed; 4-H Workforce preparation record sheet and evaluation form is developed; publication/presentation of Connecticut 4-H Workforce Preparation training materials; corporate sponsorship of 4-H Workforce Preparation curriculum/module series/event.

Internal partners include specialists and educators in CANR/CES; UConn Schools/Departments of - Business Administration, Connecticut Small Business Development Center, Center for International Business; Connecticut 4-H Development Fund/Extension Councils; 4-H Volunteers/Youth. External partners include: New England Workforce Preparation Task Force; Small Business Administration, Minority Entrepreneurial Association Network, Rotary Clubs, Chamber of Commerce, Community - Based Organizations, Industries, franchises.

The 4-H Workforce Preparation Program assists youth in becoming coping, competent, caring, and contributing members of society by fostering the development of positive employment and entrepreneurial skills and attitudes.

Training in Workforce Preparation will be provided to volunteer leaders interested in incorporating these activities within on-going groups or who are interested in establishing 4-H programs with Workforce preparation as a primary focus.

All areas of Workforce Preparation will be recognized as a valid 4-H project area and youth will have an opportunity to participate in 4-H sponsored events related to this area (e.g. career fair).

Youth and families; low income and limited resources individuals and families; minorities.

Evaluation techniques include: pre and post assessments for subject matter training conducted for 4-H leaders; survey 4-H Leaders about workforce preparation inclusion in on-going programs; record and track the number of Workforce Preparation record forms submitted on a yearly basis; establishment of a 4-H Fair judging system for Workforce Preparation projects.

### Cooperative Extension System and School of Family Studies Taskforce: Center for Youth and Family Issues

Cooperative Extension System (CES) and the School of Family Studies (SFS) Focus: Both units have discussed the value of a state center for evaluation and outreach of youth and family issues. There is a taskforce comprised of faculty from CES and SFS who will be responsible for designing a data collection strategy for determining the critical needs around youth and family programs and services.

The committee will issue a report of their findings to the Associate Dean of CANR and the Dean of SFS.

The measures of success will be a comprehensive report of the state needs for youth and family programs and initiatives will be published. It is anticipated that this report will provide critical insight into the type and level of services that can be offered to local communities and state agencies by the University of Connecticut.

Outcome products desired are information for establishing the need for the development of a Center for Community Evaluation and Outreach in Youth and Family.

Internal Linkages are faculty designated by the Associate Dean of CANR and the Dean of SFS. External Linkages are public and private agencies engaged in funding or funded community-based programs, projects, and initiatives focused on youth and families.

The strategy will be determined by a one-year task force to be formed.

The target audience will be public and private state agencies engaged in funding or funded youth and family programs.

## SMALL GROUP PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

### Community Development through Volunteerism

Cooperative Extension Focus: Communities have always relied on the contributions of volunteers who work with a variety of different not-for-profit organizations to meet the needs of the citizens. These organizations, many of which are small grassroots operations, need to access appropriate training and support in order to flourish. With the changing demographics in the nation and state, many people who have not been volunteers in the past are looking at new ways in which they can help. In addition to matching their skills with appropriate organizations, they will need and want to develop new skills in order to feel they are being effective. Organizations who use volunteers have increasing needs to network with others in order to share best practices and make the most of limited resources.

Measures of success include: citizens who serve on volunteer boards will report they have learned new skills; volunteer boards will function more effectively as a team; directors of volunteer programs in organizations will gain information and support; individuals will gain new interpersonal relationship skills.

This work will result in training curricula developed, researched based articles published in peer reviewed journals and presentations at conferences.

Partners will be: Extension Partners (advisory committees, volunteer boards); Connecticut Conference on Volunteerism; Connecticut Charts a Course; local community organizations with missions in health care, education, social service, and community enhancement.

Extension Educator will strengthen not-for-profit community agencies and organized Extension groups by providing training opportunities and individual support and direction for boards and volunteers in areas such as responsibilities of board members, staff/volunteer relations, strategic planning, communications, group facilitation, leadership, diversity and trends in volunteerism. Programs will vary in length and depth to accommodate the needs of each organization.

Through networking and individual contacts organizations that need assistance will be identified. Methods used will include presentations at conferences, small group skills training, advisement and support on individual issues affecting organizations, small group interventions and written communications.

Target audiences are: Extension Partners with specific organization development needs; grassroots community organizations; established not-for-profit organizations with new training needs; new populations entering the volunteer pool.

Evaluation will be conducted through written workshop participant evaluations, case studies of organizations and individuals, and reports from key organization staff and board members.

### Expanding Youth Programs

Cooperative Extension System Focus: In Connecticut and across the nation there is considerable interest in the activities of children between the ages of 9-16 during the out of school hours. These are the hours when crime increases, when smoking begins and when kids learn and participate in activities that are not productive for them.

Success will be measured by additional grant dollars received to fund programs for out of school time, additional youth enrolled in CES 4-H out of school time programs, and documented impact of the 4-H LIFT program.

An important desirable outcome includes legislation passed including 4-H in statewide efforts for out of school time.

Internal partners include: Donna Rogalski and Pam Gray, 4-H program coordinators and other CES educators and program staff as appropriate. External partners include: OPM, Commission on Children, Team for Connecticut's Teens, Local Boards of Education.

As principal investigator, the efforts of staff who work on grants will continue to be supported and will work to partner with co-educators to attract additional resources to expand positive youth development programs. Efforts will also be made to the Connecticut 4-H Development Fund to attract additional resources for 4-H programs.

Methods include providing bi-weekly sessions with employed staff to set priorities and solve problems and assisting staff in identifying additional audiences and defining additional program methods.

One target-audience includes staff employed to work on grants. The final target audiences are at risk low-income youth and their families.

Evaluation of the program is based upon the number of youth involved in programs, increased school attendance and improved academic standing for program participants, staff feeling supported and working to improve and expand programs.

#### Personal Privacy: Financial and Medical

Never before has so much information about individuals been available to so many so easily. Access to this wealth of information raises questions and concerns about the collection and use of personal and/or private information. Technology makes information transfer fast and easy. Computerized databases, merged databases, Look-Up Services, public records and the voluntary release of personal information make it easy and inexpensive to develop a complete profile on a consumer. In addition, information can be collected, sold, modified and utilized without the consumer's authorization or even the knowledge that this is occurring. The public needs to be informed about the situation and any actions that they can take to reduce opportunities and take more steps to prevent easy access to information. It is estimated that each day over 1000 Americans learn that their identity has been stolen and fraudulently used, mostly for financial fraud.

Anticipated measures of success are based upon the changes in knowledge and behavior of the program participants in addition to professional development training for other educators.

Outcome products desired include the refinement of the existing program, an exhibit and Extension publications.

Partners of the project consist of Extension colleagues and financial institutions.

The existing program will be refined and continue to be used to provide educational programs to consumers. It addresses Why the Concern; How and Why is Information Collected; Sources of Data; Medical Records; Medical Waivers; Social Security Numbers; Automated Identification Numbers; Caller ID; Cellular/portable phones; Opting Out options; and more. This will continue for the duration of this Strategic Plan.

Program and workshop presentations will continue to be the major method of information dissemination to the general public and professional (educators, etc). Extension publications will also be available in Extension offices, the Home and Garden Education Center and at presentations. An exhibit may be designed for use at educational fairs etc. An estimated 100 people/year will participate in educational programs.

Target audiences for the project effort include the general public, consumers, teachers and other educators. Evaluation of the project will be done by post-program assessments.

#### Family Life (Parenting, Childcare, Aging)

Cooperative Extension System Focus: Today's family is vulnerable to stressful factors such as economic, societal change, family structure, drugs, crime and violence. According to the Hartford Courant, Connecticut has the 6<sup>th</sup> highest elderly population with 14% in 1999. The elderly is expected to grow as the "Baby Boomers" retire early and live longer. Divorce rates continue to rise as half of marriages end in divorce. Three times as many single females live below the poverty level than married couples (Rubin 1997). The vulnerable elderly (incomes less than 200% of poverty) spend three-quarters of their budget on necessities (food, housing, and health care).

Violence in the home, school and workplace are increasing. One in four girls and one in six boys will be victims of some type of abuse by the age of 18 (Susan B Anthony-Torrington 1999). 3.3 million children in the U.S. between ages 3 and 17 are at risk of exposure to parental violence (Children of Battered Women, 1990). Up to 50% of all homeless women and children in the U.S. are fleeing domestic violence (Legal Reform Efforts for Battered Women, 1990). Due to these situations many Connecticut citizens have experienced stress in the family.

Success is measured by the change in knowledge and behavior of the program participants (improved parenting practices), training workshops for the staff and grant dollars received. Specifically, two hundred parents will gain knowledge of parenting skills and practice effective parenting through participation in Parenting Workshops and watching video programs. Moreover, improved parenting practices will be adopted by 50% of the Parenting program participants. In addition, forty agency staff and caregivers in Litchfield County will participate in training workshops to address family issues. Lastly, it will be a success to obtain funding for children of divorce to participate in You and Me After school pilot program.

Outcome products desired include: impact sheets to UConn administration/county partners; recognition of program activities through posters and presentations at conferences; presentation to community agencies and organizations; and training materials and publications.

Partners of the program include the Department of Divorce Education in the School of Family Studies and the Family Court in Litchfield, CT. Other partners include Education Connection, Headstart and McCall, all of which assist with parent education. Also assisting the project effort are the Family Resource Centers in Winsted, Torrington and Plymouth, CT, and elder care agencies such as AAA, AARP, Alzheimer Association, AFC and CARES.

Key components of the program include workshops, after-school programs, community programs and television and radio presentations. The Parenting People Workshops consists of a series of four workshops/videos promoting positive parenting through improved communication and discipline techniques for parents and/or childcare workers. The Parenting Apart Workshops is a series of three workshops for divorce parents on restructuring the family, helping children cope with divorce, and co-parenting. You and Me is a pilot after-school program for children of divorce (if funded in local community). Adult Family Care is a video and community program, which promotes Adult Family Living as a viable long-term care option. People Empowering People is a community based program, which empowers individuals in the community to achieve their personal goals. Lastly, presentations on Public Access TV and radio address current parenting issues and new and emerging family issues.

Educational strategies involve marketing the program, collaborating with sponsors and conducting outreach. In particular, the strategy is to market the CES Family and Parenting programs through local community agencies and organizations (i.e. Members of Bar for Divorce Ed, Community Council and Community Forum). The next part of the strategy is to collaborate with sponsoring agencies in order to conduct parenting programs in Litchfield County (i.e. Education Connection, Family Resource Centers, PTO's, McCall, Parent Aids, Family Court, Schools). A necessary part of the program is to conduct Family Education outreach for parents and older adults utilizing local community sponsors (see of satellite programs provided for distance learning at CES Center when available from UConn CES in Torrington). Finally, part of the strategy is to use the media (radio, TV, and electronic) for distribution of parenting and care-giving information (articles and information will be provided to the Home and Garden Center newsletter and CES web site).

Target audiences include parents (both single and married), agency staff, caregivers and children of divorce. Specifically, 80 parents will gain knowledge of parenting skills and practice effective parenting through participation in Parenting Workshops/video programs. In addition, 120 single parents will gain knowledge and practice effective parenting through participation in court mandated programs. Moreover, 40 agency staff and caregivers in Litchfield County will participate in training workshop to address family issues. Most importantly, 60 children of divorce will participate in pilot program, You and Me, if funded.

Evaluation techniques consist of pre and post tests, questionnaires and telephone surveys. Preliminary data from program participants will be utilized to document behavior change in participants. Program results will be obtained from pre-post test of workshop participants. Program impacts by sponsoring agencies will be utilized to document measurable results based upon data provided. Participant input from questionnaires or phone survey will be collected to assess program impacts. Use of evaluation techniques is limited to availability of training and support staff from UConn.

#### 4-H Youth Development

Cooperative Extension System Focus: The plan is to re-introduce 4-H to the parents and youth of Hartford, CT. It is important for the youth of Hartford to have the opportunity to participate in the many quality activities offered. The program will be offered to boys and girls ages 7-17. This is all in addition to working with the Hartford School-Age Child Care Boards.

Impact is measured by giving the youth of Hartford structured, safe and parent/adult involvement, in a variety of activities they may not get otherwise.

Desired outcomes include the grand opening of new 4-H clubs and a martial arts tournament. By the end of the year 2000, the plan is to have several new 4-H clubs in Hartford, three of them being martial arts. With the cooperation of two other well-known martial arts professionals, the plan is to bring to Hartford the first Greater Hartford 4-H Martial Arts Championship Tournament. At this tournament members will be selected for the Connecticut first 4-H martial arts team in order to represent Connecticut at regional and national martial arts tournaments.

Partners of the project include Wali Islam, of Islam Martial Arts Institute and Rafael Conde, of Conde Tang-Soo-Do Karate. Furthermore, Hartford School Age Child Care is an invaluable partner.

This program offers group and individual educational opportunities to encourage youth to wonder, explore, experience and grow in mind and body. Through fun activities under the guidance of caring and knowledgeable professionals and volunteers, young people learn about themselves and their world. They learn to build from their strengths as they try new things, reach out to others and compete with each other to achieve goals.

The program strategy is to reach approximately 25 inner-city youth of Hartford over the next two years.

The target audience consists of Hartford youth ages 7 to 17 for local clubs and any Connecticut youth in the same age bracket can participate in the Greater Hartford Championship Tournament in order to qualify for the state team.

The program is evaluated by the number of participants that join the Hartford clubs and the number of competitors participating in the Hartford Tournaments.

#### Windham County 4-H Fair Association

Involvement in the Windham County 4-H Fair Program fosters important skills, knowledge and confidence from the 4-H emphasis areas that are required of all contributing community members. Being an educated and experienced member of the community will help youth make the best decisions for themselves and others and will prepare them for the adult roles they will assume in the home, community, workplace, state and nation.

Success is measured by: youth increasing knowledge and skills pertaining to effective leadership; youth increasing knowledge and skills pertaining to effective communication; youth increasing knowledge and skills pertaining to effective citizenship; youth applying emphasis area concepts in all 4-H related projects, events and activities; youth applying emphasis area concepts outside of 4-H including school and community activities; 4-H and non 4-H adults appreciating the skill and responsibility level of local youth.

This work will result in: a promotion plan for entire Windham County 4-H Program area; recruitment of adult volunteers interested in joining as 4-H Leader; recruitment of county youth into 4-H program; and communication 4-H and CES goals and programs with community members.

Internal partners are: Connecticut 4-H Horse and Livestock Committees; UConn College of Agriculture and Natural Resources; 4-H Volunteers and Youth. External partners are local advertisers sponsoring events and fair book.

The Windham County 4-H Fair assists youth in becoming competent and contributing members of society by fostering skills from each 4-H emphasis areas that include Plants and Animals, Science and Technology, Healthy Lifestyles, Communication and Expressive Arts, Workforce Preparation, Consumer and Family Science, Citizenship and Environmental Science. A special emphasis is given to effective leadership and providing opportunities for applying these skills in arenas which benefit both the individual, group, and county.

Training in all areas of positive youth development and youth leadership education will be provided to 4-H Volunteer Leaders and 4-H Teen leaders who work as fair advisors or fair officers. 4-H information will be presented to fair guest by showcasing each 4-H'ers project area.

The Windham County 4-H Fair Association's target audience includes all Windham County 4-H'ers who want to take on a leadership positions with the fair board or have their project area exhibited; adult 4-H advisors who offer experience and skill to the youth board members; all fair guest who will learn about 4-H, UConn and CES.

Pre and post surveys of youth, 4-H staff, volunteer leaders are planned to determine quality of programs offered at the Windham County 4-H Fair to examine the attendance of fair guests, the number of exhibits entered into the fair, the number of Adult Volunteers and 4-H'ers participating in the fair.

#### Community Development/Families

According to a February 21st, Hartford Courant news article written by Sharon Langer, an Hartford Legal Services attorney, seven years ago Connecticut had the second lowest child poverty rate among the states. This year Connecticut is 29<sup>th</sup>. One out of every five children under the age of six lives below the federal poverty limit despite the fact that Connecticut has been number one in per capita since 1985. Why has this happened? Connecticut's welfare program is based on a work-first model. Welfare benefits are being replaced with extremely low-wage, part-time jobs that offer no prospect of advancement. People with low paying jobs or no jobs often face many other barriers: limited education, substance abuse issues, inadequate health care, poor nutrition and health, few support systems, inadequate education, illiteracy, and poor housing. They are often living isolated lives in unsafe neighborhoods.

The People Empowering People Program was designed to give people confidence and skills they need to overcome these innumerable barriers. The program builds on strengths of limited resource adults, providing opportunities and resources for them to gain experiences and skills. The program recognizes the unique gifts and capacities of each person and encourages participants to express their own issues as they see them. The program recognizes the connection between individual and community action. Individual change is encouraged in PEP through training sessions, trust-team building exercises, and discussions.

Measures of success will be: 1) The program participants will: recognize their improved communication skills; develop improved problem solving skills; increase their awareness of positive parenting practices; participants will learn the value of team building and work cooperatively to accomplish project goals; conduct at least one individual/group project that benefits the community; take steps toward economic self-efficiency; access one or more new community resources; share new skills or knowledge with at least two other people; become politically or

socially active in their community. 2) Expansion of program to new audiences: Collaboration with agencies to conduct program in other Connecticut communities; training of educators in other states; and possible training of educators from other countries. 3) Additional grant funds: Program model, manual and training with others to generate funds; possible continued use of VISTA workers; other grant sources.

This work will result in peer review articles, Extension fact sheets, PEP curriculum for youth, exhibits, flyers, possible videotapes; and national/international conference presentations.

Partners of the program include the following: CT State Dept. of Education and/or DCF family resource centers (Manchester, Hartford, West Hartford, etc.); the Dept. of Corrections - York Correctional Institution, Niantic; the Corporation for National Service(VISTA), a statewide PEP advisory committee (incl. UConn Family Studies, DCF, General Assembly, The Hartford Insurance Co, CANR, etc.); and others - Meriden YWCA, St. Andrew's Church, Enfield, etc.

(MS) There will be a multi-state relationships. A former CT PEP facilitator and co-author of the PEP manual has moved to Michigan and is working as a volunteer with PEP there. She and Michigan CES people trained in PEP will be kept informed of new materials developed in the program. UMass CE has expressed interest in the PEP manual and efforts to develop a youth PEP manual. UMass has also said it will refer Master Teacher calls for training to Connecticut. Missouri CES has written a proposal for PEP training with CES and HUD staff in the year 2000. It is expected that additional states will request training. Also a Social Work professor from the Univ. of Pretoria in South Africa has expressed interest in the PEP program and a desire to come to Connecticut.

The People Empowering People Program is conducted by a trained facilitator and guided by an advisory committee. The facilitator provides ten two-hour training sessions for the participants. The sessions include the following topics: values clarification, communication skills, problem solving, parenting, understanding the helping role, the action planning process, community awareness and community issues. Following the educational/support sessions, participants attend monthly educational/support sessions and work on two or more individual or group projects that benefit the community. Participants commit one year to the program. The program will be conducted in CT communities and replicated in other states.

There will be a number of audiences. In CT there will be the collaborating agencies who will provide funds/staff to conduct the program, the facilitators who will be trained, supported, and mentored by the CES Educator and/or other experienced PEP facilitators and the limited resource adults who will be the participants. In addition most communities will have PEP advisory committees and there will be a statewide PEP advisory committee to oversee the entire program.

Target audiences are a facilitator group and /or one-on-one training. The training may include the following educational methods: lecture, printed material (the PEP manual), discussion, role play, observation, demonstration, field trips, exhibits, etc.

CT PEP facilitators will use the evaluation instruments (weekly feedback sheets, ten week training evaluation, end-of-year evaluation, and facilitator final year evaluation.) included in the PEP manual. The CES Educator will collect the information from the facilitators and report it in yearly reports to administrators and impact sheets distributed to key stakeholders. The CES Educator will also work with an outside consultant or colleague, proficient in evaluation, to develop a way to measure knowledge, skills, and attitude level prior to and during participation and after completion of the PEP program.

### Economic Development/Management of Agricultural and Natural Resource Industries (Agricultural Direct Marketing and Tourism)

Cooperative Extension System Focus: The patterns of Connecticut agriculture have been primarily determined by proximity to the market. Innovative marketing provides opportunities to farmers and is less dependent on large-scale production. The primary advantages of close proximity to consumers are increasingly in direct marketing with a recreational component. A growing number of farmers, along with other rural residents are interested in new and expanded recreational enterprises.

Agricultural and natural resource-based tourism is being promoted by tourism districts and the Connecticut Departments of Agriculture, and Economic and Community Development. Direct marketing and recreational activities are the most likely routes to economic viability for many Connecticut farmers. New enterprises area often risky and pre-venture planning is needed to reduce the probability of ill-fated investments and provide direction for the selected enterprise. Information and training needs are especially acute at the pre-venture and start-up stage of a business or enterprise.

Extension programs will address issues relating to direct marketing/tourism opportunities and impediments in Connecticut.

Measures of success include: a) at least 100 farmers and landowners will obtain information and training regarding: direct marketing of products and services, tourism opportunities and impediments, and methods to analyze the feasibility and profitability of alternative enterprises and practices; b) at least 100 agricultural community leaders, public officials and the public will learn about the roles and contributions of agricultural and nature-based direct marketing/tourism to the state's economic and agricultural industry.

This work will result in: a) fact sheets addressing direct marketing opportunities and impediments, obtaining technical and financial assistance and direct marketing/tourism's contributions to communities and the economy; b) articles in newsletters and magazines; c) conference presentations and papers for professional association audiences; d) proceedings, abstracts and articles; e) radio interviews.

Partners will be: a) Connecticut Farm Bureau - cooperating on meeting presentations and fact sheets, including ties with county Farm Bureau Associations; b) Connecticut Department of Agriculture - cooperating on developing direct marketing Extension programs including related regulations and impediments. Provide input to legislative process; c) Connecticut Rural Development Council - cooperative efforts in reaching rural municipal officials and community leaders; d) Northeastern Extension Marketing Work Group (MS) - identifying regional marketing issues, research and Extension programs and talent sharing; e) Mid-Atlantic Direct Marketing Conference (MS) - developing a mid-Atlantic/Northeast Marketing Conference for farmers.

Assist farmers and natural resource owners/managers in considering/developing direct marketing and tourism opportunities. Emphasis will be placed upon: a) Considering direct marketing and tourism opportunities and impediments; b. Learning how to evaluate opportunities and associated impediments; and c) Working with municipal and tourism officials to ensure economically viable agricultural direct marketing and tourism businesses contribute to economic development efforts.

Strategies will include: working with agricultural and natural resources associations, agencies, firms and individuals to identify key issues, and to develop and implement educational programs.

Methods will include individual advising, presentations, writing publications, field tours, serving on committees, and other appropriate methods.

Target audiences are: farmers; agricultural and natural resource association leaders and staff; and municipal officials.

Evaluation techniques will include observing, interviewing and surveying clientele to determine knowledge gained, number of farmers using information when making decisions and number of farmers adopting new marketing techniques or starting new enterprises.

#### Middlesex County Camp – University Liaison

Cooperative Extension Focus: Maintaining a positive working relationship with the camps is vital to the 4-H Program. Currently, UConn Cooperative Extension System is focusing on camps' needs and being a better partner; the close support should continue. Camp foundation members, 4-H members, the camping program and camps' counselors will benefit.

Measures of success will be: increased enrollment of 4-H members in the area the camp serves; increased awareness of the 4-H program in general; use of 4-H curriculum in camping program; opportunities for 4-H materials to be used with a diverse audience; increased confidence in the University of Connecticut, as a support system, with the local volunteers.

This work will result in a strong partnership with Middlesex County Camp Foundation and Strong 4-H Camp Program.

Partners will be: Middlesex County Camp Foundation – Volunteers who are responsible for the camp. They are the not-for-profit group who runs the Middlesex County Camp; Bari Dworken, Extension Educator – Who works with the all camp meetings and is involved in the ACA. Her knowledge and expertise are needed to gain informational support for all camping programs; and Middlesex County Camp Administrative Staff – Glenn Xavier, Director, Monica Fortier, Program Director, Sean O'Mera, Counseling Director. This group is responsible for the day to day activities while camp is in session. They also hire counselors, review lessons and programs and coordinate staff activities.

Work with the Middlesex County Camp Foundation is ongoing – not having a specific duration. Acting as liaison is important for many reasons. It gives foundation members a local contact, and the University an employee who can be at camp in a matter of minutes if needed. It allows for smooth transition of critical information between the College and the foundation. It puts a 4-H Staff member, with working knowledge of curriculum material, in touch with the summer staff who will be using the curriculum.

The Middlesex County Camp audience is youth between 7 and 16 years of age. Day and overnight camp opportunities are available. Educational methods include classroom instruction, hands on activities, natural exploration, and team building activities and group and individual learning.

The camp uses a written evaluation for programming. An electronic response system is being initiated to hopefully gain more input. Counselors use testing, interviewing and observation to determine what skills have been learned

### Teen Leadership Weekend

Focus: Teen Leadership Weekend is a three day leadership conference and training program targeted at 4-H teens who are officers or junior leaders for their club, fair association or other group. This program is vital to developing strong teen leaders who will be role models to younger members, public activists for the mission, and productive citizens. Community service is stressed and strongly encouraged.

Measures of impact are based upon the change in knowledge and behavior of the program participants. Specifically, members will be able to: increase their understanding of different leadership styles and skills; understand how to run an effective meeting and maintain order; increase communication and other skills vital to leadership; gain knowledge pertaining to community service and opportunities in their local area; and network with youth from different areas of the state exchanging thoughts, ideas and experiences.

Outcome products desired include the development of a youth leadership training system that could be used in any 4-H program.

Partners of the project include the Youth Planning Committee, 4-H volunteers, local 4-H Advisory Committees and the staff at Camp Washington. The Youth Planning Committee is made up of participants from last years' conference or the previous CWF or Teen Connection participants. They plan the theme and help with brainstorming workshops and other activities. Many 4-H volunteers help plan and implement Teen Leadership Weekend. They include (but are not limited to) Terry Schroder, Jamison Wallace, Don Beebe, Kathy Smith, Dan Holdridge, Linanne Lee, Kathy Naples and Justin Guiliano. Local 4-H Advisory Committees contribute funds for speakers and materials to the Teen Leadership Weekend Planning Committee volunteers and staff. Finally, the Teen Leadership Weekend is held at Camp Washington in Morris CT.

Key components of the project include activities, workshops and an awards ceremony. The Teen Leadership Weekend begins on a Friday night. There is an opening activity and a keynote speaker. The second day is filled with workshops pertaining to leadership skill development. Then there is a semi-formal dinner and a dance for participants that night. On the third day another workshop is held and a presenter speaks about community service opportunities. The awards ceremony is held after lunch.

The instruction methods include lectured information, hands-on workshop participation, role playing, leadership activities and social interaction including ice breakers, sharing time, and roundtable discussion. The audience for this event is youth between 13 and 19 who are in leadership positions in their community, club, fair association or school. The number of attendees has varied depending largely on the weather. The conference is designed for up to 100 participants.

Evaluation techniques are relative and up to each individual workshop presenter. Each workshop presenter may choose to evaluate their individual piece in their own way. As a planning committee the group works to create an evaluation that can assess the outcome of the program and the impact it has made on its participants. Input is solicited from participants on what could change for the next conference. Educators also observe the learning that goes on, and can track progress in individuals.

### New England 4-H Teen Leadership Program

Involvement in the New England Teen Leadership program fosters important skills, knowledge and confidence required of all effective leaders. Being an educated and experienced leader will help youth make the best decisions for themselves and others, plus prepare them for the adult roles they will assume in the home, community, workplace, state and nation. Involvement in the New England Teen Leadership Program also provides youth with challenges and experiences unique to the New England region that includes, support and help from New England CES Staff, Adult Volunteers and 4-H'ers.

Measures of impact are based upon the changes in knowledge and behavior of the program participants. New England Volunteer 4-H Leaders, Extension Educators/Staff will increase skills and knowledge in theories and methods of positive youth development. Furthermore, the teens will: increase knowledge and skills pertaining to effective leadership; apply leadership concepts in all 4-H related projects, events and activities; and apply leadership concepts outside of 4-H including school and community activities. Finally, everyone involved will increase their knowledge and understanding of New England 4-H programs.

Desired outcomes include a promotion plan for the New England 4-H Teen Leadership Program area as well as a publication or presentation of the New England 4-H Teen Leadership Program Training materials.

Partners of the project are internal linkages, which include New England Land Grant Universities (CES), Connecticut 4-H Development Fund, National 4-H Counsel and 4-H Volunteers and Youth.

The New England 4-H Teen Leadership Program assists youth in becoming competent, caring and contributing members of society by fostering skills of effective leadership and providing opportunities for applying these skills in arenas which benefit both the individual, group, and New England region. The New England 4-H Teen Leadership Program also gives the participants an opportunity to learn from peers from the New England area.

An important project method is training. Training in all areas of positive youth development and youth leadership education will be provided to 4-H Volunteer Leaders, 4-H Staff, CES Administration and 4-H Teen leaders interested in incorporating the philosophy and activities within their own state, community or group.

The target audience for the New England 4-H Teen Leadership Program consists of 4-H Teens and 4-H Volunteer Leaders interested in incorporating the program philosophy and activities within their own state, community or group.

Evaluation techniques include pre and post surveys of youth, 4-H Staff, Volunteer Leaders to determine quality of programs offered at the New England 4-H Teen Leadership Program. Further, there will be a review of the surveys by non-participating 4-H staff (multi-state).

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### 4-H Youth Development: Environmental Education (Urban Youth, Environmental Science and Careers)

Cooperative Extension System Focus: Environmental education and awareness of the roles science and technology play in utilizing and conserving environmental resources provide youth with challenges, experiences, support and help which foster a positive attitude toward the conservation of natural resources and contribute toward a positive sense of self-esteem. The urban youth and the environment project provides opportunities for youth to develop their knowledge base and skills level to a point where they can become involved in on-going environmental programs.

Measures of impact are based upon the successful training of educators and resulting programs, which will benefit urban youth. Fifteen to twenty formal and non-formal educators will learn how to conduct science-based environmental education programs for urban youth in their classrooms or community centers. The training will result in programs for urban youth who will have an enhanced understanding of their relationship with the environment, science and technology as tools for utilizing and protecting the environment and community involvement.

Among the desired outcomes are training curriculum, presentations and publications. A training curriculum designed to provide formal and non-formal educators with the knowledge, skills and experiences to conduct educational programs for urban youth. In addition, papers will be presented at conferences and published in proceedings volumes.

Resources of the program include the Sea Grant Extension Program, Sound School Regional Vocational Aquaculture Center, National Marine Fisheries Service, Tallmadge Brothers Oyster Company, U.S. Coast Guard, Project Oceanology and roughly 6-10 community youth centers and middle schools. Multi-state cooperation could involve the University of Wisconsin and Cornell Cooperative Extension. Cooperating agencies, firms and organizations will contribute facilities and instructional resources.

Key components of the program include the training of educators, presentations and field trips. The plan is to train 15-20 formal and non-formal educators to conduct science-based environmental education programs for

youth in their schools or community centers. Training will occur through classroom presentations, field trips and hands-on activities. Educators will be provided with educational materials and experiential learning situations that can be used to enhance urban youth's knowledge of the nearby environment, roles played by science and technology, and related educational and career opportunities.

Strategies and methods include scientific work relating to environmental and water quality. Also used, are field trips. Specifically, field trips to: New Haven Harbor locations (boat trip, lighthouse park, Tallmadge Brothers Oyster Co., Sound School), farms to learn about the IPM Program and water quality and educational institutions.

The target audience for the program effort consists of formal and non-formal educators teaching middle-school-age urban youth.

The evaluation techniques used are pre and post-tests. An indicator that results occurred is an increase in the number of educators who implement new environmental education programs.

#### 4-H Youth Development

Cooperative Extension System Focus: The focus of the Plan is to implement the goals and objectives of the USDA Children, Youth, and Families State Strengthening "Connections" Grant Project. The State Strengthening Project is in the last of its five-year cycle. It aims to collaborate with partners throughout Connecticut in order to maximize the resources of each partner to strengthen the respective efforts on serving Connecticut's children, youth and families. This grant program promotes and facilitates that collaboration through USDA funds specifically allocated to Connecticut Extension programs and personnel. The focus continues the tradition of providing research-based knowledge and skills to the residents of Connecticut.

Measures of success are based upon grant dollars received and continued collaboration, both of which will provide for the continuation of the programs. Continued grant funding will be received from federal sources, which will allow us to carry out the work begun over the last four years. This continued collaboration with CT Family Resource Centers will allow us to continue programming that promote positive changes in the lives of children, youth, and families at risk living in low-resource areas. Such programs include Computer Connectivity with 15 community organizations; People Empowering People in four sites; Parents, Computers, and Kids in four sites; and 4-H Positive Youth Development Programs in four locations.

Desired outcome products include a web page devoted to the "Connections Project" collaboration between involved partners.

Internal partners include UConn schools and various departments of the College of Agriculture and Natural Resources (CANR), specialists and educators in CANR/Cooperative Extension System, CT 4-H Development Fund/Extension Councils and 4-H Volunteers/Youth. External partners include the State Department of Education, Family Resource Centers, New England Workforce Preparation Taskforce, CYFAR 2000 Conference Planning Committee, other government agencies and non-profit social service organizations. Resources include providers of external funding such as the United States Department of Agriculture (USDA).

Key components of the program include a statewide portion, a connectivity project and a community project portion. This project is in its last year of collaboration between the Connecticut Cooperative Extension System and the Connecticut Department of Education Family Resource Centers. The first of the three major components of the project is the statewide portion that provides overall planning, financial accounting and accountability. Co-principal investigators provide direct leadership to this portion and to the second facet of the project (a connectivity project, which supports community partners electronically.) The third component is the community project portion that provides direct collaboration on a local level, now operating in 14 urban at risk sites. Pamela Gray provides direct service and coordination efforts of community projects in the Eastern Region. She has worked and will continue to work with Extension staff and community partners to secure funding for associated needs in this area of Connecticut. Shihan Ghazi will continue to provide coordination of increased efforts to bring 4-H positive youth development programs to Hartford, CT. Efforts on the statewide portion improves the capacity of University of Connecticut Cooperative Extension System to promote and support the quantity and quality of community-based programs for children, youth, and families at risk. Its strategies include forming and strengthening collaborations among departments and schools in the University as well as with outside state and local agencies and organizations.

Audiences include all citizens of the state as well as particular legislators and community organizations. Educational methods include conferencing, group meetings, and presentations in various settings. Attendees could be anywhere from one to thousands, in the case of the involvement with the Family Science Expo.

The target audiences include Family Resource Center staff and the children, youth, and families who benefit from sponsored programs. In addition, audiences are 4-H youth, and the Cooperative Extension staff working with CT children youth and families. Another audience is the legislature and those who work with and in community organizations.

Program staff conduct formative evaluation on a regular basis. In addition, the UConn School of Education has been sub-contracted for an overall evaluation of the project.

#### 4-H

Cooperative Extension System Focus: An evaluation of 4-H work in Connecticut based on the following research question: What positive outcomes result from the presence of critical elements in a 4-H experience?

Measures of impact based upon the substantiation of the basic beliefs about 4-H program work with research based data.

Outcome products desired include research reports and articles for state 4-H newsletter. Also desired is the generation of data that can be shared with decision-makers at the local, state, and national levels.

Partners of the project include internal linkages with 4-H and the University of Connecticut. 4-H staff and volunteers administer the questionnaire. The data is then input and evaluated with assistance from the University.

This evaluation project will be conducted by staff or trained volunteers, visiting various 4-H programs or meetings. The 4-H groups to be evaluated will be chosen in a random manner, based on the same criteria used in the study developed by the 4-H National Impact Assessment Project.

The primary strategy follows the parameters for data collection established by the 4-H National Impact Assessment Project.

Target audiences for the project effort include 4-H members who are at least in the 4<sup>th</sup> grade and older, adult volunteers, and parents of 4-H members.

The evaluation techniques developed by the 4-H National Impact Assessment Project will be used over a two-year period for data collection.

#### 4-H Youth Development: Workforce Preparation

Cooperative Extension Focus: The SCANS (Secretary of Labor's Commission on Achieving Necessary Skills) Commission found a serious disparity between the skills of the current workforce and the jobs of the future. They found that to be successful in the workplace, workers need organizational proficiencies, individual competence, leadership and interpersonal skills to function in a multicultural environment, a developed work ethic, and job-specific mastery. Involvement in CES (Cooperative Extension System) workforce preparation projects provide youth with challenges, experiences, support and help which promote positive and realistic outlooks on the world of work. Consistent with SCANS skills and other workforce initiatives, youth involved in these programs develop skills that prepare them for entry into the world of work.

In Fairfield County, CES programs will deliver youth entrepreneur and work internship programs that increase business and life skills, while expanding the career horizons of youth.

Measures of success are based upon the changes in knowledge and/or behavior of the program participants. Staff will increase skills and confidence in teaching and implementing programs youth entrepreneur programs. Youth will acquire knowledge, skills and attitudes that foster workforce preparedness. Youth will apply requisite workforce knowledge, skills and attitudes within on-going 4-H projects. The County 4-H program will be examined and areas will be identified where workforce concepts and skills can be reinforced. A work Internship program will be implemented.

Desired outcomes include training workshops, publication/presentation of Youth Entrepreneurship programs, corporate sponsorship of Youth Entrepreneur Program and the formation of Program Advisory Councils.

Internal partners are CANR/CES faculty/staff, Fairfield County 4-H Committee and the Fairfield County Extension Council. External partners are the Bridgeport and Danbury Public Schools, Family Resource Center, SCORE, local businesses and the Minority Business Association.

Youth Entrepreneur programs for middle school youth. Programs sponsored by CES and other agencies. Staff from these agencies will be trained by CES. For high school youth, a Work Internship program will be developed in the greater Danbury area. 9. Strategies: Conduct training workshops for staff delivering youth entrepreneur program. Gather community support for program. Develop Advisory Council for Work Internship programs. Implement, support and evaluate work internship program. Anticipated audience is 40 youth and 5 adults.

The target audience for the project effort includes middle and high school students as well as adults.

Evaluation techniques consist of pre and post assessments, surveys, and tracking of amount of dollars and in-kind support received. Evaluation on key programs will be conducted at 6 months to determine the educational impact.

## Child Care

Cooperative Extension System Focus: Child Care in the broadest sense serving children from infancy through the teen years has become a national CES initiative and is in the forefront of concerns on a state and local level. The commonly articulated child care issues--quality, affordability and accessibility are actually very complex and imbedded within the larger educational, economic, employment and environmental concerns of society (Building Better Child Care... Building a Better America!!!, A Report of Child Care Research, Resident Instruction and Extension Programs of the land-grant University System, November 1998).

Measures of success include the change in knowledge and behavior of child care providers as well as \$100,000 received in grants.

Desirable outcomes include four issues of each of the following newsletters: All Children Considered, KIDS, School-age Connections, Family Child Care Connections, Center Child Care Connections, School-age Child Development Credential in place; Enhanced educational programming approved by Connecticut Charts-A-Course.

There are both internal and external partners of the program. The internal partners consist of the members of the team. Whereas the external partners consist of: the Children's Fund of Connecticut; Department of Social Services; Commission on Children; Connecticut Charts-A-Course; Connecticut School-age Child Care Association; Connecticut Family Day Care Associations Network, Wheeler Clinic, United Family and Community Services, Public School systems, National Network for Child Care(MS).

Target audiences are child care providers in Connecticut. A secondary audience is child care providers from 35 states and 92 military bases.

Educational methods include newsletters and workshops. It is expected to experiment with distance learning.

Evaluation techniques are based upon renewals of grants for newsletters and renewed subscriptions and follow-ups with participants in the Connecticut Charts-A-Course Wheeler Clinic Funded training programs will help to assess if learning/results occurred.

## Childcare Provider Education

Cooperative Extension System Focus: Childcare providers are not only educators of young children but also sources of information for their parents and guardians. In both of these roles, they serve the interest of children by becoming informed about environmental health issues that might affect them, and by sharing this information with the families of the children they care for. Childcare providers are also required by law to provide safe environments free of hazards. Educational programs designed for the childcare providers that address these issues need to be developed.

Measures of success are based upon the change in knowledge and behavior of the program participants. Childcare providers will be trained in lead poisoning prevention, asthma awareness, second-hand smoke, radon, biological pollutants and carbon monoxide poisoning prevention. The effectiveness of the training will be determined using a before and after training evaluation as well as a follow-up evaluation. The percentage of participants obtaining C.E.U's will also be measured. Parents of children in targeted childcare settings will also be surveyed to determine the kinds of information obtained from providers. Continued grant funding is anticipated based on successful outcomes

Outcome products desired include a training/resource manual to include activities for children, fact sheets and program materials, CD-ROM and marketing materials. Additionally, journal article(s) and presentations at national meetings are desired.

Internal partners are: the UConn School of Family Studies, the Office of Communications and Information Technology, Family Resource Centers, State Departments of Public Health, CT Charts-a-Course and Headstart. External partners include: the U.S. EPA (region 1, and national office), Local Health Departments, USDA/CSREES, Professional Childcare Organizations and CES educators in NJ, RI and VA.

Trainings will be conducted in the following program areas lead poisoning prevention and indoor air quality (focused on asthma awareness, second-hand smoke, radon, biological pollutants and carbon monoxide poisoning prevention). A train-the-trainer, model will be used with most audiences.

Target audiences are childcare providers with emphasis on Native Americans and other minority audiences both in Connecticut and nationally. Educational methods will include Train-the Trainer Workshops, fact sheets, and CD-ROMs, newsletters, etc. Projected number of attendees includes 200 participants

Evaluation techniques consist of surveys and follow-up studies. There will be before and after training evaluations and a representative sample of participants will participate in a follow-up study. Parents of children in targeted childcare settings will also be surveyed to determine the kinds of information obtained from providers.

## Child Care

Cooperative Extension System Focus: Connecticut has long been recognized as an important contributor to the National Extension Systems child care and youth at risk initiatives. To continue the national leadership role of CT CES, a multi-discipline team will be formed to address and respond to emerging child care initiatives effecting children from infancy to pre-adolescence.

Measures of success are grant funds received, articles published, presentations given and improvements in caregivers knowledge and skills.

Outcome products desired include both peer reviewed articles and research dollars awarded.

Internal partners are UConn CES faculty currently engaged in child care initiatives and faculty within the School of Family Studies. External partners are public and private agencies engaged in funded child care programs, projects, and initiatives (e.g. CSACCA, CT Charts-A-Course, Department of Social Services).

A key component of the program involves a child care think tank for which the duration is yet to be determined.

A particular team strategy involves monitoring national and state funding lines for childcare initiatives interested in designing new childcare options or in training child care providers.

Target audiences for the program effort consists of public and private funding agencies.

Evaluation strategies will be designed to fit the grant/funders report needs.

## Community Service-Learning

There is a great need for youth to become involved in their communities, for their growth and development and connection to community, for important work to be accomplished in communities, and for that work to be accomplished on a volunteer basis.

The Points of Light Foundation states that, "by volunteering and making contributions to their communities, youth are also building self-esteem, developing a positive outlook and engaging in positive and constructive activities. Youth participating in community service activities use and learn the following skills: critical thinking, observation, research, communication, leadership, time management, teamwork. "

Cooperative Extension Focus: Since its inception in the early 1900's, the 4-H program has involved youth in helping their communities. Note the words of the 4-H pledge, "I pledge my hands to larger service for my club, my community, my country and my world." Youth can make a difference, if given the opportunity. The vast majority of youth want to be part of the solution. Youth, adults and communities benefit from volunteer efforts. Youth involvement in community service helps them form positive values, find solutions, develop social competencies and encourages problem-solving and critical thinking skills.

4-H'ers in community 4-H clubs routinely plan and conduct community service projects. Through a grant received from the CT Department of Higher Education, the Eastern Connecticut Service Learning Program, "Leadership Skills for Life," was established. It involves youth not previously involved with community service programs and connects several Cooperative Extension related programs: three School-Age Child Care Centers in Norwich (CT SACC Program), the 4-H LIFT Program in Willimantic, CT (UConn and Windham Board of Education), 4-H After School Programs in New London and Groton (Connections Program and Southeastern CT Family Resource Centers) and the New London County 4-H Camp Teen Leaders (New London County 4-H Foundation).

This unique program began in the fall of 1998 and will continue for at least three years, involving 200 to 275 youth each year.

Measures of success are based upon the change in knowledge and behavior of the program participants. Annually, 200 to 275 youth are involved in the Eastern CT Community Service-Learning Project, "Leadership Skills for Life". Youths will assess community needs, planning and conducting programs in Groton, New London, Norwich, Windham and Franklin. Youth designed community service-learning projects will be completed in the identified communities. Interaction between the youth, teachers, volunteers and coordinators of the participating groups will cause the youth to reflect on projects and their meaning. Some type of presentation of each project (exhibit, videotape, mural, newspaper feature article, etc.) which will be shared at the project's culmination and celebration program each June and then displayed at the 4-H Fair, Extension Center or schools.

Other measures of success are based upon grant dollars received and increased youth self esteem and sense of community connection. Hopefully, Extension programs in other areas of the state will apply for and be granted similar funding. There should be increases in the number of additional community projects in which the participants initiate on their own and in the number of other youth that the participants involve in community service-learning projects.

Outcome products desired include continued funding of the grant and participants with increased self-esteem and sense of community connection.

Partners include internal linkages located at the University of Connecticut Cooperative Extension System staff, most of which are employed on grant funds (State Strengthening Grant, Connections Grant, LIFT, SACC).

External linkages include the CT Department of Higher Education, Southeastern CT Family Resource Centers, Norwich School-Age Child Care Centers (Stanton, Uncas and Greeneville Schools), schools involved in the Connections Grant Program (currently Jennings - New London and Eastern Point - Groton), Windham Middle School, New London County 4-H Foundation and Camps and Master Gardeners (for assistance with some projects).

The Eastern CT Community Service-Learning Project, "Leadership Skills for Life," involves the stated Extension staff, partners and communities. The unique aspect of service-learning, as differentiated from community service, is that the youth design and conduct the projects, reflect on their efforts and what it means to others and themselves and present this in some way. Academic learning outcomes are included. Two of the seven sites in this project are in priority school districts. The project must work to improve academic achievement. As the youth work to plan and conduct the projects, they are learning about the community's structure, uniqueness, needs, and about planning, teamwork, and involving others. They are developing skills in math, science, social studies, writing and economics.

An important strategy is to get youth in each participant group to work with their teachers or volunteer leaders, identify, design and conduct a community service-learning project. These might include reclaiming a park, building benches at a 4-H Camp, establishing a flower garden at a school, planning an activity for residents of a nursing home, preparing and serving a meal at a community meal site and collecting coats for a "Share the Warmth" project, etc.

The target audience consists of up to 275 youth in the stated groups.

Evaluation techniques include reviews and questionnaires. Specifically, reviews of the youth participants' reflections on the project and presentations and questionnaires completed by the youth before and after the project.

### Consumer and Family Economics

Cooperative Extension System Focus: The economy has had a profound effect on Connecticut citizens. Consumer debt has soared in the past five years and has led to escalating rate of personal bankruptcies that exceeded 1.4 million in 1997. According to COCS, 10,000 Connecticut residents were spared bankruptcy by financial counseling which was up 256% from 1998. According to Rubin (1997) consumer expenditures by the elderly is expected to grow as much as 20% by the middle of the next century due to the changing elderly population that retire early and live longer. Three times as many single females live below the poverty level than married couples. The vulnerable elderly (incomes less than 200% of poverty) spend three-quarter of their budget on necessities (food, housing, and health care). Unemployment in Northwest CT has increased in 1999 with five towns reporting job loss ranging from 5% to 66.2% (Source The Connecticut Economy Winter 99). According to Bureau of Census data, Connecticut cost of living ranks among the highest in the country, 20% higher than the national average. Due to these situations and political issues such as welfare reform, many Connecticut citizens have experienced financial stress.

Cooperative Extension faculty in North/West Connecticut will improve the economic wellbeing of individuals and families through educational training and decimation of consumer education and financial information. Collaborative efforts with sponsoring agencies, organizations and media will be utilized to reach client groups including low income consumers, unemployed, divorced, widows, single parents, and financially stressed elderly. Issues to be addressed including basic money management, budgeting, debt management, banking services, credit, savings, financial planning, resource management and consumer education.

Measures of impact include: 400 financially stressed individuals will gain knowledge and improve money management practices through participation in CES Money Management programs; 50% of individual program participants will improve their personal financial situation through improved money management practices, reduced indebtedness, and/or increased savings; and lastly, 60% of financially stressed individuals will develop a spending plan to more effectively utilize their income and reducing indebtedness.

Outcome products desired consist of presentations at professional conferences and community groups; media outreach; the use of distance learning and electronic media for dissemination of information. (i.e. satellite programs, e-mail, WWW); development of Extension publications, Consumer and Financial Management Fact Sheets for CES Web site if funded and supported; and impact sheets to UConn administration, collaborators, local community groups, government officials, and funders.

Resources of the program include the UConn College of Agriculture and Natural Resources (CANR), the Cooperative Extension System (CES), various organizations and state and federal agencies. CANR allocates faculty and

staff for web site development and maintenance, design of publications, fact sheets and exhibits. CES provides funding for publications, travel to professional meetings ACCI/NAEFCS/PFE, evaluation, technical support, and equipment. Organizations such as CT Consumer Credit Counseling, AARP, CL&P, Area Agencies on Aging, Community Council, Community Forum and the local media are also resources of the program. Finally, state agencies such as the Department of Social Services and Town Social Service Providers and federal agencies such as CRESS are invaluable resources.

The following program will be utilized to improve the financial well being of Connecticut families: Money 2000 (MS)-web site and financial information program designed to increase saving and reduce debts of CT participants Living With Less - A series of nine fact sheets to help unemployed and financially stressed individuals adjust to economic changes. Financial Information Workshop (MS) - A six-week course designed for midlife and older adults to make informed decisions about their finances. Topics addressed range from record keeping and investing to estate planning issues. Sponsored by AARP and local community leaders. Money Management Workshop/publications - A money management workshop featuring individual fact sheets designed to help individuals understand basic financial services including money management, goal setting, budgeting, cash management, banking services, debit cards, and savings and debt reduction. Agency/Teacher Training - Educational seminar and or training session in emerging financial and consumer education issues.

Educational strategies include collaborations, workshops and publications. One strategy is to collaborate with local community agencies to market and distribute Living with Less to unemployed families in crisis. Another strategy is to develop and market the MONEY 2000 program and fact sheets through the CES Web site and local media outreach efforts. Workshops include the Money Management Workshops and Agency Training for individuals and staff through cooperative effort with sponsoring agencies and the Financial Information Workshop (WFIP) for midlife and older adults annually utilizing local community sponsors. Publications include fact sheets and articles in newspapers, newsletters, and other popular press outlets. Lastly, the strategy is to utilize the media (radio, TV, and electronic) for the distribution of financial information.

Target audiences include consumers, limited-resource adults, low-income families, widows/divorced/single parents and agency staff and teachers. All audiences are in groups of approximately one hundred participants. Specifically, Connecticut consumers will report increase savings or debt reduction through participation in MONEY 2000. Unemployed/limited resource adults will adopt money management skills in budgeting and resource management. Low-income families will gain money management skills through participation in training programs to improve money management practices and reduce debts. Widows/divorced/single parents will utilize knowledge gained through financial information workshops and/or publications (Parenting Apart/Divorce Ed/ WFIP). Agency staff/teachers will gain knowledge of consumer and financial management issues through participation training programs.

Evaluation techniques consist of pre and post tests, surveys and questionnaires. Program results will be obtained from pre-post test of workshop participants. Names, addresses, and phone numbers of program participants will be utilized to conduct follow-up impact evaluation based upon use of graduate students and/or UConn faculty. Program Impacts by sponsoring agencies will be utilized to document measurable results based upon data provided. Participant surveys and questionnaires may be utilized or phone survey conducted to assess program impacts annually. Use of computer database to aggregate results for impact statements is needed for target programs. Use of such evaluation techniques is limited to availability and staff support from UConn.

### Family and Consumer Economics

The economy has had a profound effect on Connecticut residents. Consumer debt has soared in the past five years and has led to an escalating rate of personal bankruptcies. According to Consumer Credit Counseling Service of CT, 10,000 CT residents were spared bankruptcy by participating in financial counseling. Three times more single females than married couples live below the poverty level. The vulnerable elderly, with incomes of less than 200% of the poverty level, spend three-quarters of their budget on necessities (food, housing, and health care). Census data indicates that CT's cost of living ranks among the highest in the country, 20% higher than the national average. These situations along with welfare reform have caused many CT residents to experience financial stress.

Cooperative Extension faculty in Western Connecticut will improve the economic well-being of individuals and families through educational training programs and dissemination of consumer and financial information. Collaborative efforts with sponsoring organizations and family service agencies; and the electronic and print media will be used to reach a diverse audience, including low income consumers, the unemployed, and at-risk individuals and families. Issue topics will include basic money management, debt management and credit, financial planning, resource management and consumer education.

Measures of success are based upon the change in knowledge and behavior of the program participants. Specifically, 400 financially stressed individuals will gain knowledge and improve money management practices through participation in CES programs. In addition, 50% of program participants will improve their financial situation through improved money management practices, reduced indebtedness, and/or increased savings.

Outcome products desired include: training workshops; fact sheets; train-the-trainer materials; presentations and/or showcases at professional conferences; web site; and news releases.

Internal partners include: the University of Connecticut's College of Agriculture and Natural Resources, Cooperative Extension System (CES), Department of Communication and Information Technology. External partners include: the Family Resource Center; CT Department of Income Maintenance; CT Department of Children and Families; Danbury Commission on Child Care, Rights and Abuse Infoline; Headstart; Community Reinvestment Agencies; Shelter Programs; Municipal Social Service Departments; and non-profit Debt Management Agencies.

Basic money management workshops/series for limited resources families and agency program clients. Financial counseling skills train-the-trainer workshop series for family service agency personnel. Distribution of the "Living with Less" newsletter to individuals, families and agencies. Newsletters and news releases distributed via electronic and print media.

Educational methods include: conduct basic money management workshops for agency clientele; conduct train-the-trainer workshops for family service agency staff; and distribute news releases via the electronic and print media.

Targeted audiences for the program effort include limited-resource individuals and heads of households, family service agency staff and clientele.

Evaluation techniques consist of post-program evaluations of money management and train-the-trainer programs. Another technique is the use of a post-program mail survey at 6 months for train-the-trainer program participants.

#### Human Health and Environmental Risk

Children under the age of six, who reside in dwelling units that were built before 1978, are at most risk for lead poisoning. The correlation of incidence of childhood lead poisoning increases for children whose families have incomes that are below the poverty level because they are more likely to have poor nutrition and reside in older substandard housing. In urban areas in Connecticut, residents, especially children, are often exposed to excessive environmental and public health risks such as lead poisoning and asthma. Over the past 15 years the number of children afflicted with asthma has doubled to total six million. Minority children are disproportionately affected by asthma. Poor children experience a higher rate of death. Many children remain chronically impaired because they lack support systems that enable them to effectively manage their own disease or have access to medications. A 1993 EPA study reported that exposure to second-hand smoke considerably worsens asthma. Second-hand smoke is also responsible for lower respiratory tract infections in infants and young children and is known to contribute to ear infections, pneumonia and bronchitis and is thought to double the risk of Sudden Infant Death Syndrome. President Clinton has launched a Children's Asthma Initiative to help combat this environmental health issue. In addition, most Americans spend much of their time indoors. Research has found that in homes and buildings across America, the quality of indoor air can be much worse than outdoor air.

Community Environmental Educators will continue to be trained to deliver educational programs and information and to serve as liaisons between local agencies and their neighbors in all areas of indoor air quality. Studies will continue to determine the success of the CEE training where neighbors teach neighbors. Grant funding will be sought to continue this program.

Measures of success are based upon grant dollars received. Grant funding is anticipated in the area of lead poisoning education and information for remodelers and renovators. Grant funding is also anticipated in the area of asthma awareness, and control and will be sought in a joint venture with a CES Specialist in a neighboring state.

Impacts will be measured utilizing pre and post program tests as well as follow up evaluations of targeted audiences.

Outcome products desired include: training and resource manual for renovators and remodelers, which include fact sheets, program materials, CD-ROM, video and marketing materials; training materials in the area of asthma awareness and control; journal article(s) and presentations at national meetings based on program data and innovative programs; and development of a train-the-trainer program that will be marketed nationwide.

Resources of the program include: UConn CIT; local community action agencies; state departments of public health; US EPA (region 1, and national office); USDA/CSREES; local health departments; CES educators in New Jersey, Rhode Island, and Virginia; and the UConn School of Family Studies.

Key components of the program include training for Community Environmental Educators will be conducted in the following program areas lead poisoning prevention and indoor air quality (focused on asthma awareness, second-hand smoke, radon, biological pollutants and carbon monoxide poisoning prevention). In addition, a train-the-trainer model will be used.

Target audiences include renovators, remodelers, and homeowners will be trained using a team approach, in how to reduce lead hazard in home remodeling projects.

Participants (emphasis on urban and limited income families and individuals with children) will be taught asthma awareness, and management. Activities for children will be included. Indoor air quality information and targeted programs will be available.

Audiences will include the following: volunteers, professional remodelers and renovators, homeowners, CT citizens, childcare providers with emphasis on Native Americans and other minority audiences both in Connecticut and nationally. Educational methods will include Train-the Trainer Workshops, educational programs, fact sheets, and CD-ROMs, newsletters, etc. Projected number of attendees includes 300 participants annually.

Target audiences for the program effort consist of volunteers, professional remodelers and renovators, homeowners, CT citizens and childcare providers with emphasis on Native Americans and other minority audiences both in Connecticut and nationally.

Evaluation techniques consist of before and after training evaluations and a representative sample of participants will participate in a follow-up study. Participants in targeted areas will also be surveyed to determine the kinds of information obtained from Community Environmental Educators.

#### Marine and Environmental Science for Middle School Urban Youth

Pilot programs funded for four years by Quinnipiac River Fund Project of the Community Foundation of Greater New Haven demonstrated that urban youth from the New Haven metropolitan area have a serious interest in marine issues. These demonstration projects played a significant role in increasing the participants' awareness and interest in the marine environment and in the use of science in protecting the ecosystems. CES Focus for the next five years will be in developing educational materials for formal and nonformal educators to teach urban youth about ways that science and technology can assist society in understanding, utilizing and protecting environmental resources.

Proposals are expected to be submitted and funding received for a three-to-five year project to expand on the successful efforts of the pilot program. The goal is to create a training program, which will result in educating and involving urban youth in environmental issues and science. This would be a model that can be applied in other urban areas. Teachers and community youth program leaders would be trained to carry out educational activities designed to educate and create a new generation of environmentalists in a number of roles: as scientists; as educators; as citizens making informed decisions about what happens in their community. Learn about and understand their relationship with: the environment; science and technology as tools for utilizing and protecting the environment; community involvement. Explore careers; workplace, broader careers and opportunities.

Extension publications, peer reviewed articles, community access television productions are among the outcome products desired. Internal linkages include Extension, College of Agriculture and Natural Resources and the Aquaculture Team. External linkages include: Sea Grant Marine Advisory Program; Aquaculture School of New Haven; Project Oceanology; New Haven Parks and Recreation; Tallmadge Brothers; and the United States Coast Guard.

Collaborators will be involved by providing up to date research in the subject matter area, conducting workshops and tours as part of the educational training; providing sites for training and career exploration.

The program is a collaborative effort involving several units and departments of the University, business partners and community based organizations to develop a training manual and project for formal and informal educators to teach youth about marine environmental issues and the use of scientific research methods to increase society's understanding of marine ecosystems.

Strategies include: pre and post assessments; field trips; on shore and on the water educational workshops and activities; use of technology to access research; use of technology to study geographic areas, enter data from experiments and generate reports. Fifty educators in each of the second and third years will take part in the program effort.

Formal and informal educators of middle school youth in urban areas make up the target audience for the program effort.

In order to assess if learning or results occurred, evaluation techniques include pre and post assessments; immediate plan developed by educators for implementation of programs; six-month and one-year follow-up documenting progress or impact of planned efforts.

### Parent Education

In Connecticut, parenting is a major issue for most families with children. In recent years, parent education programs have proliferated throughout out communities. There are many community agencies servicing families such as Head Start, Family Resource Centers, Parent Aide Programs, Home Visitation Programs and others that include parent education as a component of their program. Many of the community agency staff have not had training or other educational background in child development, facilitation or related fields. This initiative will provide an educational program series designed to develop the skills required in order to conduct effective parent education programs.

Success is measured by the change in knowledge or behavior of the program participants. Program participants will report their knowledge and skills gained as measured by post-program evaluations. In addition, follow up surveys will be conducted. Lastly, numbers of program participants credentialed will be documented.

Outcome products desired include training curricula, a marketing brochure and conference presentations.

Some of the resources/partners of the program are CIT, School of Family Studies, Center for the Family, Family Resource Centers, CT State Departments and CT Charts-A-Course.

Parent Education: A Skills Approach to Conducting Programs. This program series will include the following: needs assessments; parental empowerment; group dynamics; leadership; parent development; home visiting; and working with challenging families.

One of the program's annual strategies is the participation of 100 parent educators in a program series designed to develop the skills required to conduct effective parent education programs.

The target audiences for the program effort include the staff at the following agencies: Family Resource Centers; Parent Aide Programs; Head Start Centers; Home Visitation Programs and others.

Evaluation techniques consist of program evaluations assessing knowledge and skills learned at the series completion. Moreover, follow up surveys will be conducted at 6-month intervals in order to evaluate the program's impact.

### Parent Education

Cooperative Extension System Focus: Parenting is one of the most significant issues for families in Connecticut. In recent years, parent education programs have proliferated in many communities. Community agencies such as Head Start, family resource centers, shelters, home visitation programs and GED Equivalency programs for teenaged parents include parent education as a component of their program. Some community agency staff members have not had training or any educational background in child development, facilitation or related fields. This initiative will provide an educational program series designed to develop the skills required to conduct effective parent education programs.

Success is measured by the change in knowledge or behavior of the program participants. Program participants will report their knowledge and skills gained as measured by post-program evaluations. Also, the number of participants receiving PDU's will be documented.

Outcome products desired include training curricula, a marketing brochure and conference presentations.

Resources/partners of the program are the UConn Department of Communications Information and Technology, CT Charts-A-Course, CT State Departments and the UConn School of Family Studies.

"Parent Education: A Skills Approach to Conducting Programs" is the series which will focus on: needs assessments, parental empowerment, group dynamics, leadership, parent development, home visitation, and working with challenged families.

An important educational method is workshop training, which will be conducted for 100 parent educators annually.

The target audiences for the program effort include the staff at the following agencies: Family Resource Centers, Head Start Centers, Teenaged Parent Programs and Home Visitation Programs.

Program evaluations assessing knowledge and skills will be conducted at the completion of the program, and six months following the completion of the series.

### People Empowering People

According to an article in the Hartford Courant on February 21,1999 written by Sharon Langer, a Hartford Legal Services attorney, seven years ago Connecticut had the second lowest child poverty rate in the country. This year Connecticut is ranked 29<sup>th</sup>. One out of every five children under the age of six lives below the federal poverty limit. This is despite the fact that Connecticut has been first in per capita income since 1985. Connecticut's welfare program focuses on getting people into jobs as soon as possible. Often the jobs provide very low wages and also part-time with no prospect of advancement. People in these jobs often face several other barriers: limited

education, substance abuse issues, inadequate health care, poor nutrition and health, few support systems, inadequate education, illiteracy and poor housing. They are often living in isolated lives in unsafe neighborhoods. An extremely low number of welfare recipients are registered to vote: in 1996, only 5.8 percent were compared to 14.1 percent nationally.

The People Empowering People program was designed to give people confidence and skills they need to overcome these innumerable barriers. The program builds on the strengths of people with limited incomes, providing opportunities and resources for them to gain experiences and skills. The program recognizes the unique gifts and capacities of each person and encourages participants to express their own issues as they see them. The program recognizes the connection between individual and community action. Individual change is encouraged in PEP through training sessions, trust-team building exercises, and discussions.

Anticipated measures of success are based upon the change in knowledge or behavior of the program participants. Program participants will: recognize their improved communication skills; develop improved problem solving skills; increase their awareness of positive parenting practices; learn the value of team building and work cooperatively to accomplish project goals; conduct at least one individual/group project that benefits the community; take steps toward economic self-sufficiency; access one or more new community resources; share new skills or knowledge with at least two other people; and become politically or socially active in their community.

In addition, the program will be expanded to new audiences. Grants and collaboration will provide additional support.

Outcome products desired include peer reviewed articles, Extension fact sheets, exhibits, flyers, possible videotapes and national conference presentations.

Resources and partners have yet to be explicitly defined; however, partnerships will be formed with these types of organizations: family resource centers; the Corporation for National Service (VISTA); local PEP advisory committee; local housing authority; and the religious community.

The People Empowering People program is conducted by a trained facilitator and guided by an advisory committee. The facilitator provides ten two-hour training sessions for the participants. The sessions include the following topics: value clarification, communication skills, problem solving, parenting, understanding the helping role, the action planning process, community awareness and community issues. Following the educational support sessions, participants attend monthly educational/support sessions and work on two or more individual or group projects that benefit the community. Participants commit one year to the program.

During the first year, the focus will be on learning more about running the program, putting together an advisory committee, targeting a specific community and developing partnerships and resources. The second year, the program will be implemented and a small group of people living on limited incomes will be facilitated. Cherry Czuba will provide guidance. The statewide advisory committee may also provide input. During years three through five, the program will be expanded to other communities, garnering partners and resources as well as training facilitators to provide the local programs.

The target audiences for the program effort consist of people living on limited incomes.

Evaluation instruments will be used (weekly feedback sheets, ten-week training evaluation, and facilitator final year evaluation) which are part of the PEP manual. This information will be compiled and included in annual reports to administrators and in impact sheets distributed to key stakeholders.

### Writing Across the Curriculum

Agricultural students need to learn to communicate effectively in writing. In the past, faculties of agricultural Colleges have left the development of this skill to the English Department; this is no longer acceptable as students should learn to write in their subject matter courses and not just in English composition classes. This change in philosophy is reflected in the large number of Colleges of agriculture that now have a "Writing Across the Curriculum" (WAC) requirement. However, effective teaching of writing cannot simply be legislated and agricultural faculty members must receive adequate support and training to enable them to teach writing in their respective disciplines efficiently and in synergy with the subject material.

The University of Connecticut has recently established the Writing Across the Curriculum program that allows any course in any major to be designated "W" (writing intensive). Several CANR faculty members converted their courses to "writing intensive." They report, however, that two principal deterrents to converting to a "W" course are a lack of formal training in approaches for creating and evaluating writing assignments, and difficulty in scheduling individual student feedback sessions.

This project proposes a novel solution in which a cooperative venture between the English Department, the Aetna Chair of Writing, and the College of Agriculture will develop faculty skills in teaching writing in subject specific courses, and will also develop electronic and hardcopy training materials on "Improving Writing in the Agricultural

Sciences." Techniques which are synergistic in teaching both writing and the subject area, and which enhance the use of faculty time in teaching writing will be explored.

The general objective is to improve effectiveness of College of Agriculture faculty in teaching writing in their agricultural disciplines. More specifically, the goal is to establish a series of interactive seminars/workshops to help the CANR faculty learn to teach and evaluate writing within their subject areas; establish procedures and methods by which the CANR faculty and students can respond to student writing using the Internet and electronic mail - particularly in developing ideas and drafting work-in-progress; and compile a manual of the collective experiences of these faculty members and resources found to be helpful such as subject-related examples of student writing to illustrate various points. This material will be available in both hardcopy and electronic format.

A collection of faculty experiences, course material and student work will be made. This material will serve as the basis for the manual. The manual will be published containing material to help faculty in subject based courses to improve their teaching of writing.

### Writing Across the Curriculum

The general objective is to improve student writing in the agricultural sciences. More specifically, a series of team-taught (CANR and English) seminars, five per semester, to help CANR faculty learn to teach and evaluate writing will be established. During the first year, they will focus on the "W" course faculty; during the second year, the rest of the Agriculture faculty will participate.

Also to be established is an electronic network by which CANR faculty and "W" course students can respond to student writing--particularly in developing ideas and drafting work-in-progress. This same network will permit the development and evaluation of a student peer review process. In addition to this electronic network, an internet homepage for the broadcast of interesting writing assignments with developing ideas and evaluation techniques will be established.

Lastly, another specific objective is to develop a written manual on "Improving Writing in the Agricultural Sciences." The principal investigators will develop this with assistance from faculty participants in the writing improvement program. The emphasis will be on providing examples of the variety of approaches used by different instructors to foster improvement in written communication as well as examples of student writing assignments which demonstrate improvement.

The major methods that will be employed will be small group workshops held for the CANR faculty and when available anyone else interested. The instructional form will be open interaction between the leaders and participants. Ten faculty per workshop are anticipated. Four workshops per year will be held. The teaching institute has been and will continue to be an excellent format for workshops.

The target audience for the program effort includes the CANR faculty and staff.

Evaluation techniques consist of relying upon feedback from the audience. In addition, better results from the student work suggest that learning occurred.

### Youth Development and Leadership

In 1995, a study was done asking 944 students in 19 Connecticut public high schools (urban, suburban and rural) about their health habits. The results were: 22% of the students said they had carried a weapon during the past 30 days; 29% said they had smoked cigarettes on one or more of the past 30 days; 26% had used marijuana one or more times in the past 30 days; 30% considered themselves as slightly or very overweight; 24% said they thought seriously about attempting suicide in the past 12 months; 38% said they were in a physical fight during the last 12 months; 52% said they had tried at least one drink of alcohol on one or more days during the past 30 days; 2% said they had use cocaine one or more times in the last 30 days; 37% said they had sexual intercourse during the past 3 months and 30% had someone offer, sell, or give them an illegal drug on school property during the last 12 months.

The People Empowering People program was designed to build on the strengths and capacities of adults through training sessions, team building exercises and community projects. Based on the success of the adult program, a youth program will be developed utilizing the PEP program model and building on the 7 leadership skills listed in the 4-H curriculum "Leadership: Building Skills for Life," identified by the 4-H Leadership Action Team.

Youth displaying the above risk factors would benefit from a program that builds on their strengths. At the present time, no leadership curriculum is being used by 4-H volunteers and with adolescents.

Youth, 12 -15 years of age, will: develop a positive attitude about self; learn ways to deal with stress; improve communication skills; improve decision making skills; learn goal setting and time management strategies; learn about community resources; and complete two projects to benefit the community.

A desirable outcome other than the program participants changing their behavior for the better is the creation and development of a Youth PEP manual.

Partners will be the 4-H Leadership Action Team made up of 4-H youth, 4-H volunteers, a UConn faculty member and administrator, a Youth Service Bureau director and CES faculty. Other partners could include CES faculty, UConn School of Family Studies faculty and others who would review and/or pilot test the curriculum with 4-H members and other youth group members.

A youth leadership/community development program modeled after the PEP program will be developed for youth 12-15 years of age. Like the adult PEP program, the program will be designed to build on the strengths of youth by providing opportunities and resources for them to gain experiences and skills. The program will recognize the unique gifts and capacities of each youth and will encourage them to express their own issues as they see them. The program will emphasize the connection between individual and community action. The program will include 10 weeks of training focusing on the building skills of life identified in the Indiana curriculum "Leadership: Building Skills for Life", community assessment and community issues followed by monthly or bimonthly educational/support sessions and completion of two or more individual/group projects that benefit the community. Youth will commit one year to the program. The program will be led by a trained facilitator, who could be a 4-H volunteer, a youth worker, etc.

The audience will include 4-H adult volunteers, youth workers, and others who will be trained in the model and the curriculum. They will work with youth, 12-15 years of age, who will be 4-H members and/or youth participants in other organizations.

Evaluation techniques will be developed to look at knowledge, skills and attitudes of youth both before and after their participation in the youth PEP program.

### Youth Development and Leadership

In 1995 a study was done asking 944 students in 19 Connecticut public high schools (urban, suburban, and rural) about their health habits. There were the following results: 22% of the students said they had carried a weapon during the past 30 days; 39% said they had smoked cigarettes on one or more of the past 30 days; 26% of the students had used marijuana one or more times during the past 30 days; 30% of the students considered themselves as slightly or very overweight; 24% said they thought seriously about attempting suicide in the past 12 months; 38% said they were in a physical fight during the past 12 months; 52% said they had tried at least one drink of alcohol on one or more days during the past 30 days; 2% said they had used cocaine one or more times during the last 30 days; 37% said they had sexual intercourse during the past 3 months and 30% had someone offer, sell, or give them an illegal drug on school property during the past 12 months.

The People Empowering People program was designed to build on the strengths and capacities of adults through training sessions, team building exercises and community projects. Based on the success of the adult program, a youth program will be developed utilizing the PEP program model and building on the 7 leadership skills listed in the 4-H curriculum, Leadership: Building Skills for Life, identified by the 4-H Leadership Action Team.

Youth displaying the above risk factors would benefit from a program that builds on their strengths. Also, at the present time no leadership curriculum is being used by 4-H volunteers with adolescent youth.

Anticipated measures of success are based upon changes in knowledge and behavior of the program participants. Specifically, youth, 12-15 years of age will do the following: develop a positive attitude about self; learn ways to deal with stress; improve their communication skills; improve their decision making skills; learn goal setting and time management strategies; learn about community resources; and complete two projects to benefit the community.

A desirable outcome other than the program participants changing their behavior for the better is the creation and development of a Youth PEP manual.

Partners will include the 4-H Leadership Action Team, which consists of 4-H youth, 4-H volunteers, a UConn faculty member and administrator, a Youth Service Bureau director, and CES faculty. Other resource partners could include CES faculty, UConn School of Family Studies and others who would review the curriculum and/or pilot test the curriculum with 4-H members and other youth group members.

A youth leadership/community development program modeled after the PEP program will be developed for youth 12-15 years of age. Like the adult PEP program, the program will be designed to build on the strengths of youth by providing opportunities and resources for them to gain experiences and skills. The program will recognize the unique gifts and capacities of each youth and will encourage them to express their own issues as they see them. The program will emphasize the connection between individual and community action. The program will include ten weeks of training focusing on the building skills of life identified in the Indiana curriculum Leadership: Building Skills for Life, community assessment, and community issues followed by monthly or bimonthly educational/support sessions and completion of two or more individual/group projects that benefit the community.

The youth will commit one year to the program. The program will be led by a trained facilitator, who could be a 4-H volunteer, a youth worker, etc.

Target audiences are 4-H adult volunteers, youth workers and others who will be trained in the model and the curriculum. They, in turn, will work with youth, 12-15 years of age, who will be 4-H members and/or youth participants in other organizations.

Evaluation techniques will be developed to look at knowledge, skills and attitudes of youth before, during and after their participation in the youth PEP program.

#### 4-H and Youth Development

To provide an outreach program or center based in the community. This program would provide the residents of that area with educational programs and materials based on that population's current needs. Using current CES staff and programming, as well as resources from the entire College, specific workshops for area families would be offered. This could include the PEP, EFNEP, Master Gardener Programs as well as a 4-H component for youth. The community would become better informed about parenting, youth development, foods and nutrition, and becoming more self-sufficient. Because of financial and educational challenges, this population is unable to travel to the university for programs; it would be appropriate to provide an outreach program for them in the community.

Measures of success will be based upon changes in the knowledge and behavior of the program participants. For instance, participants would become better informed about food safety and nutrition, child development, developing interpersonal skills, learning new employment skills and improving their understanding of food safety and health. There is another desirable outcome of the program effort. Specifically, the establishment of an "Outreach Center" in the Enfield Freshwater Pond community is another desired outcome. This "Outreach Center" would be partnered with the University of Connecticut, Town of Enfield, After School Program, and any other significant members.

Partners of the program effort are the University of Connecticut Cooperative Extension System, Town of Enfield, Claire Hall, director of After School Homework Program, other CES Staff and other community organizations.

A new facility is scheduled to be built on High Street in Enfield to house the current After School Homework Program as well as other activities. There will be sufficient room for the current program as well as additional classrooms and a commercial kitchen. Through a partnership with those mentioned above, the CES could provide a variety of programs designed to improve personal skills, self-esteem and knowledge. No new programs would need to be created; existing programs are sufficient to fulfil the goals. Volunteers or staff would need to be scheduled to offer each program at the site in Enfield at specific times of the year. Individuals residing in this area of the town would be able to come to the programs for no fee. One goal would be to instruct the area residents about planting and maintaining a community garden. This combined with the information learned through the EFNEP portion of the program would increase their ability to buy, grow, and cook healthy and nutritious foods for their families. The 4-H youth portion would also provide comparable programs for the youth members, which would tie in with the adult's learning.

Program strategies include: training in food safety and health issues through programs such as EFNEP; providing workshops for self improvement, such as PEP; developing job training skills; offering opportunities to work as a community establishing a community garden; recruiting volunteer leader(s) to provide a 4-H program for youth in the community.

The target audience consists of the population residing in the surrounding area of the outreach center. In Enfield, this would be those people living in the Thompsonville section.

In order to assess if learning or results occurred, assessments and surveys will serve as the evaluation techniques. For instance, pre- and post-assessments for subject matter will be given to all participants. The number of participants in each program will be recorded and tracked. In addition, potential participants will be surveyed about the topics that are important to them.

#### INDIVIDUAL PLANS (Research and Extension, Multi-Discipline, Multi-State, Multi-County)

#### 4-H Camping

Focus: The Connecticut 4-H Camping program reaches over 3,100 youth each year with a quality positive youth development program. The four CT 4-H Camps are owned by private, non-profit (very non-profit) corporations which partner with the UConn Cooperative Extension System to provide youth camping programs.

Cooperative Extension Focus: One staff member works as Extension liaison to the New London County 4-H Camp, with the 4-H Foundation and Camp volunteers to make every possible connection between the 4-H camping effort and the resources and educational programs of CES, CANR and UConn. Health and safety, policy and procedure, educational programming and other issues are raised with these volunteers and work with them to develop strategies and solutions.

In addition, the New London County 4-H Camp has a unique challenge of dealing with 100+ teenagers who registered for the teen leader program last year and an anticipated continuation of high numbers of teens. There is a great need for a sound leadership curriculum as well as written and stated plans for proper teen housing, supervision and structure and responsibilities for teens in the 4-H Camp program. Many are future counselors. Many need a safe and caring place to be, one with positive influences

Anticipated measures of impact include getting the New London County 4-H Camp Teen Leaders involved in Eastern CT Community Service Learning Project and Teen Leaders participating in training and receiving certification in First Aid, CPR, Lifesaving.

Outcome products desired include 4-H Camp Teen Leadership curriculum and an improved New London County 4-H Camp policies and procedures.

Partners of the program include both internal and external linkages. Internal linkages are located at the University of Connecticut; specifically, most are within the College of Agriculture and Natural Resources (CANR). Other internal linkages include the 4-H Camping Coordinator and Extension Liaisons to the 4-H Camps, the School of Family Studies and the School of Education. External linkages include the New London County 4-H Foundation, New London County 4-H Camp Committee, CT 4-H Camps and Camp Directors, American Camping Association - New England Section, Connecticut Camping Association and American Red Cross Instructors.

The camper age at the New London County 4-H Camp is 6 to 8 for clover campers, 8 to 14 for general campers. Many teens ages 14 to 17 want to be at 4-H Camp and are registering for the Teen Leader Program. A stated number should be accepted each week. A revised and refined Teen Leader plan will be developed. The teens will participate in a curriculum which will include daily meetings with the Teen Leader Directors, instruction leading to possible certification in first aid, CPR or lifesaving, training in camping skills, practice with small groups of campers leading to second year Teen Leaders assisting in a cabin of campers. Teen Leaders will have definite responsibilities at the Camp and will learn to assist with the camp store, evening programs, activity classes (such as archery, arts and crafts, recreation, etc.). Their work will be evaluated.

The primary strategy consists of working with the 4-H Camp Committee, Camp Director and the 4-H Camp Teen Leader Directors in order to design a curriculum and a list of procedures for the Teen Leader Program. Also part of the strategy is to research successful teen leader programs being used by other camps.

Target audiences for the program effort include youth ages 14 -17, youth ages 6-14 for the clover and general camp sessions and the New London County 4-H Foundation and Camp Committee.

Evaluation techniques include pre- and post-program questionnaires for 4-H Camp Teen Leader program participants; reflections by 4-H Camp Teen Leaders participating in the Eastern CT Community Service Learning Project; and interviews with 4-H Camp staff and the 4-H Foundation.

### Healthy Lifestyles and Personal Development

Healthy Lifestyles and Personal Development is one of the nine key areas of emphasis for the University of Connecticut's 4-H Youth Development Program. Involvement in Healthy Lifestyles and Personal Development projects provide youth with challenges, experiences, support and help which promote positive and realistic outlooks on self, home, community and the world. It also fosters the development of skills and attitudes recognized as critical for successful living in an increasingly diverse world.

Cooperative Extension System Focus: Training of formal and informal educators to use curricula for use in reaching youth and families in community based organizations and day camps; training for teenagers in workforce preparation and leadership skills.

Anticipated measures of success are based upon changes in knowledge and improvements in the behavior of the program participants. Volunteer 4-H Leaders, Extension Educators and other formal and non-formal educators will increase skills and confidence in teaching and implementing programs and activities which emphasize healthy lifestyles and personal development (MS). Youth will acquire knowledge, skills and attitudes that promote a healthy style of living and foster sensitivity to the problems and needs of people different from themselves. In addition, youth will apply acquired healthy lifestyle and personal development knowledge, skills and attitudes within on-going 4-H projects and complete appropriate record sheets.

Outcome products desired include curriculum review, training manual, state event (fair or exhibit), promotion plan and corporate sponsorship. The 4-H Double Dutch Health and Fitness curriculum will be piloted

with six states and then submitted for review to the National 4-H Curriculum Juried Review (MS). A leader training manual and instructional video will be developed for the 4-H Double Dutch Health and Fitness curriculum. A 4-H Healthy Lifestyles and Personal Development local, county and state event, fair or exhibit might be established. A promotion plan for the 4-H Healthy Lifestyles and Personal Development emphasis area is designed. Corporate sponsorship of 4-H Healthy Lifestyles and Personal Development curriculum, module series and event is also desired. Concluding the list of desired outcomes is the revision or update of the training manual for the 4-H Summer Nutrition Education Program.

Partners of the program include both internal and external linkages. Internal linkages consist of the UConn Department of Sports, Leisure and Exercise Sciences; Specialists and Educators in CANR/CES; CT 4-H Development Fund/Extension Councils; and 4-H Volunteers/Youth. External linkages include the Hunger Coalition (in kind); Youth Service Bureaus (in kind); CT Assn. of Nutrition and Dietetics; CT Association of Parks and Recreation; Community-based recreation and exercise organizations (YMCA or YWCA, Boys & Girls Clubs, Federation and Neighborhood Houses).

Resources of the program have provided external funding. This includes grants awarded by the National 4-H Council (MS), the Regional Workforce Development Board and the Food Stamp Program.

The 4-H Healthy Lifestyles and Personal Development program assists youth in becoming coping, competent, caring, and contributing members of society by fostering the development of positive patterns for daily living as well as positive attitudes toward diversity within individuals, families, communities, and nations.

Program strategies involve developing training manuals, curriculum materials and establishing sources of support. For instance, a Healthy Lifestyles and Personal Development Training Manual and Video will be developed for 4-H Youth Volunteer Leaders. In addition, volunteer leaders will be trained to use Healthy Lifestyles and Personal Development curriculum materials (MS). Concluding the list of strategies is the establishment of sources of support/recognition for the 4-H Healthy Lifestyles and Personal Development program.

Target audiences for the program effort includes: youth and their families; formal and informal educators; and youth development workers.

Evaluation techniques include the use of surveys and keeping track of record forms. For example, 4-H Leaders will be surveyed about Healthy Lifestyles and Personal Development inclusion in on-going programs (MS). Moreover, the number of Healthy Lifestyles and Personal Development record forms submitted on a yearly basis will be recorded and tracked.

#### SIDS (Sudden Infant Death Syndrome) Education

Cooperative Extension Focus: Connecticut family providers and infant care providers do not have ample opportunities to participate in SIDS education. When an infant dies, the death affects not only the parents, family, siblings, subsequent children but also the community. There is a body of knowledge and skills that people who work with families with infants should know in the event that they are faced with a SIDS tragedy. Research shows that supportive family care following infant death helps families, children, and others to heal.

In order to measure the impact of the program, family providers and infant care providers will report their knowledge and skills gained as measured by pre-post program evaluations. Further, the number of program participants credentialed will be documented.

Desired outcomes include exhibits and publications.

Partners of the program include CT Charts-A-Course, CT Department of Children and Families, Family Resource Centers and CT Shelter staff.

The key components of the program are educational programs including basic information, risk reduction strategies and supportive family care techniques and community resources. These may include train-the-trainer programs.

Annual program methods involve reaching approximately 200 family providers and 100 infant care providers via workshops, fact sheets and media outreach.

The target audience for the program effort includes both family providers and infant care providers.

Pre and post evaluations at program completion assess knowledge gained and skills learned.

#### 4-H Youth Development/"Connections"

Cooperative Extension System Focus: The focus of the plan is to implement the goals and objectives of the USDA Children, Youth, and Families State Strengthening "Connections" Grant Project. In addition, as a member of the 4-H Youth Development Team, one role promotes and supports its programs and goals. The State Strengthening Project is in the last of its five-year cycle. It aims to collaborate with partners throughout Connecticut in order to maximize the resources of each partner to strengthen the respective efforts on serving Connecticut's

children, youth and families. This grant program promotes and facilitates that collaboration through USDA funds specifically allocated to Connecticut Extension programs and personnel. The focus continues the tradition of providing research-based knowledge and skills to the residents of Connecticut.

Anticipated measures of success are based upon grant dollars received and continued collaboration. Continued grant funding will be received from federal sources, which will allow us to carry out the work begun over the last four years. This continued collaboration with CT Family Resource Centers will allow us to continue programming that promote positive changes in the lives of children, youth, and families at risk living in low resource areas. Such programs include Computer Connectivity with 15 community organizations; People Empowering People in four sites; Parents, Computers, and Kids in four sites; and 4-H Positive Youth Development Programs in 4 locations. UConn Cooperative Extension will be an important player in informal science education, through membership on the CPTV Science Expo Steering Committee and connections with the National 4-H Computer Curriculum Committee.

Outcome products desired include a web page devoted to the "Connections Project" collaboration between involved partners and exhibits at the Annual CPTV Family Science Expo.

Partners of the program include both internal and external linkages. Internal linkages include UConn Schools and various departments of CANR, Specialists and Educators in CANR/CES, CT 4-H Development Fund/Extension Councils and 4-H Volunteers/Youth.

External linkages include the State Department of Education, Family Resource Centers, New England Workforce Preparation Taskforce, CYFAR 2000 Conference Planning Committee, and other government agencies and non-profit social service organizations.

This project is a collaboration between the Connecticut Cooperative Extension System and the Connecticut Department of Education Family Resource Centers. The project works toward realizing the vision that all Connecticut children, youth, and families will lead fulfilling, secure and financially sufficient lives. The three major components of the project are a statewide portion that provides overall planning, financial accounting and accountability. The second component is the community project portion that provides direct collaboration on a local level, now operating in 14 urban at risk sites. The third facet of the project is a connectivity project, which supports former USDA Youth at Risk Programs. Efforts on the statewide portion improves the capacity of University of Connecticut Cooperative Extension System to promote and support the quantity and quality of community-based programs for children, youth, and families at risk. Its strategies include forming and strengthening collaborations among departments and schools in the University as well as with outside state and local agencies and organizations.

Audiences include all citizens of the state as well as particular legislators and community organizations. Educational methods include 1:1 conferencing, group meetings, and presentations in various settings. Attendees to the collaboration efforts and programs could be anywhere from one to thousands, in the case of the involvement with the Family Science Expo.

The target audiences include Family Resource Center staff and the children, youth, and families who benefit from sponsored programs. In addition, audiences are 4-H youth, and the Cooperative Extension staff working with CT children, youth and families. Another audience is the legislature and those who work with and in community organizations.

Program staff conduct formative evaluation on a regular basis. In addition, UConn School of Education has been sub contracted for an overall evaluation of the project.

#### 4-H

Cooperative Extension System Focus: The Cooperative Extension Youth Development Program fosters the development of children in becoming adults of integrity who are coping, competent, caring and contributing members of society. 4-H programs feature experiential learning opportunities, involvement over time with a caring adult, applications to current and future life, opportunities for evaluation, recognition and social interaction. 4-H participants have a responsibility for decision making and leadership. 4-H groups, projects and activities exist and are developed within this framework.

The development of leadership skills is critically important to building quality positive youth development programs and to providing youth with skills to make them caring contributing members of society. The individual plan is focused on the maintenance and promotion of 4-H work in Litchfield County with emphasis on volunteer adult and youth leadership.

Anticipated measures of success are based upon changes in knowledge and improvements in behavior of the program participants. Volunteer youth and adult leaders will gain skills to plan, implement and evaluate youth

education programs. In addition, youth will gain skills and knowledge to assume leadership roles in the community at large.

Outcome products desired: volunteer management system in place, including volunteer leader handbook; 4-H members accepting leadership roles in 4-H and other activities; curriculum and personnel with skills to educate youth and adult volunteers; and updated 4-H promotional materials.

Partners of the program include faculty and staff with expertise in volunteer management, 4-H volunteers and 4-H members.

Programs focusing on leadership teach skills that allow adult and youth participants to identify, understand and perform the roles and tasks and functions necessary for effective leadership. They actively participate in program planning, implementation and evaluation of programs and projects. Efforts to recruit adults and youth as volunteers and potential 4-H'ers will continue, through promotion of the 4-H program.

One of the program methods includes providing volunteer leaders with manuals, to help them understand their role as a group leader. Training sessions will also be held for face to face contact with CES staff. Youth will learn leadership skills from both the study of the subject, and through the practice of skills within the 4-H program.

Target audiences for the program effort include adults and youth, both those involved in the 4-H program presently and those recruited into the program.

Evaluation techniques consist of interviews, program monitoring, reported experiences of youth and successful events implemented by trained leaders.

#### Critical Review of National Extension Parent Education Curriculum

Cooperative Extension System Focus: Parent Education has long been recognized as an important part of the National Extension Systems family and community outreach and education program. In 1994, the National Extension System published a seminal work entitled The National Extension Parent Education Model of Critical Parenting Practices. This publication outlined a six-area framework for the design of parent education programs and curricula.

The model has won numerous awards and has been adopted by countless agencies and organizations engaged in the work of conducting parent education programs or designing and selling parent education curricula.

Connecticut has been selected as a national review site for the first National Extension Parent Education Curriculum that is based on the six areas outlined in the National Extension Model.

Success will be measured by a state review panel of parent educators. This panel will be convened for the purpose of providing a critical review of the National Parent Education Curriculum. Based upon a positive review of the curriculum, it is anticipated that a series of state and regional training sessions will be conducted for parent educators interested in utilizing the National Extension Parenting curriculum.

Research projects will be designed to compare the efficacy of the national Extension model with other popular parent education curricula.

The most desirable outcome products are peer reviewed articles.

Partners of the project include both internal and external linkages. Internal linkages consist of CES faculty currently engaged in parent education and faculty within the School of Family Studies. External linkages consist of both public and private agencies engaged in funded parent education programs, projects, and initiatives.

Key components of the year-long project description include peer reviews and focus groups.

Project methods include receiving a national model, setting up a review panel, conducting curriculum review, designing a pilot process for state/regional arrangements and designing a research study.

Target audiences include parent educators and agencies receiving funding to conduct parent education programs.

In order to assess the results of the project, evaluation forms from National Extension will be used.

#### 4-H Youth Development and Volunteer Management

Cooperative Extension Focus: Involvement in an informal program of positive youth development provides youth with challenges, experiences, support and help which foster a positive attitude and prepare youth for the adult roles they will assume in the home, community and workplace. Skills learned will prepare today's youth to be coping, competent, caring and contributing adults of tomorrow.

There are nine key areas of emphasis for the University of Connecticut's 4-H Youth Development Program: workforce preparation; leadership; citizenship; literacy; consumer and family sciences; expressive arts; environmental and earth science; personal development; and plants and animals.

Critical to the success of the local youth program is the recruitment, training and support of adult volunteers. These volunteers provide positive role models for youth.

The success or impact of the program is based upon the change in knowledge and/or behavior of the program participants. Specifically, volunteer leaders and staff will increase knowledge and skills in theories and methods of positive youth development and the nine areas of 4-H program. Youth will acquire knowledge, skills and attitudes that foster their personal growth, life skills, civic responsibility, and subject matter interests. Youth will apply the knowledge, skills and attitudes learned in 4-H to their life. Volunteer management system will be developed and maintained.

This work will result in: training workshops for adults and youth; corporate sponsorship for parts of youth program; training/resource manual for volunteers; promotion plan for 4-H youth program and volunteer recruitment; empowered volunteer committees; and presentations or exhibits at professional conferences.

Internal partners are: CANR/CES faculty/staff; CIT; Fairfield County 4-H Committees; Fairfield County Extension Council. External partners are: Bridgeport and Danbury Public Schools, Family Resource Center, SCORE, local businesses, Minority Business Association CT Business Systems, Bethel Agway 8. Program Description: Youth are involved in 4-H through community groups, after-school programs, home correspondence course, and special summer programs. Volunteers and CES staff are trained to work with youth. Some youth serving agencies utilize 4-H curriculum and receive training in a train-the-trainer format. County activities and events are organized to enrich club program.

Educational methods involve conducting training/recruitment for volunteers delivering youth development program; gathering community support for program; maintaining and supporting County committees; offering and supporting all nine areas of 4-H programs to youth.

Target audiences include youth, ages 7-19, and adults.

Post/pre assessments and survey evaluation of youth and adults of knowledge gained, skilled learned or attitudes changed. Tracking of amount of dollars and in-kind support received will be conducted. Evaluation on key programs will be conducted at 6 months to determine educational impact.

#### Child Safety Education

Cooperative Extension System Focus: Safety and violence prevention is the most critical issues facing children in today's society. Parents, educators and community members want to ensure the personal safety of children of all ages - from newborns to teenagers. This includes safety in the home environment, in the neighborhood and community, in automobiles and at school. Research shows that when children and adults follow basic safety rules and strategies, deaths and injuries can be prevented.

Measures of success will be parents, children and community leaders reporting their knowledge and skills gained as measured by pre-post evaluations of educational programs/training. Numbers of participants (i.e. childcare providers, teachers) earning PDU's will be documented.

This work will result in publications, radio interviews/tapes, exhibits and conference presentations.

Partners are CT Charts-A-Course, CT Department of Children and Families, CT Shelter Staff, Family Resource Centers - Branford, Groton, New London, Middletown, New Haven and the Department of the U.S. Navy, Groton.

Educational programs/forums, web pages, and publications will include basic safety information, prevention strategies, and community resources. These may include train-the-trainer programs.

Educational methods include workshops, fact sheets and media outreach.

Target audiences are parents (100 per year), childcare providers (100 per year) and community leaders/facilitators (25 per year).

Evaluation techniques are pre-post evaluations at program completion assessing knowledge gained and skills learned.

#### 4-H Youth Development - State 4-H Awards Program

The State 4-H Awards Program provides a means of recognizing outstanding 4-H members and volunteers for their efforts and achievements in the 4-H program.

The impact of the program is apparent when 4-H volunteers feel a sense of commitment and belonging to the program as a result of recognition for their efforts.

The most desirable outcome would be a quality event that gives volunteers a sense of pride in their achievements; an event which meets the needs of volunteers in terms of recognition for their efforts and possible training opportunities.

Internal partners are: Cooperative Extension 4-H Youth Development Staff nominate volunteers and coordinate events such as State 4-H Public Speaking Finals which are also part of the overall state event. 4-H volunteers coordinate State 4-H Fashion Revue. External partners are: Media to provide coverage of events such as

State 4-H Fashion Revue which are part of the overall state 4-H recognition event; organizations such as the Connecticut 4-H Development Fund to provide sponsorship for the event.

The State 4-H Awards Program is an annual one-day event which provides recognition to outstanding adult volunteers for their efforts in the 4-H program. The event also incorporates the State 4-H Public Speaking Finals and the State 4-H Fashion Revue into the day's activities.

Methods include: up to eleven adult volunteers receive recognition, approximately 20 4-H youth participate in the State 4-H Fashion Revue and eight 4-H youth participate in the State 4-H Public Speaking Finals.

Target audiences consist of 4-H volunteers and 4-H youth.

Evaluation techniques will be to conduct a survey among 4-H volunteers to determine if the event meets their needs not only in terms of recognition but for potential youth development training and the formation of a committee of 4-H volunteers and 4-H faculty and staff to evaluate the State 4-H Awards program and generate ideas for future events.

#### 4-H and Youth Development

Cooperative Extension Focus: The 4-H Youth Development Program is the Cooperative Extension System's nonformal, educational program for youth. Through project work, these young people learn life skills, which they retain and use in all situations they encounter. Adult volunteers help to guide youth in their project skill development, while at the same time provide them with caring, significant adult role models. Youth need to be connected to a group where they feel comfortable, significant, and worthwhile. The 4-H program provides them with this. This program allows youth to be confident, become leaders, learn to plan and implement programs, confidently speak in public and give back to their community through volunteerism. During the upcoming five years, individual goals for this program include: recruit additional 4-H Volunteer leaders; increase total numbers of 4-H membership in Hartford County; work with adults and youth on 4-H Advisory Committee and Hartford County; 4-H Fair Association, Inc.; act as Liaison to the Hartford County Camp Board of Trustees; maintain current clubs in Hartford County; create partnerships with existing organizations, schools or recreation centers to form 4-H clubs or activities; increase public awareness of CES and the 4-H program through a variety of means; increase participation of teens at county, state and national levels; work with youth at Eastern States Exposition in New England Center.

Anticipated measures of success correlate to changes in the knowledge or behavior of program participants. For example, volunteer leaders, volunteer board members and staff will increase skills and abilities to work with youth through training sessions and development activities. The number of youth members will increase as will the total number of clubs throughout Hartford County. Higher numbers of teen members from Hartford County, (13 and older) will take a more active role in statewide teen activities as well as apply for national level activities. Numbers of volunteer leaders in Hartford County will increase Participation in special activities (Fashion Show) at ESE will increase.

Outcome products desired include: a computer program tracking volunteer leaders and youth according to club, interest area(s) and other significant data which may be needed for reporting purposes; a Youth Leadership Education Training Program which can be used throughout the state; an increased number of 4-H clubs or groups throughout Hartford County; possible partnerships with existing organizations, such as the YMCA, to establish 4-H youth groups within their structure; create publicity materials such as brochures, displays to use for public awareness of program; and an increased publicity in print and broadcast media.

Partners of the program include UConn Schools and Departments, volunteer leaders, 4-H Advisory Committee, Hartford Cooperative Extension Council, Hartford County 4-H Camp Board of Directors, staff in various Cooperative Extension Offices and organizations such as YMCA/YWCA town or city recreation departments, youth service organizations and schools; civic organizations such as Rotary, Civitan, etc.

The 4-H Youth Development program in Hartford County will provide youth with the opportunity to increase their self-esteem and skills through project work. These projects may consist of almost any interest area to youth. Curriculum for these areas will be provided to volunteer leaders or independent members in order to reach their goals. Through these projects, youth will develop positive attitudes about themselves, learn a variety of life skills, and be more aware of others around them. Leadership skills will develop through club work and responsibilities youth have as officers of Fair Association or individual clubs. More confident, competent, caring young people and adults will result. Youth will also be involved in environmental awareness and volunteerism.

Clubs or after school groups will tailor their program to address the interests and needs of the members. Countywide workshops will be provided throughout the year in a variety of project areas. Adults and teens on committees and Fair Association will be provided with specific training programs. All 4-H members will be informed of and have the opportunity to participate in county, state, interstate and national programs.

The 4-H Fair Association will provide youth with opportunities to develop leadership skills and to organize and run the annual 4-H Fair. The 4-H Advisory committee will assist in the planning, conducting and evaluation of Hartford County 4-H programs.

All youth ages seven through nineteen are eligible to take part in the 4-H program. Recruitment of new members will occur through open houses, community programs, brochure distribution, and media coverage. Youth and adult volunteers will receive training and materials to work with. Updated record keeping materials and leader manuals will be provided. Volunteers on Advisory Board will provide written guidelines and criteria for county and state 4-H awards and trips.

The target audience consists of all youth, ages seven through nineteen in Hartford County.

A variety of evaluation forms will be used after leader, volunteer or youth leader trainings. Total numbers of youth enrolled in the program will be compared on a yearly basis as well as numbers enrolled in certain project activities. An increased number of teen members will actively participate in statewide teen programs and apply for state or national awards. The 4-H Advisory Committee will increase in number and involvement with county events.

### Family and Consumer Economics

Cooperative Extension Focus: Connecticut's economic climate has increased the number of families and individuals seeking financial assistance and counseling from community agencies, programs and support systems. Welfare reform has created a financial crisis for many families as they lose many of the safety nets such as income, housing, education, health, child care, and nutrition assistance. Most family service agency staff have little or no training in financial counseling. Programs to train agency staff can help them to assist at-risk families.

Anticipated measures of impact are based upon the increase in knowledge and the improvement of behavior of the program participants. Specifically, 100 family service agency personnel, volunteers and community leaders will be trained to provide financial counseling and assistance to clients in their programs. In addition, 200 program participants will gain knowledge and improve money management practices through participation in on-going CES programs. Moreover, 30% of program participants will improve their personal financial situation through improved money management practices, reduced indebtedness, and/or increased savings.

Outcome products desired include training workshops, fact sheets, train-the-trainer materials, presentations and/or showcases at professional conferences, a web site and news releases.

Partners of the program are both internal and external linkages. Internal linkages are within the College of Agriculture and Natural Resources (CANR). Specifically, the faculty and staff at the Cooperative Extension System (CES) and the Department of Communications and Information Technology (CIT) are all invaluable partners. External linkages include Family Resource Centers; CT Department of Income Maintenance; CT Department of Children and Families; Danbury Commission on Child Care, Rights and Abuse; Infoline; Headstart; Community Reinvestment Agencies; Shelter Programs; Municipal Social Service Departments; and non-profit Debt Management Agencies.

Key components of the project description include basic money management workshops/series for limited resources families and agency program clients; financial counseling skills train-the-trainer workshop series for family service agency personnel; and distribution of the "Living with Less" newsletter to individuals, families and agencies.

Project strategies involve conducting basic money management workshops for agency clientele; conducting train-the-trainer workshops for family service agency staff; and distributing news releases via the electronic and print media.

The target audience for the project effort includes limited-resource individuals and heads of households as well as family service agency staff and clientele.

In order to assess the program, there will be post-program evaluations of money management and train-the-trainer programs. Additional assessments will be conducted with a post-program mail survey at 6 months for train-the-trainer program participants.

### Connections State Strengthening Grant

Cooperative Extension System Focus: Positive Youth Development.

Measures of success will be: continuing to provide quality 4-H programs in New London and Groton; seeking additional funding for the existing afterschool 4-H clubs; providing for additional out-reach in 4-H development; and continued growth in community service learning projects.

Desired outcome products include the creation of a 4-H TV show in New London, the addition of playground equipment to New London Park (community service learning project) and a presentation to the National CYFAR Conference on afterschool 4-H Clubs.

Resources of the program include 4-H Youth Development Team, 4-H LIFT, CT Family Resource Centers, Department of Higher Education, New London Police Department and Windham Public Schools.

Key components of the project description are to continue to provide administrative/technical support to existing afterschool 4-H clubs in addition to develop and implement a volunteer tutoring program.

Project strategies include one-on-one and group presentations in educational methods. Audiences include parent groups and students ages 9-13 (up to 15 for the most part).

Target audiences for the program effort include: students at (New London) Jennings School & BDJ Middle School, (Groton) Eastern Point School, and (Windham) Windham Middle School.

In order to evaluate the program, staff will conduct assessments on program regularly and share information at monthly staff meetings. Further, the program has sub-contracted to the School of Education to provide formal evaluation.

### Family Nutrition Program

Cooperative Extension System Focus: Children with special health care needs now comprise approximately 10% of the pediatric population, given better survival rates due to technological advances in medicine. These children are afflicted with physical and/or mental disabilities, which can range from mild to severe. Nutritional concerns among this population are significant: underweight, overweight, dehydration, constipation, micronutrient deficiencies, aspiration risk, feeding difficulty, and behavioral problems around food. Low-income families of children with special needs face additional obstacles (financial, psychological, and access to information or services) to obtaining adequate nutrition care and dietary adequacy for their child. In addition, among multi-ethnic groups, rates of certain birth defects and conditions are higher than the general population.

This project is targeted to low-income families of children who have special dietary and medical needs and professionals who provide service to these children. Outreach efforts are focused on providing nutrition education to improve dietary adherence and improve health outcome.

Anticipated measures of success are based upon the changes in knowledge and improvements in behavior of the program participants. Specifically, success is measured by an increased knowledge about nutrition for children with special needs and improved service delivery by professionals attending workshops. Also, a success are improved shopping practices and adherence to nutrition recommendations of low-income parents of children with special needs attending nutrition programs. The last two measures of success are the appropriate referral for low-income families needing pediatric nutrition counseling and/or food assistance and the linkage of EFNEP to provide home visits to selected families of children with special dietary needs.

Outcome products desired include education materials, training curriculum, exhibits, videos and journal articles. Specifically desired are: nutrition education materials developed for parent and professional use on specific medical conditions; training curriculum for agencies such as Birth to Three on nutrition for special dietary needs; Exhibits to highlight project at state and regional meetings; video of low protein cookery for metabolic disorders; and Extension or nutrition journal article on project.

Partners of the project include the CT Children's Medical Center, CANR Food and Health Team/Extension Outreach Committee, Birth to Three Program, Head Start, Department of Public Health and the New England Nutritionists for Children with Special Needs (MS).

The key component of the project description is to provide nutrition education. This project will provide nutrition education to professionals and families of children with special dietary and medical needs. Education efforts will be by workshops, development of materials, video development and food demonstrations. Previous workshops have covered: specialized formulas, weaning off tube feedings, diabetes, nutrition management of HIV/AIDS, feeding children with oral/motor difficulties, behavior problems and drug/nutrient interactions in children. Workshop content is geared to the specific needs of the audience. In addition, this project provides nutrition resources to professionals and parents on specific special needs topics. Linkages are also provided to refer low-income families for nutritional counseling, insurance coverage of foods and special formulas. The project is involved in the planning and implementation of a family PKU weekend in Ivoryton, CT, for 30-40 families of children with PKU.

Project strategies include group training sessions for professionals, nutrition education material development, video development, workshops for parent groups who have children with special dietary needs and food demonstrations. Another facet of the project is the Camping Education Weekend for Families of Children with PKU. The project should reach 150 professionals and 150 parents per year.

Target audiences include low-income (Food Stamp eligible) families with children with special dietary or medical needs and professionals (Birth to Three, DMR, Head Start, Public Schools, etc) working with special needs

children or parents in the community. Other targeted audiences include health care providers at CT Children's Medical Center.

Evaluation techniques consist of case studies, pre and post tests and surveys. Case studies will be used to evaluate the health and nutrition outcomes for selected children. Pre and post tests will be used to evaluate the workshops. Surveys will be conducted of children with food demonstrations. The final evaluation technique is to track the number of referrals made for nutrition counseling/food assistance/insurance coverage for specialty formulas of identified families.

#### Balancing Work and Life--Family Resource Management

Connecticut families and individuals face daily challenges in managing their family resources effectively. With 65% of all women working full-time and 28.9% working part-time, Connecticut has higher labor force participation for women than the U.S. average. It is also true of that men in Connecticut have higher labor force participation than the U.S. average. In Connecticut, a very large proportion, about 72 percent of women with young children are in the workforce. Connecticut is one of the wealthiest states in the nation, but it also has three of the nation's poorest cities. Nearly 1 in 5 Connecticut children lives in a family with an income below the poverty level. The overall rate of poverty in Connecticut has increased from 9.2% in 1992 to 10.7 percent in 1996. According to the Cost of Living Comparator, using an U.S. average income of \$50,000 as a base for comparison, a family would have to earn \$60,490 (20.98 percent more) to have the same purchasing power in Connecticut. Families living at the federal poverty level of \$13,330 per year for a family of three do not earn enough to pay for an average two-bedroom apartment anywhere in the state. The ratio of women's earnings to men's is ranked 29<sup>th</sup> in the nation. Over 46 percent of single females with children are living in poverty, considerably more than the national poverty level for this family type. Children living with only their mother are sixteen times more likely to be poor than those living with two parents.

Cooperative Extension System Focus: By helping Connecticut families and individuals better understand and develop their resources, they will be better able to satisfy the needs and desires of their families or households.

Anticipated measures of success are based upon the changes in knowledge and behavior of the program participants, especially with respect to decision-making abilities. In addition, service providers will gain knowledge in a variety of discipline areas relating to building family strengths and apply this information in working with their clients.

Outcome products desired include a brochure to market the program, material posted on a web site, training curricula and an exhibit for future presentations.

Partners of the project include local family resource centers and local housing authorities, both of which assist with program delivery.

The project will focus on helping people become more knowledgeable about the personal, family/household, community and state resources available to them and encourage them to more effectively manage these to meet their families' needs.

Project strategies consist of exhibits, radio interviews, newspaper articles and incorporating new lessons into other Extension multi-session programs. In addition, a particular educational strategy is the Worksite lunch and learn program.

Target audiences for the project effort include families and individuals on limited or moderate incomes, people new to the workforce, people transitioning from welfare to work and young employees.

A random sample study will be conducted to evaluate the program. Follow-up evaluations will be conducted six months later.

#### ALLOCATED RESOURCES - GOAL 5

Programs listed below reflect funding from all sources including Hatch funds, Smith Lever funds, Offset, University operating, grants and special projects.

Finding resources for new program areas as well as funding ongoing programs as traditional support has vanished is critical. In some areas, current support is adequate while additional resources would facilitate moving the research and Extension agendas along at a faster rate.

Financial resources needed for staff include:

- staff for web site development and maintenance and distance learning
- additional staff needed in support of 4-H horse program

- assistance in developing and maintaining community and state partnerships
- staff support to design, develop, implement, and review results of follow up survey instruments
- staff to continue work initiated under funding from grants
- purchase of translation services
- assistance in recruitment of 4-H members
- professionals to volunteer as project leaders to provide support of 4-H workshops in specific project areas
- state wide coordinator for 4-H events, activities and programs
- staff support to further develop statewide workforce preparation for youth program

Resources requested for non-personnel needs:

- support of camp program and facility update needs
- support for conducting conferences and workshops targeted to teens
- recognition materials for 4-H
- purchase, development, and marketing of program supplies, educational materials, 4-H curricula, volunteer development materials
- training materials for volunteer development
- high quality displays and exhibits
- funds to purchase journal subscriptions
- travel for both in-state and out-of-state
- assistance in developing community and statewide sponsorship of 4-H programs
- media corp to better cover current programs
- facilities and labs available on campus or at other locations to present 4-H program

Increased coordination with the School of Family Studies and the School of Education.

#### Funds Spent in Support of Goal 5

	1999	2000	2001	2002	2003	2004
Total from all Sources	1,408,872	1,408,872	1,408,872	1,408,872	1,408,872	1,408,872

#### PROGRAM IMPACT REPORTING

Each year, faculty and program staff within the College and the Connecticut Cooperative Extension System are asked to report program impacts. These impacts are used not only to report to USDA but also to develop marketing materials. These materials include impact sheets by program team. The impact sheets feature results of the past year in Extension, teaching, and research. These are broadly distributed to stakeholders within and outside of the University. In addition, impacts are clustered by Congressional district. These impact statements are shared with the Congressional delegation to focus on what is happening in their district.

## 2. STAKEHOLDER INPUT PROCESS

Stakeholder input for the College and Extension system plan of work will occur on multiple levels and with various groups. The process seeks input on critical issues to agriculture, the environment, and families and communities as well as the prioritization of the use of funds. Efforts to gain input from a broad cross section of the general public will be conducted by the Connecticut Extension partners. These groups include the eight Extension councils, the four 4-H camps, the International 4-H Youth Exchange, and the Connecticut Master Gardener Association. This group meets three times a year and is planning and implementing the following process.

The initial meeting of five diverse CES faculty, about the options for involving stakeholders in the planning process, was held in early January 1999. A test run of a "mock" meeting was done with Center Coordinators shortly thereafter. The process needed adjustment! The need for a process was included in the agenda for a Partner meeting the following day. At that meeting, 30 CES active volunteers, members of Extension Councils, provided ideas. These ideas lead to the formation of local steering committees and the planning process.

Between early February and mid-April, Steering Committees met with CES state staff at six local meetings and by phone and email to clarify the roles and goals of the committees. In late April, the local Steering Committees shared their draft plans at a Partner Meeting. Many ideas about "Who to contact?" and "How?" were shared. Two statewide resource needs were identified: a universal brief questionnaire and a generic CES tabletop display. Volunteers and staff agreed to review drafts for these items before they were produced by the State CES.

The challenge to Extension Councils was to conduct as broad of based stakeholder input process as possible. In order to do so, Councils have planned to exhibit at fairs and other public events, purchase newspaper ads, cable access time, and distribute input surveys at all events conducted by CES. In addition, members of councils have volunteered to personally talk with local social service agencies, local service organizations, and other community groups. We have challenged our Extension partners to insure that we reach as broad of based audience as possible.

Other methods for gathering stakeholder input have included three statewide workshops focused on the future of agriculture and land use. The first two were planned by the Connecticut Agricultural Information Council which a faculty member of the College chairs and the third was conducted by the Connecticut Food Policy Council which the associate director of Extension chairs.

The first two forums focused on producer concerns and issues. What is agriculture in Connecticut; how should ag organizations be organized; and what are issues which need to be addressed? The third conference targeted land owners and town officials and focused on policy issues related to preserving land for open space and production. Each forum resulted or will result in a proceedings which will form the basis for program development in the College and the Extension system.

The third methodology which will be used are meetings with leaders of agricultural organizations. The dean and director will invite onto campus agricultural leaders from all segments of the industry to meet with College and university leaders to discuss who we are and to listen to concerns.

As part of the College wide and Cooperative Extension System planning for the next five years, all faculty and program staff were asked to identify three people to whom we should seek input. Faculty and program staff listed contacts with whom they work or who they know in their personal lives. We will follow up with these people either through asking for input via the survey instrument; inviting to lunch with the Dean and Director to discuss the focus of the College; or by mail.

Specific program teams within the College are also discussing and planing ways in which specific stakeholder input might be gathered. A new center in the School of Family Studies is being organized to explore the needs for applied research related to youth and families in the state.

College and Extension system administration will continue to meet with commodity boards, to attend annual meetings, to work with state wide professional organizations such as the Connecticut Veterinary Medical Board, the Connecticut Mastitis Board, the Connecticut affiliate of the Family and Consumer Sciences Association and the Connecticut Association of Agriculture Educators (CAAE) to assess needs.

Stakeholder input will be reported as an appendix in the College wide strategic plan which is distributed for the Extension system's merit review process.

The number and proportion of Connecticut's population that is aged 18 and over is expected to increase from 2.5 million or 75.6 percent in 1995 to 2.5 million or 75.9 percent in 2000. This population is expected to increase to 2.9 million or 77 percent in 2025.

As the Baby Boom generation (those born between 1946 and 1964) reaches retirement age, the growth of the elderly population (65 and over) is expected to accelerate rapidly. The size of the elderly population is projected to increase in all states and the District of Columbia over the 30-year period. The proportion of Connecticut's population classified as elderly is expected to increase from 14.3 percent in 1995 to 18 percent in 2025. Among the 50 states and District of Columbia, the state is projected to have the 9<sup>th</sup> highest proportion of elderly in 1995 and the 38<sup>th</sup> highest proportion of elderly in 2025.

By 2025, non-Hispanic Whites would comprise 69 percent of Connecticut's population, down from 82 percent in 1995. Non-Hispanic African Americans would comprise 11.1 percent of the state population in 2025, up from 8.4 percent in 1995. Non-Hispanic American Indians, Eskimos and Aleut would comprise 0.2 percent of the 1995 state population and 0.2 percent of the 2025 state population. Non-Hispanic Asians and Pacific Islanders would increase from 1.9 percent of the 1995 state population to 4.3 percent of the 2025 state population. Persons of Hispanic origin, who may be of any race, is projected to increase from 7.5 percent of the 1995 state population to 15.4 percent of the 2025 state population.

Between 1995 and 2025, the number of non-Hispanic Whites residing in Connecticut is projected to decrease by 105 thousand, compared to a gain of 142 thousand for non-Hispanic African Americans, a gain of one thousand for non-Hispanic American Indians, Eskimos and Aleut, a gain of 99 thousand for the non-Hispanic Asians and Pacific Islanders, and a gain of 327 thousand for persons of Hispanic origin.

The numeric change in Connecticut's non-Hispanic White population from 1995 to 2025 ranks as the 45<sup>th</sup> largest gain among the 50 states and District of Columbia. In the same period, the non-Hispanic African American population change ranks as the 24<sup>th</sup> largest gain, while the non-Hispanic American Indian, Eskimo and Aleut population change ranks as the 44<sup>th</sup> largest gain. The non-Hispanic Asian and Pacific Islander population change ranks as the 21<sup>st</sup> largest gain, while the Hispanic population change ranks as the 15<sup>th</sup> largest gain.

In the large metropolitan areas of Connecticut the underserved groups are African Americans and Hispanic. In some areas the under served include Asian immigrants. The College has a diversity plan to increase awareness, to increase participation by under represented groups and to make administrative changes as needed. This plan is currently under revision by the College Diversity Committee.

### 3. PROGRAM REVIEW PROCESS

#### a. Merit Review

Key concepts of the Plan of Work were generated by faculty and program staff and will be refined and further developed through the merit review process. The basis for the merit review will be the seven part test of guiding characteristics for an engaged institution as reported in the 1999 Kellogg Commission Report on The Engaged Institution. These seven characteristics will be presented for consideration of the focus and process used. These characteristics include responsiveness, respect for partners, academic neutrality, accessibility, integration, coordination, and resource partnership.

Merit Review for the Connecticut Cooperative Extension System will occur on four levels each with a different review group and focus. First, each faculty and program staff member has submitted plans written on three levels. The first tier is the individual plan, the second tier is a small group plan and the third tier is a College wide team plan. Following the submission of this plan of work document, the College wide program teams which are cross functional and multi discipline, will review all individual submissions. From this review, a College wide (and Extension system wide) plan for the next five years will evolve. This is the first level of the merit review.

The second level is an university wide review of the College and Extension System plan. A copy of the plan will be submitted to university administration and to deans and directors. These individuals will be invited to comment on the goals of the College and areas of focus. In addition, university administration will be asked to comment on ways in which we might work across Colleges and schools to increase our outreach efforts.

The third level of review will be our peer institutions across New England. Once the College and Extension system plan is completed, the document will be distributed to all deans and Extension directors across the other five New England states. These individuals will be asked to comment on our focus and on areas of collaboration.

A fourth step in the review process will be from our stakeholders in the state. Our Extension councils and Extension partners have been asked to help gather stakeholder input. These same Extension partners will then be asked to comment on our plan in regard to focus and needs within their particular location.

The merit review process for Connecticut will then consist of four components. These include peers within the Extension system, administration within the university, peers across New England and stakeholders who planned and implemented our stakeholder process.

A final document outlining the College and Extension system plan will be distributed to the general public. A statement asking for their input and reactions to the plan will also be included.

#### b. Scientific Peer Review

The essential features of the peer review process for Hatch and other projects within the Storrs Agricultural Experiment Station are:

- A. Project proposals are developed by faculty members and submitted to their department head for review and approval.
- B. The proposal is then reviewed by Experiment Station Office staff with attention to format, clarity, budget, requirements for facilities, animals, etc.
- C. Following these initial reviews, subject matter review is arranged by the Experiment Station Office. Peer reviewers are generally drawn from the College of Agriculture and Natural Resources and other University units but in some cases assistance is requested from scientists at other institutions. 4. Subject matter reviews are conducted anonymously. All reviews are read within the Experiment Station Office, substantive comments which may necessitate changes in the proposal are extracted or summarized, and then forwarded to the Project Leader(s) for a response. The response may be either written or oral. 5. If major changes in the proposal are necessary the revised project outline is resubmitted to the peer reviewer for re-examination and the process is repeated. In some circumstances, additional reviewers may also be selected. 6. In some cases research programs initiated as Hatch or other Experiment Station projects become jointly funded by extramural sources such as NIH, NSF, or DOE. Since

these agencies also require comprehensive peer review, processing of project outlines for renewal of these projects during continuous extramural funding may be expedited by waiving local subject matter review.

#### HATCH MULTI-STATE RESEARCH

	1999
Total Hatch Funds and Offset Dollars	\$722,167
Total Hatch and Offset Dollars spent on Multi-State Research Projects	\$2,319,905

#### 4. MULTI-STATE RESEARCH AND EXTENSION ACTIVITIES

The Connecticut Cooperative Extension System partners with the other five New England states as a New England consortium focused on the coordination of programs across the region. This is exemplified in the program outcomes listed under each goal.

In addition, the New England Extension Directors are an active partner of the New England Federal Partners for Natural Resources. A formal MOU identifies that federal agencies in the region will work together to better coordinate activities and outcomes. The focus currently is on the Connecticut River as an American Heritage River and on the Shetucket-Quinnebaugh Corridor as a national park to be expanded into Massachusetts.

Connecticut is an active partner in SARE, the Northeast Region Sustainable Agriculture Research and Education Program, and in NRAES, the Natural Resources Agriculture and Engineering Service. This group produces high quality publications and conferences of which our faculty are involved in writing, producing, and attending the meetings.

Discussion is under way with the U.S. Forest Service to once again employ an Extension regional forester. This position would be expected to produce grant dollars for the state as well as high quality program impacts.

The Northeast Leadership Development (NeLD) Program has involved two Connecticut faculty who have each shown tremendous professional growth as a result of this expenditure. Efforts for the next five years will involve at least two additional faculty participating in the training.

Since the state has no state fair, all such events are conducted at The Big E held in Massachusetts. Considerable faculty and administrator time is devoted to planning, coordinating, and conducting educational events throughout the year. Youth develop leadership and citizenship skills as a result.

	FY 1997	FY 1999
Hatch Funds and Offset Total	443,874	445,132
Smith Lever Funds and Offset Total	1,338,003	1,563,850
Total Hatch, Smith Lever and Offset	1,781,877	2,008,982
25% of Total Hatch and Smith Lever Funds	445,469	502,245
25% of Total Smith Lever/Offset Funds	334,500	390,962
Amount Actually Spent for Multi-State Efforts	14,448	321,870
Twice the 1997 Baseline	-----	28,896

FY 1999 MULTI-STATE RESEARCH PROGRAM (MSRP)

STORRS (CONNECTICUT) AGRICULTURAL EXPERIMENT STATION

RRF #	STATION #	MULTI-STATE RESEARCH PROGRAM (MSRP)	EST. ALLOT-MENTS	STATE OFFSET	TOTAL
NE-59	389	Regional Research Coordination, Northeast Region	\$33,359	\$0	\$33,359
NE-60	715	Genetic Bases For Resistance to Avian	\$11,300	\$6,626	\$17,926
NE-92	646	Integrating Cover Crops, Cultivation and Herbicides to Optimize Weed Control	\$44,226	\$49,848	\$94,074
NE-112	487	Mastitis Resistance to Enhance Dairy Food Safety	\$15,737	\$14,810	\$30,547
NE-127	629	Bio-Physical Models for Poultry Production Systems	\$1,096	\$19,870	\$20,966
NE-138	541	Epidemiology and Control of Emerging Strains of Poultry Respiratory Disease Agents	\$57,206	\$54,452	\$111,658
NE-148	658	Regulation of Nutrient Use in Food Producing Animals	\$11,728	\$49,283	\$61,011
NE-161	602	Changes in Ovarian Function of Association of Fertility with Temporal Domestic Ruminants	\$12,146	\$33,149	\$45,295
NE-164	603	Facilities Engineering for Controlled Environment and Greenhouses	\$29,754	\$11,553	\$41,307
NE-165	607	Private Strategies, Public Policies and Food System Performance	\$1,196	\$14,843	\$16,039
NE-172	643	Assessment of Nutritional Risk in the Elderly	\$49,809	\$46,685	\$96,494
NE-186	700	Genetic Maps of Aquaculture Species	\$6,594	\$1,657	\$8,251
NC-131	674	Molecular Mechanisms Regulating Skeletal Muscle Growth and Differentiation	\$56,055	\$35,649	\$91,704
W-133	701	Affecting Public and Private Land Benefits and Costs of Resource Policies	\$34,871	\$28,664	\$63,536
		TOTAL	\$365,077	\$367,090	\$732,167

## 5. INTEGRATED RESEARCH AND EXTENSION ACTIVITIES

The first parameter is the development of the highest quality Extension education programs to meet critical needs of society. Such needs are often identified through academic planning processes, and are defined by faculty experiences and findings. To develop high quality programs, the most up-to-date, cutting-edge and innovative research and experience must be used. Faculty must remain current with the research and Extension literature, as well as, the experiential learning in their field(s) of expertise. This requires the devout reading of the literature in key journals and other sources of professional knowledge in one's field. In short, good research drives high quality Extension education programs.

Maintaining an active and interactive relationship with colleagues regionally and nationally to share ideas, results and experiences to keep up on unpublished new findings and results is also essential. The Extension educator takes the best information available from the literature and other sources, gives appropriate credit to others and crafts it into existing programs or into pilot programs tailored to meet the needs of clientele.

The second parameter is the implementation of pilot programs to test effectiveness, determine weaknesses and relative success. This is usually accomplished in conjunction with a small group of early innovator clientele, who are willing to take limited risks by trying new programs or ideas so that they stay on the cutting edge of change in their field and obtain competitive advantages of early adoption among their peers. Pilot programs will show the holes that need to be filled before the program can be fully implemented. The Extension educator looks more closely into the literature for the answers, seeks the assistance of researchers, and/or may conduct the applied research to fill the program holes with the needed knowledge. The enhanced program is again field tested and evaluated.

During all stages of program implementation, the third parameter (thorough evaluation) is needed. Evaluation is the process used to determine to what degree a program has met the critical need(s) and goals for which the program was implemented. Good evaluation is often the difference between the most and least successful programs. Well planned evaluations are most likely to yield information and answers in the form of results, accomplishments, impacts, outcomes and changes in behavior. Lower levels of evaluation primarily document activities and general information, upon which program success can not be adequately based or supported. Evaluation provides feedback for making continual refinements and enhancements leading to program excellence over time.

Quality reporting is the fourth parameter of success. Reporting is the presentation of results and impacts for sharing with and influencing decision-makers and others. Results must answer the question "why" a program was developed and implemented. Impacts achieved must be of sufficient quality and importance to satisfy the "so what" question often asked by decision-makers. Reports and impact sheets must adequately answer both the "why" and "so what" questions for programs or projects to be deemed successful, valuable and worthy of support. Without quality results and impacts there is little that is reportable or marketable to establish program success, continued need, value and accountability. Programs without good reporting of results and impacts are "at risk" of becoming casualties of reduced or eliminated support as resource reallocation decisions are based on program potential, excellence and new opportunities. Reports and impact sheets directed to funders and other decision-makers to satisfy requirements of financial support are not generally considered to be scholarly works. The information and findings within such reports, however, can be reformatted, further developed and presented in scholarly works, such as those presented in the examples below.

Scholarship, the fifth parameter of the model for successful Extension programs, is a key process, in which results are shared with others through the literature and other knowledge-based vehicles. Scholarship can be defined as the creation of new knowledge or products that are communicated to others. Scholarship can be achieved in the three component areas of the Land Grant University Mission of teaching, research and service. Faculty draw from the literature for program development and enhancement. Likewise, faculty have an obligation to contribute to the literature base through their scholarship.

Functionally, scholarship is directed primarily to clientele groups and peers. Extension faculty/staff have external and internal clientele and peer groups. External clientele include those outside the University who participate in Extension programs to enhance their lives, the lives of others and their surroundings. Some examples of scholarly products targeting primarily external clientele include: fact sheets, newsletter and newspaper articles, new software programs, new curricula, training manuals, Extension bulletins, slide sets, videos, and World Wide Web sites.

Decision-makers, such as legislators (state and federal), other funders and partner organizations are also external clientele.

External peers look to scholarship through the literature base and other vehicles to enhance their knowledge and understanding to further develop thinking, concepts and programs. Peers are often called upon to evaluate the quality of faculty/staff work and scholarship through peer review publication processes and through promotion tenure and reappointment reviews.

Internal clientele include University administrators and the Board of Trustees. These clientele approve and allocate institutional resources and conduct performance reviews in support of the strategic plans or academic plans of the University as implemented at the College, Department/Unit levels. Internal peers also provide significant input and recommendations through the PTR process.

Scholarship has been identified as one of the five key academic goals established by the current Strategic Plan for the University of Connecticut. Scholarly production is a common benchmark for faculty/programmatic staff performance at major universities, such as the University of Connecticut. Scholarship is a key way in which program quality and results can be presented, evaluated, shared and used. Scholarly products targeting internal clientele are often the same or similar to those developed for sharing with external peers. Some examples of scholarly works targeting peers include: published books, peer reviewed journal articles, abstracts and proceedings of presentations at professional society meetings.

The sixth parameter in the proposed Extension model for success is grantsmanship, which is the process of obtaining external funding in support of program development and/or enhancement. Grantsmanship provides an opportunity to garner additional or new resources to meet needs consistent with the missions of both the grantor and the grantee. External funds provide resources to pursue new knowledge, find solutions to needs and to more fully develop new opportunities. Faculty with a strong history of translating previous results and impacts into scholarly products are most likely to be successful in grantsmanship, especially when preliminary results related to the grant topic can be included in the proposal.

Grantsmanship often completes or starts the feedback loop in the Extension model for success as presented here. External funding frequently provides the support in pursuit of parameters 1 (the development or enhancement of the highest quality Extension outreach education programs to meet critical needs of society) and 2 (program evaluation). Strong program evaluation yields results, impacts and accomplishments that can be developed into reports and impact sheets used for marketed in support of maintained or increased program funding. Good scholarship leads to enhanced programming and increased success in grantsmanship, which further drives program development and enhancement. All six success parameters are interactively linked.

Integrated research and Extension activities are reported under each program goal as noted earlier. In addition, documentation of integration between units within Connecticut is documented by the attached letter.

	FY 1997	FY 1999
Hatch Funds and Offset Total	443,874	445,132
Smith Lever Funds and Offset Total	1,338,003	1,563,850
Total Hatch, Smith Lever and Offset	1,781,877	2,008,982
25% of Total Hatch and Smith Lever Funds	445,469	502,245
Amount Actually Spent for Multi-Function Activities	2,353,815	2,179,209

PLEASE NOTE: All Smith Lever funds reported do not include the penalty mail allocation and the required match.



University of Connecticut  
*College of Agriculture and Natural Resources*

Cooperative  
Extension System

July 1, 1999

TO: Colien Hefferan  
Acting Administrator, CSREES

FROM: John Anderson, Director  
Kirklyn M. Kerr, Dean and Director

RE: 1999 CSREES Plan of Work

As Directors of the Connecticut Agricultural Experiment Station and the University of Connecticut - Storrs Agricultural Experiment Station and the Connecticut Cooperative Extension System, we hereby certify that at least 25% or \$1,928,915 of Hatch funds and Smith Lever funds and their required offset are spent in support of integrated cooperative research and extension activities.

*An Equal Opportunity Employer*

1376 Storrs Road, U-134  
Storrs, Connecticut 06269-4134

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web: [www.canr.uconn.edu](http://www.canr.uconn.edu)

## APPENDIX

March 26, 1999

TO: CANR Faculty and Program Staff  
FROM: Kirklyn M. Kerr  
Dean and Director  
RE: College Academic and Academic Support Planning

The weather in January prevented us from holding the Annual College Faculty and Professional Staff Conference and thus, initiating the Academic and Academic Support Planning process. As you are aware, it is time to develop the next five-year plan for the College. The due date for these plans is May 1, 1999. Once the plans are received, the Dean's Office will sort by team, unit and department. Copies will then be returned to department heads and unit leaders for their use in further developing the College Academic and Academic Support Plan with College program teams and departments. The May 1st deadline will allow us to meet the federal deadline for a plan of work to be submitted by June 1st. No federal dollars will be received for Hatch or Smith Lever funding without an approved plan in place. The 1998 Farm bill authorized USDA, our federal partner, to require a five-year plan of work for Extension and research. Since our College Academic and Academic Support Plan is based on the needs of the state and the interests of our faculty and program staff, we will use the same process to develop both plans.

As we move forward with our planning process, we should keep in mind the USDA/CSREES five strategic goals and the academic goals for the University as identified by Chancellor Emmert. Both the USDA and the University goals are outlined in Attachment B.

Our College process, in addition to processes used in our departments and units, is based on the concept of working in teams on three tiers.

- 1) The first tier is the individual faculty or staff member working with his or her graduate students, volunteers, external partners and/or other faculty and staff in their area of interest or expertise.
- 2) The second tier team is a small group of faculty and/or program staff working together on a specific area of interest such as climate, home environment, poultry, or IPM.
- 3) The third tier is what we have called College program teams. These teams are multi-disciplinary and multi-functional (teaching, research, and Extension). Serving on a College program team is voluntary and is a choice made by faculty and program staff. Some faculty and staff serve on more than one College program team. Department heads or unit leaders serve as administrative advisors to program teams. Current College program teams as listed on the College organizational chart are identified as Attachment A.

The first step in our College Academic and Academic Support Planning process is for each faculty and program staff person to develop their own plans. Attached is an outline for the planning process. Each person should develop three plans--one for you as an individual for tier one, one for your plan on tier two teams, and one for your plan on tier three College program teams.

While a copy of the outline is attached to this memo, you will also receive electronically a copy of this letter and the plan outline. Plans should be submitted electronically as a word document, labeled by your last name and first initial. Please use only a standard Times New Roman font size 10 and submit to the College share drive at the following address: s:share/academic plan.

In addition to this memo, department heads and unit leaders will be receiving a packet of support materials to use in developing the plans. The packet will include: the University's Strategic Plan; the Guidelines from USDA for developing a Plan of Work; the Northeast Research and Extension Program Framework, summary of the Connecticut Agriculture Forum held on February 24, 1999, and the Issues to Action document developed by the Board on Agriculture of NASULGC.

The new federal plan requires us to document our work across state lines either on a regional or national basis. In order to easily document what each of you are doing, we are asking that you also complete the attached form indicating the percent of time which you spent working on events, activities, papers, projects, which were with faculty or staff from other states. These forms are also due May 1st.

Another critical component of the new federal Plan of Work process is gathering stakeholder input. This process is being conducted in a variety of ways. The Extension Councils around the state are planning to hold listening sessions. We encourage each College program team to consider a way to gather input from those people who either use or might use our programs. The plan for stakeholder input will be part of our USDA plan. The actual stakeholder input received will be included as an integral component of our College Academic and Academic Support Plan.

We realize this letter is lengthy. We have tried to keep the process as simple as possible for everyone. The key points are as follows:

- All faculty and program staff should complete and submit three plans. One for each of the three tiers of teams--individual, small group and College program teams.
- Plans are to be submitted electronically no later than May 1, 1999. Everyone should also submit a hard copy of the form documenting multi-state work.
- The Multi-State activities form documenting 7/1/98-6/30/99 is to be completed and submitted no later than May 1, 1999.

Should you have any questions or concerns, please discuss them with your department head, unit leader or Dr. Bull. Dr. Singha, Dr. Bull or myself would be happy to meet with faculty by department or team to discuss this process. We will continue this discussion at the May 17, 1999 Faculty and Professional Staff Conference. This first step in our planning process is the most involved and important. From here on, it should be relatively easy for faculty and program staff.

Thank you for your support and efforts on behalf of the College.

UNIVERSITY OF CONNECTICUT  
COLLEGE OF AGRICULTURE AND NATURAL RESOURCES  
ACADEMIC AND ACADEMIC SUPPORT  
STRATEGIC PLANNING PROCESS  
FISCAL YEARS 2000-2005

Please limit your response to each item to no more than one paragraph.

1. Your Name \_\_\_\_\_

2. Title of Program Area \_\_\_\_\_

3. Level of Plan Being Submitted

College Team Plan (Name of Team) \_\_\_\_\_

Small Group Plan (Name Group Members) \_\_\_\_\_

Individual Plan \_\_\_\_\_

4. Statement of Issue indicating Significance of Issue and Justification for Program. Please provide information on the significance of this issue. Supportive data and a short reference should be included. Explain who will benefit and how. Write for only one of the following areas.

Academic Program Focus:

Cooperative Extension System Focus:

Research Focus:

5. Anticipated Measures of Success or Impact (such as research results anticipated, grant dollars received, change in knowledge or behavior of program participant, etc.)

6. Outcome Products Desired (such as peer reviewed articles, Extension publications, exhibits, awards, video tapes, radio productions, etc.)

7. Resources/Partners (Internal and External Linkages). List no more than the top five or six partners with whom you will work and how they may contribute to the project. Include grants received, agencies/organizations, businesses collaborated with in program delivery or development. If working on a multi-state basis, indicate with an (MS).

8. Program or Project Description/Key Components including duration.

9. Strategies/Methods. Identify audiences, educational methods used, number of attendees, research strategy.

10. Target Audiences for the program or project effort.

11. Evaluation Techniques. How will you assess if learning occurred or if results occurred? For Extension, this should include at least one plan for a six-month or one-year follow-up of an educational effort to assess change which occurred as a result of your efforts.

12. Staff Development Needs. This should be for yourself or for your team not for the "public."

13. Resource Needs (such as financial support, staff, program materials, facilities, etc.)

14. As we gather stakeholder input into the College Plan, who is one person, within your circle of acquaintances, to whom you think we should speak?

All Plans are due to Dr. Bull no later than May 1, 1999. Plans should be submitted to the College share drive at s:share/academic plan. For questions on how to access the share drive and submit the document, please contact Tom Corso at 486-0146.

The Report of Multi-state Activities must be submitted in hard copy only.

REPORT OF MULTI-STATE ACTIVITIES  
 UNIVERSITY OF CONNECTICUT  
 COLLEGE OF AGRICULTURE AND NATURAL RESOURCES  
 1999 PLAN OF WORK

Your Name: \_\_\_\_\_

Program Area (such as 4-H, FCS, Ag, Nat Res) in which multi-state work occurred: \_\_\_\_\_

From 7/1/98 to 6/30/99, I spent \_\_\_\_\_ days OR \_\_\_\_\_ percent of my work time was committed to Extension/educational programs or research projects, which utilized one or more of the multi-state methodologies listed below.

Signature: \_\_\_\_\_

Date signed: \_\_\_\_\_

Multi-state is defined as using any one or more of the following methodologies to work with Research or Extension professionals in other states. These states may or may not be located in the northeast.

Methodologies include but are not limited to: writing publications, joint appointments between states, symposiums, workshops, sharing of specialists, contracts, assessments, web page design work, regional research projects, research coordinating projects, national or regional meetings, peer review of materials, sabbaticals, guest lectures, regional leaders training, national 4-H events, distance education, shared diagnostic labs, data pooled for national impacts, professional association commitments, federal cooperators located out of state, grower meetings, work with non-governmental organizations (NGOs).

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For CANR Business Office Use Only

FRS Account	% Time	Total
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

## ATTACHMENT A

### College Program Teams:

Agricultural Biotechnology  
Aquaculture  
Dairy/Livestock  
Economic Viability  
Family and Community Development  
Food, Food Safety and Health  
4-H Youth Development  
Integrated Crop Management  
Water Resources  
Wildlife Resources

## ATTACHMENT B

### University Strategic Plan/Academic Goals

- Be the university of first choice for undergraduates by providing an educational experience second to none.
- Provide professional education at the forefront of each field, with particular emphasis on those professions of importance to Connecticut and the nation.
- Conduct world-class research/scholarship and Ph.D. education through selective excellence, focusing resources in those areas where we can attain true national and international distinction.
- Be active partners with government, industry, and the citizenry in the promotion of the economic, social, and cultural development, not only of the State of Connecticut but beyond.
- Create an inclusive environment, reflective of the diversity of our citizenry, which welcomes and supports all those with the ability and willingness to join the University.

### USDA/CSREES (Cooperative States Research, Education and Extension Service) Goals

1. An agricultural system that is highly competitive in the global economy.
2. A safe and secure food and fiber system.
3. A healthy, well nourished population.
4. An agricultural system which protects natural resources and the environment.
5. Enhanced economic opportunity and quality of life for Americans.

Other sources of assistance include the USDA web site which is <http://www.reeusda.gov> then click on "About CSREES" and then on "GPRA" or go to the GPRA Home Page at <http://www.reeusda.gov/part/gpra/gprahome.html>. Other documents are available at the ESCOP home page <http://www.escop.msstate.edu> in the "ESCOP Workroom."

## STAKEHOLDER INPUT PROCESS SURVEY

COLLEGE TEAM PLANS	CONTACT
<b>Agricultural Biotechnology</b>	
Gerald Berkowitz	Dr. Thomas Chen, Dr. Steven Geary, Dr. Yi Li
Mark Brand	Edward Sossman
Mark Bridgen	Mr. Mike Emmons, Prides Corner Nursery, Lebanon, CT
Antonio Garmendia	Dr. John Reddington (DiagXotics, Wilton, CT)
Yi Li	Dr. C.S. Prakash, Center for Plant Biotechnology Research, Tuskegee University
Kristin Schwab	Representatives from agriculture, community officials, business and industry, DEP, Land Grant Association
Lawrence Silbart	Dr. Steven Geary
Xiangzhong Yang	Professor R.H. Foote, Cornell University (UConn Alumna)
<b>Aquaculture</b>	
Richard French	Dr. Herb Whiteley (CANR Aquaculture Subcommittee Chair)
Lance Stewart	Ernest Beckwith, DEP Fisheries Director, Hartford, CT
<b>Dairy/Livestock</b>	
Sheila Andrew	Mr. Robin Chesmer, Graywall Farm, Lebanon, CT
Jim Dinger	Dr. Harry Hartley, Past President of UConn
Steven Geary	Dr. Lawrence Celebrate, Dr. Philip Marcus, Dr. Margaret Sekellick, Dr. Antonio Garmendia
Dennis Hill	Dr. Walter Hyde, Iowa State University
Mazhar Khan	Dr. Herbert Whiteley
Joyce Meader	John Breakell, CT Pork Producers Assn., 54 Bare Hill Road, Goshen, CT 06756 (860) 491-2243
Richard Meinert	John Briscoe, Red Mountain Agricultural Services, 20 Red Mountain Road, Lakeville, CT 06039 (860) 435-6345
Paul Stake	Mr. Charles Rowland, President, CT Pork Producers Assn., Oxford, CT (203) 888-1599
<b>Economic Viability</b>	
John Alexopoulos	Community officials involved in land use planning
Marilyn Altobello	John Wadsworth, Charter Boat Captain, Niantic
Norman K. Bender	Ernie and Sandy Staebner, Blue Slope Farm, Franklin, CT
Stephen Broderick	John Hibbard, Executive Director, CT Forest & Park Assn., Rockfall, CT (860) 346-CFPA
Ronald W. Cotterill	Senator Charles E. Schumer
Annette FitzGerald	Sue Kelly, Chair of CCCE, Consumer Credit Counseling of CT, 111 Founders Plaza, Suite 1400, East Hartford, CT 06108 (860) 282-2000 ext. 3131; Donna Devino, Community Relations, Connecticut Light and Power, P.O. Box 2030, Waterbury, CT 06722-2030 (860) 597-4292
Kenneth Hadden	Linda Bowers, Land Trust Service Bureau, The Nature Conservancy, Middletown
Linda Lee	Commissioner Shirley Ferris
Tsoung-Chao Lee	Dr. Henry Bahn of ECS
Rigoberto Lopez	Paul Newman, Westport
Peter Miniutti	Community officials involved in community planning and design
Mark Westa	Community officials involved in land use planning
Thomas Worthley	John Hibbard, CT Forest and Park Assn. (860) 346-2372
<b>4-H Youth Development</b>	
Emily Alger	Carol Birdsey, D.J. Shaw, Dick Woolam, Matt Belcourt, Paul Rogeleski, Kirstina Frazier, Margie Rausch
Dave Colberg	Board of Directors and Education Director, Mystic Aquarium, 55 Coogan Blvd., Mystic, CT 06355
Bari Dworken	Jim Logee, President - Windham County 4-H Foundation
Carole Eller	Donald Beebe
Diane Lis	Sylvia Murray, 294B Cossaduck Hill Road, North Stonington, CT 06359 (860) 889-7777 (4-H volunteer leader, President of Sheep Breeders Association)
Harry Mangle	Susan MacKay, Educational Outreach, CPTV
Laura Marek	Sharon Gomes, Volunteer Board Member, Litchfield County Extension Service Association
Ede Valiquette	State Rep. Lewis J. Wallace, Jr. (109 <sup>th</sup> District), Legislative Office Bldg., Rm. 4027, Hartford, CT 06106-1591 (860) 8585 - Serves on Education and Environment Committees and Chairs the Internship Committee
<b>Family &amp; Community</b>	
Angela D. Caldera	Miriam Mercado, Director of Family Center Hispanic Community, Program of Catholic Family Services
Cheryl Czuba	Mary Ann Poinell
Lynne Grant	State Rep. Lewis J. Wallace, Jr. (109 <sup>th</sup> District), Legislative Bldg., Rm. 4027, Hartford, CT 06106-1591 (860) 240-8585 - Member of Education, Environment and Internship Committees

Faye Griffiths	State Agency Heads, Departments of Children & Families and Social Services
Wanda Little	Frank Milone, Program Manager, Regional Workforce Dev. Board, 560 Ella T. Grasso Blvd., New Haven, CT 06519 (203) 624-1493
Cathy Malley	Pat Goldman, Danbury Commission on Child Care, Rights and Abuse, (203) 748-4542
Maureen Mulroy	Nancy Bull or Charlie Super
Rosemary O'Neill	Patricia Brewer, RSM, Ph.D., Director - Trust House
<b>Food Safety Health</b>	
Linda Drake	Frank Rich, Gloria McAdam, Christine O'Rourke (all at Foodshare)
Cameron Faustman	Mr. Robert Furmanski, Mr. Michael Greiner
Sharon Gray	Yvonne Griffin, Hartford Public High School
Carol Lammi-Keefe	Industry (Nestle)
Doris Little	Les Williams - CT Food Bank Outreach
Rafael Perez-Escamilla	Hispanic Health Council, Tracey Weeks, CT Dept. of Public Health, Food Protection Program
Colleen Thompson	Tracey Weeks, CT Dept. of Public Health, Food Protection Program
Kumar S. Venkitanarayanan	Dr. Ian C. Hart, Professor and Head, Animal Science Department
<b>Integrated Crop Management</b>	
Richard Ashley	James Futtner
T. Jude Boucher	Randy Blackmer, President of Farm Bureau
Donna Ellis	Patricia Douglass, USDA-APHIS Plant Protection & Quarantine State Plant Health Director (203) 269-4277
Norman Gauthier	Cooperative Extension Councils, CT Pomological Society
Dana Karpowich	Dr. Richard Ashley
Ana Legrand	Knox Parks Foundation, CT Northeast Farming Assn. and farms involved in Community Supported Agriculture
Lorraine Los	Mr. Jonathan Bishop, Bishop's Orchard, Route 1, Guilford, CT
Leanne Pundt	Mr. Robert Heffernan, Executive Director, CT Greenhouse Growers Assn., P.O. Box 415, Botsford, CT 06404 Telephone (203) 261-9067
<b>Water Resources</b>	
Chester Arnold	Fred Banah, CT DEP Water Bureau
Karen Godin	Charlene Cutler, Exec. Director, Quinebaug-Shetaucket Heritage Corridor, P.O. Box 161, Putnam, CT 06260 (860) 963-7226 e-mail quinebaug_shetucket_nhc@nps.gov
Karl Guillard	Fred Banach, CT DEP (860) 424-3020
Roy Jeffrey	Larry Van Der Jagt
Carl Salsedo	Larry Van Der Jagt
Lance Stewart	Ernest Beckwith, DEP Fisheries Director, Hartford, CT
Hugo Thomas	Arthur Rocque, Commissioner of Environmental Protection
<b>Wildlife Resources</b>	
John Barclay	Ed Parker, Chief, Bureau of Natural Resources, CT DEP
Sylvain De Guise	Jack Barclay
Salvatore Frasca Jr.	Dr. Jack Barclay
Herb Whiteley	Dr. David St. Aubin
<b>INDIVIDUAL PLANS</b>	
<b>Agric. &amp; Resource Economics</b>	
Marilyn Altobello	Dwight Merriam, Attorney - Robinson & Cole, Hartford, CT
Ronald W. Cotterill	Jim Fishkin, Bureau of Competition, FTC
Kenneth Hadden	Linda Bowers, Land Trust Service Bureau, The Nature Conservancy, Middletown
Tsoung-Chao Lee	Dr. Henry Bahn of ECS
Rigoberto Lopez	Paul Newman, Westport
<b>Animal Science</b>	
Sheila Andrew	Mr. Jack Collins, Collins Powder Hill Farm, Enfield, CT
Michael Darre	Mr. Gary Proctor (860) 647-7785; Mr. Joe Fortin, Kofkoff Egg Farms (860) 642-7581; Mr. Bill Bell, New England Poultry Association, Inc. (207) 622-3940
Jim Dinger	Dr. Harry Hartley, Past President of UConn
Cameron Faustman	Dr. Andre Senecal
Thomas Hoagland	Charles Rowland, Dr. William Fodor - Alexicon
Rhonda M. Hoffman	Joyce Meader, Emily Alger
Robert Milvae	Jerry Yang
John Riesen	Kim Chambers
Lawrence Silbart	Dr. Steven Geary
Paul Stake	Mr. Ron Robillard, Editor, The Chronicle newspaper, Willimantic, CT (860) 423-8466

Kumar S. Venkitanarayanan	Dr. Ian C. Hart, Professor and Head, Animal Science Department
Xiangzhong Yang	Professor R.H. Foote, Cornell University (UConn Alumna)
Steven Zinn	Sue Driscoll, Principal - Eastford Elementary School, Eastford, CT; Carolyn Tarca, Vet Technical - North Veterinary Clinic, Ashford, CT
<b>CES Unit</b>	
Emily Alger	Linda Zanelli
Norman K. Bender	Nini Davis, Executive Director, Northeastern CT Visitors District, Putnam, CT
Candace Bartholomew	Linda Schmidt, DEP Pesticide Management Division
Stephen Broderick	John Hibbard, Executive Director, CT Forest & Park Assn., Rockfall, CT (860) 346-CFPA
T. Jude Boucher	Randy Blackmer, President of the Farm Bureau
Angela D. Caldera	Maria Colon, Teacher for Special Project 1 <sup>st</sup> and 2 <sup>nd</sup> grade intergraded program, Maria Sanchez School, Hartford
Dave Colberg	Superintendent, Windham/Willimantic School System
Cheryl Czuba	Deborah Zipkin
Mohamed Dhinbil	Edmond Marrotte
Bari Dworken	Mary Drexler, President-Elect, CT Conference on Volunteerism Regional Director, INFOLINE 2-1-1, North Central Region
Carole Eller	Elizabeth Brown, Commission on Children (860) 240-0042
Karen Filchak	Beverly Tuttle
Annette FitzGerald	Janice Hollywood, 595 Prospect Road, Waterbury, CT 06706 (203) 755-7227 Maureen Barber, 2890 Colebrook Road, Winsted, CT 06098 (860) 738-7025/(860) 482-8562
Mary-Margaret Gaudio	Owen Humphries, Coordinator Lead Poisoning Prevention Education Program, Hartford Health Department (860) 547-1426 x7186
Shihan J. Ghazi	Senator Eric Coleman
Charles J. Gibbons Jr.	Jim Murphy, Special Asst. to Deputy Commissioner of CT DEP
Karen Godin	Charlene Cutler (info. listed above under Water Resources Team)
Lynne Grant	Maria Cinte-Lowe, Executive Director, Hispanic Center of Greater Danbury, 87 West Street, Danbury, CT 06810 (203) 798-2855
Pamela Gray	Pat Weingart, 4-H Leader, Franklin, CT
Sharon Gray	Lynn Skene Johnson, Birth to Three Program Manager, Wallingford, CT; Robert Greenstein, MD Director of Genetics Dept., CT Children's Medical Center; Karen Austin, RN, Project Learn, Old Lyme, CT
Faye Griffiths	Involve employers through their human resources and employee assistance programs
Diane Wright Hirsch	Michael Hiza, Food Service Management Program, Manchester Community Technical College
Roy Jeffrey	Larry Van Der Jagt
Dana Karpowich	Dr. Richard Ashley
Latif Lighari	Home Horticulture Team Leader
Doris Little	Luberta Sims, a grandparent from Varick Support Group
Wanda Little	Frank Milone, Program Manager, Regional Workforce Development Board, 560 Ella T. Grasso Blvd., New Haven, CT 06519 (203) 624-1493; Robert Page, Executive Director, Dixwell/Newhallville Community Mental Health Services, 660 Winchester Avenue, New Haven, CT 06511 (203) 776-8390
Leslie MacLise-Kane	Input from the local stakeholders is provided through the design of the project by incorporating broad membership in the watershed committees from the communities involved.
Cathy Malley	Ruthie Brown, NEON (Norwalk Economic Opportunity Now) - (203) 831-5517
Harry Mangle	Don Beebe, President of the New London 4-H Foundation
Laura Marek	Bob Burden, President - Litchfield Country 4-H Foundation
Joyce Meader	Moses Taylor, Eastern CT RC&D, 24 Hyde Avenue, Vernon, CT 06066
Richard Meinert	Joe Wettemann, DEP Water Management Bureau, 79 Elm Street, Hartford, CT 06106-5127 (860) 424-3803
Rosemary O'Neill	Preschool Intervention Program - Rose Flores, Parent Educator; Kathy Liner, Program Coordinator
Heather Smith Pease	Salvation Army Community Services, Director Milagros Marrero
Michael (Sandy) Prisløe	Linda Krause, Executive Director, CT River Estuary Regional Planning Agency, Old Saybrook, CT (860) 388-3497
Leanne Pundt	John Casertano, Casertano Greenhouses & Farms, 1030 South Meriden Road, Cheshire, CT 06410 (203) 272-6444
Cheryl Rautio	Ann Ross
Robert Ricard	Fred Borman, Urban Forester, CT DEP, Division of Forestry, 79 Elm Street, Hartford, CT 06106-5127 - telephone ((860) 424-3630
Zoraida Rivera	Maria Machado, Hispanic Clinic Mental Health, One Long Wharf, New Haven, CT 06511 Telephone (203) 789-7812
Carl Salsedo	Paul Brown
Lance Stewart	John Volk, Dept. of Agriculture/Bureau of Aquaculture, Milford, CT
Joel Stocker	Fred Banach, CT DEP Water Bureau

Ede Valiquette	Linda McCaffrey, Davis and Hoyt Associates, Brookfield, CT 06804
Mary Ellen Welch	Joan Brown, Maternal Child Health Nurse, Navy Family Service Center, Groton (860) 694-3383
Thomas Worthley	Dan Donahue, Natural Resources Consultants, Ashford, CT (860) 429-4958
<b>Natural Resources Mgmt. &amp; Eng.</b>	
John Barclay	Drew Major, Contaminants Specialist, Northeast Region, U.S. Fish & Wildlife Service, Concord, NH; Dr. Sally Richards, Director, Little Harbor Laboratory, Guilford, CT; Greg Chasko, Assistant Director, CT DEP Wildlife Division, Hartford, CT
Daniel Civco	Dr. William Campbell, Head, Applied Info. Science Branch, NASA GSFC, Greenbelt, MD; Dr. Timothy Foresman, Asst. Prof., Remote sensing and GIS, Dept. of Geography & Environmental Systems, University of Maryland-Baltimore County; Mr. Thomas Abbott, Teacher, Environmental Sciences, Coventry High School
Thomas Meyer	Ms. Laurie Boynton, Land Preservation Alliance - e-mail: land.alliance@snet.net
<b>Nutritional Sciences</b>	
Linda Drake	Mark Winne, The Hartford Food System
Hedley Freake	Willimantic Food Coop
Harold Furr	Dr. Richard Clark, Dr. Andrew Clifford
Carol Lammi-Keefe	State Department of Health
Ellen Shanley	Cathy Cobb, CDR, Connecticut Department of Public Health
Colleen Thompson	Susan Fiore, MS, RD State Department of Education, Child Nutrition Programs
<b>Pathobiology</b>	
Sylvain De Guise	Michael Fournier
Salvatore Frasca Jr.	Dr. A. Brian West
Richard French	John Volk (CT Dept. of Ag., Bureau of Aquaculture & Lab., Director)
Antonio Garmendia	Dr. Mike Sheppard (Pfizer, Groton, CT)
Steven Geary	Dr. Lawrence Silbart
Dennis Hill	Dr. Walter Hyde, Iowa State University
Mazhar Khan	Dr. Herbert Whiteley
Herbert Van Kruiningen	Dr. George Kitzes, Crohn's and Colitis Foundation of America
Herb Whiteley	Dr. Steven Cohen
<b>Plant Science</b>	
John Alexopoulos	Dr. John Clausen, Landscape Architecture Group
Richard Ashley	Robin Bellinder
Gerald Berkowitz	Dr. Yi Li, Plant Science
Mark Brand	Jim Costello
Mark Bridgen	Mr. Mike Emmons, Prides Corner Nursery, Lebanon, CT
Donna Ellis	Patricia Douglass, USDA-APHIS Plant Protection & Quarantine State Plant Health Director (203) 269-4277
Norman Gauthier	Norman Gauthier
Karl Guillard	CT Assn. Of Golf Course Superintendents, Inc. (203) 387-0810; Current President - Anthony Grasso, Pautipaug Country Club (860) 822-8597
Ana Legrand	Knox Parks Foundation, CT Northeast Farming Assn. and farms involved in Community Supported Agriculture
Yi Li	Dr. C.S. Prakash, Center for Plant Biotechnology Research, Tuskegee University
Lorraine Los	Mr. Jonathan Bishop, Bishop's Orchard, Route 1, Guilford, CT
Edmond Marrotte	Roy Jeffrey
Harvey Luce	Kipen Kolesinskas, State Soil Scientist, CT and RI, Natural Resource Conservation Service, 16 Professional Park Road, Storrs, CT; Douglas Wysocki, Soil Gemorphologist, National Soil Survey Center, Federal Building, 100 Centennial Mall North, Lincoln, NE 68508-3866
Peter Miniutti	Peter Miniutti
Thomas Morris	Benjamin Freund, farmer in North Canaan
Kristin Schwab	Landscape Architects (Executive Board of the CT Chapter of American Society of Landscape Architects)
Susanne von Bodman	Dr. Clarence Kado, Dept. of Plant Pathology, University of California, Davis
Mark Westa	Landscape Architects (Executive Committee of the State Chapter of the American Society of Landscape Architects)
<b>SMALL GROUP PLANS</b>	
<b>Agricultural Biotechnology</b>	
John Riesen	Jerry Yang
<b>Ag Marketing Policy</b>	
Rigoberto Lopez	Paul Newman, Westport

<b>Agri. &amp; Resource Economics</b>	
Ronald W. Cotterill	Chuck Clark, Farmtek, South Windsor, CT
<b>Aquaculture Education</b>	
Lance Stewart	John Curtis, BRVAS, Bridgeport, CT
<b>Aquatic Animal Health</b>	
Sylvain De Guise	John Volk
Salvatore Frasca Jr.	Dr. David J. St. Aubin, Director of Research & Veterinary Services, Mystic Aquarium
Richard French	Dr. Herb Van Kruiningen (Northeastn Ctr. for Wildlife Diseases Research, Director)
<b>Assn. of Fertility with Temporal Changes in Ovarian Function</b>	
Robert Milvae	Jerry Yang
<b>Child Care</b>	
Carole Eller	Peter Libassi
<b>Consumer Education/Horticulture</b>	
Norman Gauthier	Home & Garden Center Advisory Committee (Roy Jeffrey)
<b>Consumer &amp; Family Economics</b>	
Annette FitzGerald	Lynn and Joel Gordes (former legislator), RFD 4, Winsted, CT 06098 (860) 379-2430
<b>Curriculum Writing</b>	
Thomas A. Hoagland	Keith Barker, Director of the Teaching Institute
<b>Diagnostic Toxicology</b>	
Dennis Hill	Dr. Alan Wu, Hartford Hospital for epinephrine project; Dr. Steven Cohen, School of Pharmacy for acetaminophen project
<b>Economic Viability</b>	
Linda Lee	Commissioner Shirley Ferris
<b>EFNEP</b>	
Angela D. Caldera	Noemi Flores, Director of Family Resource Center – Mary Hooker School, Michael Fox School, Moylan School, Kinsella School
Linda Drake	Jean Kupec, Covenant Soup Kitchen, Willimantic
Sharon Gray	Elizabeth Wheeler, Hartford Food System
Toni Ellis	Aleta Ventre, Willis Diggs, Salvation Army
Rosemary O'Neill	Chair Hall Director, The Afterschool Program
Heather Smith Pease	Services and Basic Human Needs Director, Samuel King; Foodshare, Gloria McAdam
Cheryl Rautio	Kathy Demers
<b>Environmental Health</b>	
Lawrence Silbart	Dr. Steven Geary
<b>Equine Teaching Dairy/Livestock</b>	
Jim Dinger	Dr. Harry Hartley, Former UConn President
Rhonda M. Hoffman	Dr. Harry Hartley, Former UConn President
<b>4-H Youth Development</b>	
Emily Alger	Don Beebe
Norman K. Bender	Allen Bernien, Milford Boat Works, Milford, CT
Harry Mangle	Barbara Hegenbart, Administrator – Meriden Family Resource Center
Laura Marek	Kathie Rogaleski, 4-H Volunteer Leader, Litchfield County
Ede Valiquette	Kathy Smith, Community Resource Center, 1 School Ridge Road, Danbury, CT 06811
<b>Family and Consumer Economics</b>	
Lynne Grant	Beverly Tuttle, President, Consumer Credit Counseling Service of CT, 111 Founders Plaza (Suite 1400), East Hartford, CT 06108 (860) 282-2000
<b>Food Microbiology</b>	
Kumar S. Venkatarayanan	Dr. Ian C. Hart, Professor and Head, Animal Science Department

<b>Food Safety</b>	
Diane Wright Hirsch	Jonathan Bishop, Bishop's Orchards, Guilford
<b>Forest Management</b>	
Tsoun-Chao Lee	Donald H. Smith Jr.
<b>Integrated Pest Management</b>	
Ana Legrand	Knox Parks Foundation, CT Northeast Farming Assn. and farms involved in Community Supported Agriculture
Lorraine Los	Mr. Jonathan Bishop, Bishop's Orchard, Route 1, Guilford, CT
<b>Int'l Environ. Degradation</b>	
Kenneth Hadden	Linda Bowers, Land Trust Service Bureau, The Nature Conservancy, Middletown
<b>Land Use &amp; Water Quality</b>	
Charles J. Gibbons Jr.	Fred Banach, CT DEP Water Bureau
Karen Godin	Charlene Cutler (info. listed above under Water Resources Team)
Michael (Sandy) Priscoe	Linda Krause, Executive Director, CT River Estuary Regional Planning Agency, Old Saybrook, CT (860) 388-3497
<b>Landscape Architecture</b>	
John Alexopoulos	Community officials involved in community planning and design
Peter Miniutti	Community officials involved in community planning and design
Kristin Schwab	Community officials involved in community planning and design
Mark Westa	Community officials involved in community planning and design
<b>Livestock Health Care</b>	
Thomas Morris	Bob Balfe, Ellington, CT
<b>Livestock Management</b>	
Paul Stake	Ms. Sylvia Murray, President, CT Sheep Breeders Assn., North Stonington, CT (860) 889-7777
<b>Livestock Production</b>	
Thomas Hoagland	Charles Rowland, Dr. William Fodor
<b>Marine/Envir. Science for Youth</b>	
Wanda Little	Elizabeth Gambardella, Exec. Dir., Farnam Neighborhood House, 162 Fillmore Street, New Haven, CT 06513 (203) 562-9194; Kaye Harvey, Exec. Dir., Hill Cooperative Youth Services, 158 Carlisle Street, New Haven, CT 06519 (203) 624-4108
<b>Master Gardener Program</b>	
Roy Jeffrey	Larry Van Der Jagt
<b>Mastitis and Milk Quality</b>	
Sheila Andrew	Dr. George Saperstein, Tufts University School of Veterinary Medicine, Woodstock, CT
<b>Meat Food Science</b>	
Cameron Faustman	Mr. Robert Furmanski, Mr. Michael Greiner
<b>Multiplex PCR/Shellfish Diseases</b>	
Mazhar Khan	Dr. Herbert Whiteley
<b>Natural Resources &amp; Land Use</b>	
Stephen Broderick	Donald Francis, First Selectman, Brooklyn (860) 779-3411
<b>New Plant Development</b>	
Mark Bridgen	Mr. Mike Emmons, Prides Corner Nursery, Lebanon, CT
<b>Nutrient Management</b>	
Thomas Morris	Nate Cushman, Franklin, CT
<b>Nutrition Education &amp; Training</b>	
Ellen Shanley	Susan Fiore, MS, RD, Connecticut Department of Education, Child Nutrition Programs
Colleen Thompson	Susan Fiore, MS, RD, State Department of Education, Child Nutrition Programs
<b>Nutrition &amp; Metabolic Hormones</b>	

Hedley Freake	Bill Johnson, Assistant Superintendent, Windham Public Schools
Steven Zinn	Lori Reynolds, Teacher, Eastford Elementary School, Eastford, CT; Catherine Eckleston, Vet Technician, North Veterinary Clinic, Ashford, CT
<b>Nutritional Risk Children</b>	
Ann Ferris	Georgine Burke, Ph.D. Assoc. Director of Research, CT Children's Medical Center and Director of the Aetna Child Health Project
<b>Ornamental Nursery Plant</b>	
Gerald Berkowitz	Dr. Mark Brand
Mark Brand	Mark Sellew
<b>Pathogenesis of Chicken Virus</b>	
Mazhar Khan	Dr. Herbert Whiteley
<b>Parent Education</b>	
Cathy Malley	Fran Rosato, Community Resource Center, Danbury, CT (203) 797-4897
Mary Ellen Welch	Barbara Macauley, GATEWAYS Program Coordinator, Middletown, CT (860) 343-3871
<b>People Empowering People</b>	
Faye Griffiths	Karen DeVito, Coordinator, Section 8 Program, Milford Housing Authority, P.O. Box 291, Milford, CT 06460
<b>Plant Biotechnology</b>	
Yi Li	Dr. C.S. Prakash, Center for Plant Biotechnology Research, Tuskegee University
<b>Poultry Manure Management</b>	
Joyce Meader	Harvey Polinsky, State Director, Farm Service Agency, 218 West Town Street, Norwich, CT 06360 (860) 887-9941
<b>Rapid Molecular Diagnostic Tests</b>	
Mazhar Khan	Dr. Herbert Whiteley
<b>Recombinant Vaccine for Infectious Bronchitis Virus</b>	
Mazhar Khan	Dr. Herbert Whiteley
<b>Repro Physiology and Biotech.</b>	
Xiangzhong Yang	Professor R.H. Foote, Cornell University (UConn Alumna)
<b>Residential River Stewardship</b>	
Karen Filchak	Maria Storm
<b>Role of Toroviruses in Diarrheal Diseases of Animal and Man</b>	
Herbert Van Kruiningen	Dr. Donald Lein, Cornell University, College of Veterinary Medicine
<b>Rural America Project: Ag in NE</b>	
Marilyn Altobello	Denise Schlener, Executive Director, CT Nature Conservancy, Middletown
<b>Soma Axis/Oocyte Competence</b>	
Steven Zinn	Kathleen Blais, Director of Pupil Services, Eastford Elementary School, Eastford, CT; Patty Dietrich, Vet Technician, North Veterinary Clinic, Ashford, CT
<b>Sustainable Landscapes</b>	
Carl Salsedo	Frank Stenta
<b>Turf/Agronomy</b>	
Derek Allinson	S. Singha
<b>Turfgrass Management</b>	
Karl Guillard	Stan Zaramba CT DEP (860) 424-3730
Dana Karpowich	Dr. Richard Ashley
<b>USDA NE-172 Regional Project</b>	
Carol Lammi-Keefe	The food industry

<b>Vaccine Research</b>	
Steven Geary	Dr. Lawrence Silbart, Dr. Philip Marcus, Dr. Margaret Sekellick, Dr. Salvatore Frasca
<b>Vegetable ICM</b>	
Richard Ashley	David Anderson
<b>Vet Diagnostic Lab</b>	
Herb Whiteley	Commissioner Shirley Ferris
<b>Viral Patho &amp; Immunology</b>	
Antonio Garmendia	Dr. William Smith (USDA, Sutton, MA)
<b>Water Quality</b>	
Chester Arnold	Fred Banah, CT DEP Water Bureau
Laurie Giannotti	Fred Banah, CT DEP Water Bureau
Leslie MacLise-Kane	Input from local stakeholders is provided through the design of the project by incorporating broad membership in the watershed committees from the communities involved.
Thomas Morris	Members of the Branford Land Trust
Joel Stocker	Fred Banach, CT DEP Water Bureau
<b>Watershed Project/Wildlife Mgmt.</b>	
Thomas Worthley	Jon Modica, Watershed Committee Member, Coverts Cooperator, Property Owner, Land Trust Member, East Haddam (860) 873-9003
<b>Wildlife Diseases</b>	
Herbert Van Kruiningen	President, Ducks Unlimited
<b>Youth Development</b>	
Bari Dworken	Alfred Mannebach, Professor Curriculum & Instruction, UConn School of Ed.
Cheryl Czuba	Thomasina Clemons