Cornell University
FY00 Annual Report for Agricultural Research and Extension Formula Funds

Cornell University Agricultural Experiment Station
NYS Agricultural Experiment Station
Cornell Cooperative Extension
College of Agriculture and Life Sciences
College of Human Ecology
College of Veterinary Medicine

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FY2000 Annual Report
Cornell University

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Background

Planning Option: Statewide activities -- integrated research and extension plan.

Period Covered: October 1, 1999 through September 30, 2000

Program Definition and Scope

This report directly reflects our approved plan of work. As indicated in our approved plan, all program descriptions were framed as ongoing major programs. We have not, therefore, separated results into timeframe categories (short-term, near-term, long-term). Data and narrative documentation were collected for the indicators included in our approved plan of work and supplement.

Methodology

A variety of data sources and documentation procedures were used to generate this report. For extension, the primary sources were system-wide annual accountability reports and fiscal and personnel accounting records. The annual reports include participation data, reports against our approved performance indicators, and program impact statements. For research, The CRIS reporting system, annual faculty activity reports, and fiscal and personnel accounting records were the primary sources. Because the multi-state and integrated activity supplements to the plan were approved well into the program year, we had to initiate special data requests to meet these reporting expectations.

Our approach reflects directly the approved plan. For example, as outlined in the plan supplement we used joint extension/research appointments as direct evidence of integrated activity and rely on personnel accounting to do so. In the case of multi-state extension activity, we relied on direct reports by faculty on a project-by-project basis. With final approval of our plan and supplement, we have worked to include appropriate indicators in our project documentation and reporting structures to facilitate reporting in future years. Stable reporting requirements are essential to permit an accurate accounting of our work.

For each of the five goals, we provide indicator, expenditure and effort data to reflect the scope and reach of programming in that area and selected impact statements to convey the nature of that work. For the indicator data, we include results for 2000 followed by the plan of work target result. In reviewing our aggregated FY00 data, we noted that most of the reported research indicators approximate the targets projected in the plan of work. Research expenditure and FTE data for Goal 3 is a notable exception. After reviewing the data, we have concluded that the discrepancy is due to: a) the reclassification of Hatch projects in the CRIS system in 1999, b) refinements in data collection and reporting methodology at the local level, and c) the inadvertent inclusion of Animal Health funds and associated indicators in the original plan of work. Therefore, we will be revising the original targets stated in the approved plan of work and forwarding a supplement to CSREES.

We did not attempt to communicate in detail the work within or across goals. Rather, we selected examples to provide a broad view of our efforts related to the goal. This approach is best illustrated by our use of impact statement data. Impact statements are solicited annually from research and extension faculty and off-campus educators. We received 336 statements for year 2000 from which the examples included in this report were chosen. The scope of reported results was very broad. An approximate allocation of the impact statements to the themes identified by CSREES within the five national goals appears in Appendix A. (Note that the total allocated statements is greater than 336 because some statements addressed more than one theme.) A complete

title listing of the statements appears in Appendix B. For this report, rather than including all statements, we have selected a small number to illustrate primary themes within each goal.

It should be noted that the impact statements included reflect both federal formula funds and associated matching and/or supplemental funding. In most cases, Smith-Lever and Hatch funding is significantly enhanced by other sources in carrying out any given project.

GOAL 1 – AN AGRICULTURAL PRODUCTION SYSTEM THAT IS HIGHLY COMPETITIVE IN THE GLOBAL ECONOMY

Agricultural production systems in the United States are part of the overall growing global economy of food and fiber products. On a more localized level our production systems are the basis for maintaining the rural economy and providing a safe and nutritious food supply to our diverse population. Our agricultural systems in the northeast are broad and encompass small and large scale plant and animal farming; regional and specialty market production and processing; and, local, national and international marketing. This diversity has enabled our agricultural systems to remain competitive in the global economy. The foundation for this has been our ability to develop and integrate new technology into our agricultural production systems through the combined efforts of fundamental and applied research programs linked with effective extension efforts. However, as the global market changes, we must understand where our opportunities lie.

Although our efforts are extremely diverse, they can be subdivided into the areas of production, protection, processing and marketing.

Production

Improving the yield and quality of plants and animals in agricultural production systems is fundamental to improving our ability to compete in a global economy. These improvements can be accomplished through: 1) traditional and modern breeding programs which select for desired traits (such as yield, flavor and pest resistance) and an understanding of how they can be expressed under different environmental regimes; 2) improving our understanding of the nutritional requirements for plants and animals so that inputs and waste products are minimized; 3) improving our understanding of soils in order to maintain or improve the health of the soil; 4) improving our understanding of the impact of environmental conditions on plant and animal production.

Protection

Plants and animals are stressed by various organisms including insects, pathogens and weeds. Traditional control of these pests through the application of synthetic pesticides has allowed farmers to manage some of these pests, but concerns about their effects on the environment and the development of resistance must be taken into account. Improvements in protection of our production systems can be accomplished through: 1) genetic engineering of plants to express pesticidal traits and the development of management systems which ensure the durability of the deployment of these plants; 2) utilization and/or improvement of insects and microbes which may act as pesticides against insects, pathogens and weeds; 3) improvements in the production systems for mass producing natural enemies; 4) an improved understanding of the non-target effects of pesticides.

Processing

The value of agricultural raw products is multiplied through processing them into foods and fiber which become distributed through wholesale and retail markets traded worldwide. The value of grapes at harvest, for example, is minimal compared with the value of the wines they produce. Improvement of our agricultural production systems on a global market can be achieved through processing which: 1) recovers components from what would be engineering waste and converts them into marketable items (particular enzymes, flavors, bulk materials, etc.); 2) enhances the food product by preserving or increasing the level of nutrients or flavors; 3) maximizes the freshness of the product through minimal processing; 4) minimizes the process of converting the raw product into foods.

Marketing

The competitiveness of our agricultural products is influenced by domestic and international factors and an understanding of the production, distribution and marketing costs will influence what agricultural production systems are most competitive for our region. Improvement of our agricultural production systems on a global market can be achieved through: 1) an understanding of the costs for our production systems compared with other domestic and regional production areas; 2) an understanding of the specific desires of the consumers in various regions of the world economy; 3) an understanding of the political, regulatory and social structures which influence the production and distribution of agricultural products which are produced in other regions.

The agricultural production systems of the northeast are diverse. Over the decades some of our systems have lost their relative strengths compared to other regions while other systems have grown in their relative strengths. The majority of the population of the US is centered in the northeast region and the opportunities for agricultural systems should be high. However, presently we import ca. 80% of our food. In many cases this is the result of more favorable agricultural conditions (lower labor costs, longer season, etc.) outside our region. Future research investments should be directed toward those projects which provide us with the best opportunities to compete both nationally and internationally. Dairy systems, floriculture and ornamental and fresh foods are examples of areas in which northeastern agriculture can effectively compete. The growth of community food systems, such as local and roadside markets, should be encouraged as well. For any of these areas, there will continue to be a need to increase research investments in fundamental and applied sciences to improve the production, protection, processing and marketing of our agricultural products so they can be competitive on the regional, national and international markets.

PERFORMANCE GOALS FOR INITIATIVES RELATED TO GOAL 1

Empower individuals and enterprises in agriculture and food systems to thrive in order to:

maintain strong, rural communities;
advance a clean healthy environment;
promote attractive landscapes;
assure a safe, nutritious, and abundant local food supply; and
support a thriving New York State economy.

Indicator Data Specific to Goal 1

(For each indicator, both actual and annual target results are included, the latter in parentheses.)

INDICATOR 1.1 The total number of refereed or peer reviewed articles or materials reporting research on topics related to agricultural production and competitiveness.

Year	# refereed items	# patents, licenses, varieties
2000	780 (675)	75 (40)

OBJECTIVE 1.1 To produce new and value-added agricultural products and commodities.

INDICATOR 1.1.2 The total number of persons completing non-formal education programs on production of new and value-added commodities and products and the number of these persons who actually adopt one or more recommended practices or technologies within six months after completing one or more of these programs.

Year	Output: # completing programs	Outcome: # adopting practice/ technology
2000	6546 (5000)	1738 (2300)

OBJECTIVE 1.2 To annually increase agricultural producer awareness, understanding, and information regarding the production of new and value-added commodities and products in U.S. agriculture.

INDICATOR 1.2.1 The total number of persons completing non-formal education programs to improve the productivity and global competitiveness of the U.S. agricultural production system and the number of these persons actually adopt one or more new production techniques or strategies within six months of completing one or more of these programs.

Year	Output: # completing programs	Outcome: # adopting practice or technology
2000	11717 (10000)	4574 (4000)

OBJECTIVE 1.3 To improve decision-making on public policies related to the productivity and global competitiveness of the U.S. agricultural production system.

INDICATOR 1.3.1 The total number of persons annually completing non-formal education programs on topics related to public policy issues affecting the productivity and global competitiveness of the U.S. agricultural production system and the number of those persons make use of such knowledge within six months of completing one or more of these programs.

Year	Output: # completing programs	Outcome: # utilizing information
2000	3487 (5500)	1239 (2400)

Resources Allocated to Goal 1 (FFF & Match)

Dollars x 1000 and (FTE) or (SY)

	FY2000 Target	FY2000 Actual
Extension Total	3,378 (60.9)	3,342 (60.35)
Research Total	5,200 (34.1)	5,894 (34.0)

Impact Examples Related to Goal 1

Golden Nematode-resistant Potatoes

The detection of the golden nematode on Long Island in the 1940s jeopardized the potato and nursery industries there, because this potato pathogen is a quarantined pest and soil and potatoes from infested areas cannot enter uninfested areas. Subsequent detections of this pathogen in upstate NY jeopardized the production of many vegetables, turf grass, nursery stock and potted plants because soil associated with these crops might be contaminated. An initial response was to apply chemical fumigants and to restrict uses of contaminated land.

Plant pathologists, plant breeders and horticulturalists collaborated to develop potato cultivars that are resistant to the golden nematode. Use of these cultivars is more effective than use of chemical fumigants to suppress nematode populations. Resistance to the golden nematode is the top priority of the Cornell potato breeding effort. Thus rapid introduction of clones from the program is necessary. Horticulturalists and seed certification specialists collaborate to make these new cultivars rapidly available to growers in New York. The activities of the team effort have now also responded quickly to the recent detection of a new race of the golden nematode and resistance to this race is already being introgressed into the potato clones of the future.

This program has helped to avoid embargos against all New York State soil-bearing crops, which have an estimated value of more than $700 million annually. The use of golden nematode-resistant potato cultivars to suppress populations of the golden nematode has eliminated the need to use thousands and thousands of gallons of chemical fumigants on New York farms. Currently such resistant cultivars occupy 33% of the total potato seed tuber acreage in the state, and use of these cultivars has helped retain a viable potato production industry ($70,000,000 annually) in New York. Thus environmental and economic benefits have accrued to all citizens of the state. (However, because this pest is quarantined on a worldwide scale, it also is a threat to the national production of all Solanaceous crops -- $6 billion value.) The current collaborative effort at Cornell has responded rapidly to the occurrence of a new race of the nematode and successful efforts against this new race will further benefit citizens throughout New York and the United States.

Improved Dairy Foods

Dairy products such as fluid milk compete not just with other foods but also with the beverage (soft drinks) and related products markets. While dairy foods have many advantages in this market they also have disadvantages, one of which being limited shelf life. Technologies that extend shelf life while producing high quality and safe products are needed.

We have developed a low cost system for improving quality and extending the shelf life of dairy foods. This technology is based on the known antimicrobial activity of low levels of carbon dioxide. The CO2 is added directly to the dairy food at levels below taste but high enough to inhibit spoilage.

This technology has benefited the dairy producing industry. For example after 20 years of decline cottage cheese consumption has increased. New dairy based products including beverages have been introduced based on our technology. We are developing a system to allow long-distance shipping of concentrated milk.

Winter Raspberry Production

Farmers in New York face a number of constraints, including a short growing season for their crops. Consumers wanting to eat locally face very limited choices during the winter months. Producing high-value crops off-season can offer new marketing opportunities for growers.

We have developed methods of producing fresh, local raspberries during the winter utilizing greenhouses that might otherwise sit empty during the colder months. Raspberries are grown in pots outdoors, then when their chilling requirement has been fulfilled, they are brought inside a relatively cool greenhouse. Our research team has developed a system for growing and fruiting raspberry plants under relatively cool temperatures. The system requires temperature and humidity control, plant manipulation, and uses bumble bees and predatory mites for pollination and pest control. The quality of the raspberry fruit is superb, and yields are quite high. Retail prices range from $3.00 - 6.00 per half-pint (6 ounces), making them one of the most valuable of all agricultural products produced in New York State.

At least 5 growers in New York State are now producing winter raspberries commercially, as are many others throughout the Northeast and Midwest. In addition, we have a list of chefs who are interested in purchasing these raspberries once they become available for sale. Currently, growers are selling all they can produce at their farm markets.

Fundamental Research Leads to Harpin, a New Biopesticide

Writers of grant proposals and administrators often defend fundamental research on plant disease as the key to future disease control strategies. Cornell Plant Pathology seems to have substantiated this supposition with its fundamental research that resulted in the discovery of harpin and its striking beneficial effects on plants. A new biopesticide, Messenger™, was granted registration by the United States Environmental Protection Agency (EPA) in April 2000, for use on food and fiber crops, trees, turf and ornamentals. The active ingredient in Messenger™ is the protein harpin, which was discovered during fundamental research on the cause of fire blight, an often-devastating disease of pear, apple and related plants. The Cornell Research Foundation licensed the harpin technology to Eden Bioscience Corporation, of Bothell, Washington. The company developed and registered Messenger™ as a commercial product based on fundamental discoveries made at Cornell and in their own facilities. Further Cornell discoveries figured in many of the developments, and several former Cornell scientists currently hold key technical positions at Eden Bioscience.

The harpin technology is based on a new class of nontoxic naturally occurring proteins produced by plant pathogenic bacteria. When plants are treated with isolated harpin proteins, the plants' natural defense systems are triggered and simultaneously certain plant growth systems are activated. Thus, when applied to crops, harpin increases resistance to pathogens and pests and results in more biomass, due to increased photosynthesis, nutrient uptake and root development. Ultimately, crop yield and quality are enhanced.

EPA approved Messenger as a biochemical pesticide for disease management and yield enhancement in over 40 crops. The Agency concluded that: "Human health risks posed by Harpin are expected to be minimal to nonexistent," that "Harpin is not expected to cause any harm to the environment," and that "…it [harpin] has the potential to be an important human health and environmental risk reduction tool." It is currently registered in 47 states; registration in New York State is pending.

Harpin technology is a new and fundamentally different approach to crop production. As compared to the use of conventional pesticides, the use of harpin negates virtually all human health and environmental concerns. The naturally occurring nontoxic harpin proteins harness and stimulate the innate defense and growth systems to achieve desirable plant productivity effects. As such harpin has potential for use in IPM, sustainable and conventional agriculture programs.

Control of Invasive Plants

Invasive non-indigenous plants are a major problem in agricultural and natural landscapes. Invasive plants change ecosystem processes and threaten rare and endangered species. Traditional techniques using physical, mechanical and chemical means often fail to provide cost-effective, long-lasting, environmentally friendly control. An alternative to traditional control techniques is the use of biological control, the introduction of host-specific natural enemies from the native range of an introduced plant. However, the majority of private citizens and land managers in government agencies or non-governmental organizations are not familiar with biological control. Consequently, the full potential of this technique in contributing to control of invasive plants in currently not realized.

The College of Agriculture and Life Sciences, Department of Natural Resources established the Biological Control of Non-Indigenous Plant Species Program to develop and implement biological control programs for invasive plants in natural areas. In collaboration with overseas scientists host-specific insects are selected, screened, and imported after approval by the USDA. In collaboration with Federal and State agencies, universities, and other land management organizations, biological control agents are distributed throughout the United States. Pre- and post-release monitoring programs assess the impact of invasive plants and of the released control agents on native plant and animal communities.

In the past 5 years, Cornell has distributed over 2 million leaf feeding beetles and 20,000 root-feeding weevils to partners in >30 states participating in the control program targeting purple loosestrife. Nationwide, in cooperation with our partners, insects have been released in >2,000 wetlands to restore tens of thousands of acres of valuable wetland habitat. As a result of insect feeding, purple loosestrife has declined to less than 10% of its original abundance at many release sites. In addition to work on purple loosestrife, new programs target garlic mustard, Japanese knotweed, and Phragmites.

Potato Late Blight

Potatoes and tomatoes were destroyed over large acreages throughout New York in the mid-late 1990s by a resurgence of the late blight disease. Some crops in commercial agriculture, organic agriculture and home gardens were totally destroyed; others suffered large yield reductions, but all potato and tomato crops were in jeopardy. Damage caused by this plant disease cost New York farmers tens of millions of dollars in the mid-late 1990s. The disease forced some farmers into bankruptcy and others out of business.

Investigations were initiated immediately to learn why the disease suddenly became more serious and then to develop strategies and tactics to mitigate future damage. Research in plant pathology at Cornell quickly determined that the disease was caused by exotic strains of the pathogen. They had recently been introduced from Mexico. Subsequent investigation identified the distinguishing characteristics of the exotic strains, so that appropriate mitigating measures could be developed. Such measures were developed via field and laboratory experiments. Cornell Cooperative Extension in collaboration with the New York State IPM program then informed the agricultural community about the situation, and about the appropriate measures to be implemented.

In 1999 and 2000, late blight of tomatoes and potatoes did not have widespread devastating impact. Most growers and many homeowners were aware of the changed situation and had implemented new, more appropriate mitigating technologies. Costs to commercial agriculture were again reasonable and many orders of magnitude less than during the mid-1990s.

Cornell Plant Breeders Develop Disease-Resistant Birdsfoot Trefoil Variety

Many New York farmers must grow hay and pasture crops on poorly drained or shallow soils. Birdsfoot trefoil provides a productive forage legume that helps farmers remain competitive. Fusarium wilt is the most devastating trefoil disease, killing stands as early as in the seeding year. This disease is spreading and has hurt the competitive position of New York farmers. All current varieties of birdsfoot trefoil are susceptible.

Cornell breeders and plant pathologists have developed 'Pardee' birdsfoot trefoil with high forage yield and strong resistance to Fusarium wilt. On a 0 (no disease symptoms) to 5 (dead plant) basis, Pardee rated 2.45 compared to 4.64 with Norcen, a very popular variety during the last 20 years. In the first production year of an experiment, Pardee yielded 4.49 tons/acre of dry matter forage compared to Norcen's 2.31 tons/acre.

Pardee trefoil will help more than 10,000 New York farmers with thin or poorly drained soils to maintain their competitiveness. Pardee will be particularly helpful to growers on small farms in hilly areas of New York, who have limited choice of productive crops. For some, the loss of trefoil from Fusarium wilt threatens their economic survival. Birdsfoot trefoil is included in seedings on about 200,000 acres in New York, producing more than $10 million of hay annually. The Pardee variety will remove the Fusarium wilt threat to help maintain the competitiveness of New York farmers. Seed will be available to growers in 2002.

Improving the Competitiveness of NY Beef Producers

Ninety-seven percent of cow-calf operations in New York have less than 50 brood cows. Although these producers are small, they represent an economic contribution of $35,214,000 in the value of livestock alone. Cow-calf producers lack the volume of animals to take advantage of economies of scale. Therefore, instead of selling at an auction barn for the wholesale market, more and more small farms are selling value-added products. By improving the knowledge of and access to value-added programs, New York beef producers can sell their goods at a higher price, thus remaining profitable and viable.

Participating in value-added programs is most important to the viability of small farms in NY. Extension's Response is to help farmers learn, develop and adopt value-added practices.

The North West New York (NWNY) Dairy, Livestock and Field Crops Team has regular newsletters and seminars that cover the latest in research and programming efforts for producers in a 9 county area. The programming efforts for beef producers include a monthly newsletter, "Livestock Ledger", Beef Field Days, NY Feeders Conference for feedlot owners, pasture walks, cattle handling demonstrations and specialized programs such as the Empire Heifer Development Program. The 2000 New York Feeders Conference included an afternoon workshop to link feedyards in New York with cow-calf producers to discuss retained ownership of cattle from calf through carcass. This conference is an excellent opportunity for producers to review research and network with neighbors. Over 50 participants attended this program.

The Empire Heifer Development Program (EHDP), showed cooperators how to improve the value of beef heifers. The first year of this value-added management and marketing program involved 17 different producers across New York State. Weaned beef calves were brought to a central feeding facility, where they were managed and fed as one group, performance evaluated, bred by artificial insemination (AI) and returned back to the home farm.

Beef Field Days offer a time for producers to come together to learn about field research, discuss up-to-date regional news, participate in current extension programs and work with neighbors. The Spring 2000 Beef Field Day, with 40 participants attending, highlighted information and research related to heifer development and value-added marketing.

Participating beef producers have improved their management techniques, increased their efficiency of operation and received more for their product. Regional programs, newsletters and seminars directly reach approximately 400 beef producers yearly, with another 4,000 farms receiving educational literature through agricultural press.

The Feeders Conference has helped link cow-calf producers to local feedlot owners, facilitating communication between industry segments. By cutting out a middle person, retained ownership allows the cow-calf producer to seize more of the profit, an average in 1999 of $85/hd over feeder price, for high quality animals. The interest in retained ownership and participation by producers has grown by 300% in the last 5 years.

The Empire Heifer Development Program allowed producers to take advantage of economies of scale with feeding, vaccination, data collection, artificial insemination and performance testing. Producers' enrolled heifers for a variety of reasons, from improved heifer performance and the ability to AI, to having space and labor for managing additional cows, each fueled by improving profitability. A beef producer in Ontario, NY, has commented "by sending my heifers to the EHDP, I am saving $200/yr on bull costs alone." The real advantages will be seen in future years of productivity as these animals are returned to the cow herd.

The 2000 - 2001 Empire Heifer Development Program is aiming to incorporate marketing 'quality' heifers in spring and fall 2001. This will allow producers to capture up to $150-$200 more per heifer over feeder calf price, if those same animals were marketed as calves.

A farmer with an average herd size of 25 brood cows, who retains ownership of spring-born calves and utilizes the Empire Heifer Development Program, can capture $ 2000/yr more in receipts than selling these same animals through an auction barn.

BMR Sorghum Sudan Research

Family owned dairy farms that produce and store 90% of their own forages also have at least 45% of their milk cows' diet consisting of purchased grains. More than 30% of their land resource is less than ideal for corn production as the lowest cost energy source for their animals. Primary managers have a desire to improve the farm's profitability in order to provide for greater family welfare, yet can't accomplish this in a long -term sustainable manner. They are caught in an economic spiral. Corn production requires they own a separate line of single use equipment (corn planter, special corn head for harvester). Their equipment inventory is marginally adequate due to the age and limited labor resources to operate it in a timely manner for optimum harvest of top quality forage. This has limited their ability to improve profitability through use of adequate amounts of high quality forages rather than purchased concentrate as the basis of their milk production. These limits on profitability are hindering farmers' abilities to improve labor or equipment to gain a more timely harvest for improved forage quality.

A research trial was prepared to study the economic, environmental, and practical benefits of growing BMR Sorghum Sudan as an alternative to corn for silage. Four sub-studies were prepared to take place at the Cornell Valatie Research Farm. The first being the Nitrogen Study, which answers two questions: How much nitrogen is needed? What is the best application system? This is used to determine the optimum size of the nutrient sink and provide the foundation for manure recommendations under CAFO plans. Resulting data will be incorporated in fertilizer recommendations. A second study included the application of Calcium Chloride and Potassium on the crop to determine the effects of different fertilizer rates in producing specialty forage for the key transition in the cow's life. This represents a unique effort to produce a crop tailored to a specific stage of lactation in a dairy cow. The third study was titled the Planting Date Study that gives us the answer as to how late we can plant this crop and get an economic return. The fourth study titled the Harvest Date Study proceeded

by growing and harvesting different replicated plots each week throughout the growing season and analyzing for feed quality and yield. This will produce the foundation for determining the optimum harvest for a particular livestock and size of that harvest window.

We have been reported as being the only researchers in the country to be testing this variety in depth. Reports have started coming in from other agents around the state who have used my information to help their farmers. Sales of the seed have soared from 360 bags sold in 1999 to 1800 bags sold in 2000. Plans are being made to acquire funding for the feed analysis of over 100 samples taken from the summer's research.

Integrating Organic Gardening Education into the New York State Master Gardener Program

Master Gardener Volunteers and Organic Gardening: Background: Thousands of Master Gardener Volunteers have received horticulture training in a broad range of topics for over twenty years in N.Y. State (in Erie County since 1978). In at least 40 counties Master Gardeners answer garden "Hotlines" and provide answers to gardening problems. During the 1970s and into the 1980s, these volunteers in C.C.E. offices provided "Cornell Recommendations" which included - and often favored - pesticide solutions over cultural, organic, or IPM approaches.

Organic gardening community reactions to C.C.E.: The organic gardening and farming community frequently criticized Extension, and in general stopped asking for information from County offices, according to many reports.(Source: officers and members of NOFA-NY, Northeast Organic Farming Association, interviewed over 6 years of NOFA conference participation.)

Master Gardener Training in Erie County in 1986 did not refer to organic gardening practices as an option, except in highly skeptical terms. A part-time program assistant received as a first assignment in 1991 the goal to re-write an archaic fact sheet on "organic gardening practices," and began to develop a series of fact sheets. As Extension entered the late 1990s, the environmental movement, intensified interest in non-pesticide solutions, and a growing organic gardening community demanded that Extension address the need for fact-based comprehensive organic gardening education. IPM (Integrated Pest Management) was successfully communicated as a premise for agricultural and horticultural problem solving. However, IPM fell short in its acceptance with those who sought best management with organic methods only.

In 1999 the Homes-Grounds and Community Horticulture Steering Committee decided to include Organic Gardening in Master Gardener education statewide. In 2000 a 60-page chapter was put into use in Master Gardener trainings. In summer 2000 a graduate student was hired to develop a slide set with script. It will accompany all future Master Gardener training and a modified module will be used by Master Gardener and Extension speakers for public programs. The organic gardening community (NOFA-NY leadership) provided commentary and editing, and expressed gratification at this Extension response to a need.

Disease Management and Dairy Producer Competitiveness

Diseases, particularly mastitis, limit dairy industry productivity, not only because of the illness itself, but because currently there is no farm-specific method for deciding what to do with mastitic cows. Farmers currently lack a decision-making tool to use on their own individual farms to determine the economically optimal action. The dairy industry would be greatly improved by developing systematic ways to treat mastitis that can respond and adapt its problem-solving methodology to each individual farm situation.

Currently, the investigators are in the 18-month data-collecting phase of the project. Sampling all cases of clinical mastitis at 2 New York State dairy herds that have daily milk weight recording systems are being conducted. To date, approximately 750 microbiological culture results have been obtained. A database to

record all observations of disease occurring in each herd, as well as all milk, reproduction, and culling events has been developed.

Having collected mastitis culture results for the past 15 months, the investigators have found the following distribution of pathogens in our database*: Streptococcus species,* 18%; *Staphylococcus aureus,* 7%; *Staphylococcus species*, 8%; *Escherichia coli*, 22%; and others, 45%. A pilot study on 1500 cows in our 2 herds has been conducted. Preliminary results indicate that all 4 mastitis pathogens cause a reduction in milk loss at time of disease. For mastitis caused *by Strep. spp.* and *E. coli*, the milk loss was greater in older cows (Parity 2+) than in younger cows (Parity 1). For mastitis caused by *S. aureus* and *Staph spp.*, the milk loss was greater in Parity 1 cows than in older cows. The first case of mastitis was diagnosed, on average, at 75 days in milk.

After the data collection phase is completed, they will perform state of the art statistical techniques to estimate the effects of clinical mastitis on milk production and on the length of time that cows remain in the herd. The project will have economic, environmental, and social impacts. From the results, an economic decision tool that determines whether it is more profitable for a cow with a specific etiologic agent to be treated, not treated and kept, or culled will be developed. Environmentally and socially, the results can be used to make disease (e.g., mastitis) management decisions that will most effectively utilize farm resources and ensure that farms remain in business.

GOAL 2 – A SAFE AND SECURE FOOD AND FIBER SYSTEM

To provide a safe and secure food supply our research program currently maintains three broad initiatives: food safety research program, food quality and functionality program and value-added enhancement program. The three programs combine to address the issues of a safe and secure food system.

We improve the safety and nutritional quality of foods to promote wellness and reduce the risk of disease. We identify and study important consumer and processor food safety issues in the areas of microbiological safety, chemical safety and naturally occurring plant toxicants as well as health promoting opportunities from food components.

Our food safety research program includes initiatives to study the agents, environments and controls related to microbial contamination of fresh and processed foods. Expand research on foodborne pathogens, both emerging and long- recognized species. Develop and utilize modern immunological and molecular biological techniques to study the effect of innovative processes and products on microbial growth and survival and to detect microbial contaminants at very low levels.

This program conducts studies to help processors develop HACCP programs. It includes developing computer simulation/modeling systems to improve food quality and safety and models of microbial growth inhibition. Our scientists investigate putative natural toxicants or antinutrients in genetically modified plant and animal foods. We study the chemistry and toxicology of production-enhancement chemicals used in plant and animal production and manifesting themselves as residue or chemical changes in foods. We investigate health-promoting phytochemicals. This program establishes both required and toxic concentrations of consumption. We investigate risks/benefits associated with increased consumption of plant-based foods. In this program we investigate factors that influence bioavailability of nutrients in foods and diets. We study the effects of processing, preservation and storage on nutritional value and quality of foods. We develop improved chemical and instrumental methods for measurement of macro and micronutrients in foods that can be used for analysis in support of nutrition labeling or for process control. We utilize this knowledge to provide direct assistance to companies to insure the processing of safe foods.

Our program on value added processing systems improves technologies and systems that enhance food value including nutritional value, safety and cost thus securing our food system for the future.

In this effort we evaluate new plant and animal foods and food components as well as production management techniques that add nutritional value and economic benefit. We develop new methods for quality assessment and help set goals for plant and animal breeding and selection. We explore process technologies (e.g., fermentation, thermal processing, extraction, concentration, separation, sensor development) and new modeling techniques that can improve the profitability of the food industry. We study methods of minimal processing and packaging of foods. We also study the economic potential of new products and processes. Our scientists develop engineering systems based on microbiology, enzymology and mechanical techniques to minimize waste disposal problems of the industry. This program develops processing methods for fractionating major and minor components of foods. A major effort includes the development and/or evaluation of processes and/or ingredients designed to improve the sensory quality of low fat foods. We seek to generate the knowledge base to provide leadership in value-added processing for the food manufacturing industry.

Our program on food quality and functionality uses a multidisciplinary effort as we seek to improve the understanding of mechanisms affecting food acceptability and probe the molecular basis of functionality and quality with special emphasis in the areas of biochemistry of plant and animal foods/post harvest physiology,

sensory quality of foods, physical/chemical properties of foods and ingredients and microbiology of foods. Quality foods are a key component to ensuring the security of our food system.

In this program on food quality we develop methods to define and improve quality in fresh and processed foods by studying the factors that influence composition, appearance, flavor and texture with a focus on post harvest storage management and enhancement. We study the biochemistry and genetics of plant and animal products that determine appearance, flavor, and texture. We study the microbial population of foods, and their relationship to quality and shelf life. In order to understand food quality we investigate physical and chemical properties of fresh, raw, and processed foods and ingredients. The development of mathematical models of the relationships between product properties, instrumental measurements and human perceptions are key efforts in this program. Industry directly utilizes this research through outreach and advisory programs.

As effective as these initiatives are, numerous issues will combine to affect changes in their direction over the next five years. The emergence of new pathogens is increasing and will demand greater attention by our scientists. Clearly an interrelationship of both water and food safety issues in our food supply will drive an integration of these research areas. Also the need for unique functional ingredients for food manufacture and health will drive research programs in this area. The need for advanced systems to ensure freshness, quality and safety in fresh and minimally processed foods will require highly interdisciplinary teams of scientists.

PERFORMANCE GOALS FOR INITIATIVES RELATED TO GOAL 2

Improves the health, nutrition, and safety of communities and individuals

- Prepare and keep foods safely
- Reduce food insecurity
- Increase citizen participation in local food related policy decisions
- Expand knowledge of health behaviors that effect women's health status
- Increase fruit and vegetable consumption

Indicator Data Specific to Goal 2

(For each indicator, both actual and annual target results are included, the latter in parentheses.)

INDICATOR 2.1 The total number of refereed or peer reviewed articles or materials reporting research related to a safe and secure food and fiber system and the number of related patents, licenses, or varieties issued.

Year	# refereed items	# patents, licenses, varieties
2000	94 (125)	8 (5)

OBJECTIVE 2.1 To improve food accessibility, affordability, safety, and nutritional value.

INDICATOR 2.1.2 The total number of persons completing non-formal consumer education programs on food accessibility and food affordability, and the total number of these persons who actually adopt one or more recommended practices within six months after completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually adopt practices
2000	23275 (20000)	8967 (14000)

OBJECTIVE 2.2 To increase the effectiveness of constituent and citizen participation on public policy issues affecting food security (i.e., food access, affordability, and recovery).

INDICATOR 2.2.1 The total number of persons completing non-formal education programs on public policy issues affecting food security (i.e., food access, affordability, and recovery) and the total number of these persons who actually become actively involved on such issues within six months after completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually become involved
2000	923 (2000)	364 (600)

OBJECTIVE 2.3 To annually increase consumer awareness, understanding, and information regarding food safety and food borne risks and illnesses.

INDICATOR 2.3.1 The total number of persons completing non-formal, consumer education programs on food safety and/or food borne risks and illnesses and the total number of these persons who actually adopt one or more recommended food safety behaviors or practices within six months after completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually adopt behaviors
2000	38617 (30000)	17817 (17000)

Resources Allocated to Goal 2 (FFF and Match)

Dollars (x 1000) and FTE or SY

	FY2000 Target	FY2000 Actual
Extension Total	2,360 (31.5)	2,318 (31.1)
Research	790	469

Total	(5.2)	(3.0)

Impact Examples Related to Goal 2

Preventing Listeria monocytogenes Contamination of Ready to-Eat seafoods and Other Foods

Listeria monocytogenes is a bacterium associated with potentially serious diseases in humans and animals. Human cases are strongly associated with the consumption of contaminated food products. The Centers for Disease Control (CDC) estimate that 2,500 cases of clinical listeriosis occur annually in the United States, resulting in a total of 500 deaths. Total financial losses resulting from human listeriosis are estimated to be $480 million per year.

Researchers in the Department of Food Science have developed the capability for specific detection and tracking of L. monocytogenes in the smoked salmon industry. For the salmon processing industry, efforts focus specifically on providing the scientific knowledge and the tools to comply consistently with the Food and Drug Administration's (FDA) zero-tolerance ruling issued for L. monocytogenes in ready-to-eat fish products. Researchers have identified possible contamination sources of L. monocytogenes (i.e., processing environments and raw materials) and are currently working with the industries to develop control strategies for this pathogen. Through various presentations, the project has been introduced to sanitarians and extension educators who then assist processors and producers. Current efforts focus on expanding the knowledge gained from this project to help control listeria contamination in other seafoods (including crabs and crawfish) through collaborations with researchers in Louisiana, Maryland, Delaware and Virginia.

This project helps prevent costly recalls by smoked fish and dairy processors and producers of products found to be contaminated with L. monocytogenes. Costs of recalls vary greatly and are difficult to quantify accurately but probably account for losses ranging from $5,000 to millions of dollars for a single recall of contaminated products. Because L. monocytogenes is currently found in 6 to 36 percent of cold smoked salmon samples, this organism is of tremendous economic concern.

Cornell Food Science Summer Scholars Program for Undergraduates

Many graduating food science majors choose attractive positions in the food industry rather than graduate programs leading to advanced degrees. As a result, we face a national shortage of people for careers in government, industry and academia that require advanced degrees in food science. While many food companies have attractive summer internship programs for undergraduate students, there are no formal programs that offer students the opportunity to explore careers in research and college teaching.

We have developed a summer undergraduate research program in food science, which was first offered in the summer of 2000. Thirteen participants for the program were selected from a national applicant pool and matched with faculty members affiliated with the Cornell Institute of Food Science for paid 10-week research internships at Cornell. Some of the participating students were food science majors, but most were from fields as diverse as computer science, chemistry, and biology. Research projects conducted by the summer scholars included investigations of antioxidant activity in fruits, studies on the effect of dissolved carbon dioxide on thermal destruction of bacteria in raw milk, and process development for the production of red beet juice for juice blends. While the primary focus of this program was to provide an intensive research experience, other activities exposed students to career opportunities and personal development. Students participated in a discussion session on "Ethics in Science and Food Science," an information session on applying to graduate school, day trips to food processing plants, and a Career Night Panel Discussion with representatives from the food industry, academia and regulatory agencies. The capstone for the program was a day-long symposium of oral presentations by the scholars.

Formal program evaluations as well as informal feedback from the students and the faculty participating in the program were very positive. Responses to the written program evaluation indicated that participants would recommend this program to friends and other students (overall score of 4.7 with 1 = would not recommend it to another student; 5 = I would highly recommend this to a student). Participants were also very likely to apply to the Food Science and Technology Graduate Program (MS or PhD) at Cornell (overall score of 4.0 with 1 = I am not at all interested in applying; 5 = I am sure I will apply; five students marked 3, two marked 4, five marked 5). The overall rating of the program by participating students was 4.8 (1 = extremely poor program; 5 = outstanding program). This program will be offered again in the summer of 2001 and we are currently soliciting applications from interested undergraduates in the US and abroad.

Food Stamp Nutrition Education Program

Program goal is to enable Food Stamp recipients and applicants to make informed choices, which will support optimal nutritional health, physical, mental health, and well being through maximization of all resources.

Four part-time nutrition teaching assistants targeted working poor and elderly who are either receiving food stamps or are eligible to receive food stamps in all parts of the county including the Old Forge area. Delivery methods included home visits, group sessions at community centers and worksites, along with newsletters and exhibits at community events.

Eighty-four participants were enrolled in on-on-one home visits and received 523 home visits. 87 participants were enrolled in structured groups. 3358 additional persons were reached through unstructured groups such as WIC clinics, food pantries, Herkimer County Employment and Training workshops, Parent Education Resource Center classes, senior citizen groups, newsletters, and health fairs.

Overall results have been positive. Based on evaluation of graduated participants receiving home visits or enrolled in group work, 89% showed improvement in one or more food resource management practices (i.e. planning meals, comparing prices, not running out of food, or using grocery lists). 65% more often planned meals in advance and 32% less often ran out of food before the end of the month. 88% of participants showed improvement on one or more nutrition practices (i.e. planning meals, making healthy food choices, etc.): 42% improved in serving more fruit and 44% improved in serving vegetables. 59% of participants showed improvement in one or more of the food safety practices (i.e. thawing and storing foods properly). 55% more often followed the recommended practice of not thawing foods at room temperature.

DNA Fingerprinting of Listeria monocytogenes and Detection of Human Listeriosis Outbreaks

The bacterium Listeria monocytogenes causes serious human foodborne disease and also affects many animal species. An estimated 2,500 human listeriosis cases, resulting in 500 deaths, occur annually in the U.S. Listeriosis outbreaks caused by a contaminated food may often be spread over a wide geographical area and over a long time. Thus listeriosis outbreaks are often difficult to detect. Although few human listeriosis cases occur, this organism is very common in the environment and is also occasionally found in food products. It appears that L. monocytogenes subtypes differ in their ability to cause disease. Certain subtypes are likely to cause animal disease, but may have limited ability to cause human disease. A better understanding as to which L. monocytogenes types represent a real human health hazard is required to develop science based food safety regulations.

We have developed collaborations in New York state and other states to develop a large improved rapid methods for molecular subtyping ("DNA fingerprinting") of Listeria monocytogenes and to develop a database of L. monocytogenes DNA fingerprints. We routinely obtain L. monocytogenes isolates from affected humans

and animals and from contaminated foods. All isolates are characterized by various DNA fingerprinting methods. Fingerprinting of L. monocytogenes isolates from human cases occurring in New York State and other selected states allow early detection of human listeriosis outbreaks. Fingerprinting of L. monocytogenes isolates from foods will help to detect possible linkages of specific food products to disease outbreaks. Fingerprinting data for all isolates are also assembled into a database, which is analyzed for correlations between specific subtypes (as determined by DNA fingerprinting) and their likelihood and ability to cause human and animal disease. This database will be made available through the WWW to allow broad access to our data.

Our work has been crucial for the early detection of at least three human listeriosis outbreaks. One outbreak in 1998/99 was linked to the consumption of deli meats and hot dogs and was linked to more than 100 human cases, including at least 20 deaths. Another outbreak in the fall and winter of 1999/2000 was linked to the consumption of pate and caused illnesses in at least 10 people. In both outbreaks, our work contributed significantly to the early detection of each outbreak, thus preventing additional human illnesses and possibly deaths. A third outbreak is currently under investigation. The efforts from these collaborative efforts have also been honored with a 2000 USDA Honor Award to the Listeria Outbreak working group.

The Listeria fingerprint database has already provided some important initial new data on the existence of specific L. monocytogenes subtypes, which appear to have lost the ability to cause human disease. Further definition of specific subtypes that do not represent a human health hazard will have a significant positive impact on the food industry by possibly preventing unnecessary costly recalls of foods, which may contaminated with low levels of L. monocytogenes that lack the ability to cause human disease.

"Urban Delights:" City Wide Youth Farm Stand

"Urban Delights", a City Wide Youth Farm Stand, is a coalition of 14 community organizations, and community minded funders working with 20 youth to establish youth-run farmstands selling fresh fruits and vegetables in low-income neighborhoods. The five neighborhoods in which the farmstands operate struggle to fight the negative influences of poverty, poor nutrition, drugs, violence and vacant housing.

The student-owners of Urban Delights are residents of these limited resource neighborhoods, and gain experience with entrepreneurship, leadership, and workforce readiness education through the experience of running and owning a micro-enterprise.

The youth-run farmstands sell fresh, local produce to neighborhood residents who have limited access to fresh produce from supermarkets and farmers' markets. The farm stands provide the teens with a unique employment situation that includes constructive challenges, promotes self-esteem, and foster a sense of responsibility and participation in community. "Urban Delights" is also helping to cultivate new and potentially profitable inner city and ethnic markets for area farmers.
"Urban Delights" City Wide Youth Farm Stand seeks to enhance the Syracuse community's long-term food security by:

Improving low-income consumers' access to and consumption of fresh, locally grown produce through youth involvement in the food system.
Supporting farm viability by facilitating expansion into new markets.
Promoting long-term community based food security planning measures.

The project will accomplish this through a combination of innovative community-based strategies, including direct marketing of fresh produce in low-income neighborhoods at youth farm stands, providing at-risk urban youth with economic opportunities through food systems job skills training, promotion of healthy food choices.

This year, 20 youths attended the initial training sessions, 17 youths started operating the stands and 13 youths remained at the end of the season. The Farm Stands were run at eight locations in the city for a 6-week period. Several participants subsequently put in a great deal of effort operating a stand for 10 days at the State Fair. The total profit of $1339 for the season was divided between the participants with more being allocated to those who worked at the Fair.

Accomplishments and results included:

Expanding the number of sites from 6 last year to 8 this year. The two new sites are in high traffic areas in the business section of the city.

Commitment by the collaborating agencies to extend the project beyond the summer months.

78% of youth participants surveyed stated they would be interested in running their own business at some time in the future.

Participants were able to identify multiple ways in which the Farm Stand experience helped to prepare them for future jobs (business skills, customer service, gaining good references, experience).

Created a venue for growers to reach inner-city markets.

" It's a holistic approach to the challenges facing the community" (from a participating agency)

Creates connection between growers, inner-city neighborhoods, and youth.

Food Sense

Division of Social Services and New York State Electric and Gas representatives reported that low-income families need access to low cost foods and help with stretching their food dollars. They suggested that Food Stamp Nutrition Education Program staff at CCE investigate a food coop program, similar to those in other counties.

FSNEP staff contacted individuals in surrounding counties with Food Sense Programs to learn how the programs operate. Contact with the Food Bank of Central New York in East Syracuse indicated that a site in Penn Yan was possible. FSNEP staff surveyed several low-income audiences including Food Stamp recipients, WIC participants, and FSNEP participants, to determine interest in the program. In February, the first food distribution took place in Penn Yan, with 177 households participating. Many people repeatedly take part in the program and new people start each month. A check of prices in a local grocery store consistently indicates that participants would be paying double the amount in cash or food stamps at the store for the same items.

Participants purchased $30 worth of food for $15.50 for a net savings of $14.40 per unit. In addition to realizing saving in their food budgets, participants practice budgeting techniques. They are required to pay for food two weeks in advance of receiving it, thereby having to plan ahead. CCE is reaching a new audience and will use the coop as a way of recruiting families for more intensive educational efforts through FSNEP and Power Partner. Currently, informational flyers, including food preparation tips and food safety tips, are distributed at the site.

"Eat Smart New York" "Supercupboard" Program

Many challenges exist to assisting economically and educationally disadvantaged families with adopting and maintaining healthy lifestyles. To compound this problem, a growing number of our target populations suffer from additional conditions or situations- physically and mental disabilities, abusive or violent home environments and cultural and social displacement, e.g., with refugee families. Research demonstrates that a disproportionate number of minorities and individuals with disadvantages suffer the highest rates of lifestyle-related diseases. Nutrition education efforts need to be "specific, hands-on and visually-oriented" to have positive outcomes. Through collaboration and outreach efforts, CCE Onondaga has been able to reach a greater number of adults with special needs, and through inclusion methods, facilitate learning of desired practices.

By adapting our educational approaches and collaborating with county partners we have been able to:

Reach over 150 families through nine comprehensive food and financial fitness programs called "Supercupboard" with parents and staff served by targeted community agencies. (Many participants were learning disabled and/or were recovering from addictions for abusive situations.)

Teach "Supercupboard" Nutrition Education to a group of 8 Hispanic women through a local Spanish Action League through the assistance and interpretative skills of one of the staff members.

Incorporate train-the trainer models to expand our program efforts through "multiplier effects" to strengthen communities within time and resource constraints.

Our teaching models included parent aides, counselors and caseworkers learning with family members in agency sponsored CCE Nutrition Education Programs. Notable improvements in food resource management, diet quality and food safety-related behaviors and skills were:

Documented by agency staff (observation of program families through home visits)

Gleaned from evaluation reports by CCE educators and/ or

Shared by several of the program participants between two-six months after completing our programs.

Food safety improvements (defrosting in the refrigerator instead of the counter, proper storage, handling and following temperature guidelines; a general improvement in cleanliness and sanitation practices- particularly critical with children in the household):

98% of the 80 families who participated in Food Safety program were able to identify correct practices in all areas of food safety and sanitation after completing a four-week interactive program.

15 participants shared specific practices learned in the program with neighbors and friends

Parent Aides reported assisting over 100 additional low-income families to improve food safety behaviors.

Food resource, budgeting, meal planning and diet quality improvements

25 residents of a Chemical Dependency Rehabilitation Program achieved the following life skills improvement after engaging in 10 sessions of CCE Nutrition education programs.

27% were able to plan meals in advance and shop with a list

55% improved diet quality by using the "Nutrition Facts" label to make healthier food choices

64% demonstrated the ability to practice safe food handling and preparation behaviors.

36% reported eating regular meals with attention to diet quality-a practice that was a "first" in their lives.

55% reported "increased confidence in their ability to adapt recipes to meet their special needs and preferences".(Many previously had never even followed a recipe.)

Dairy Production and Food Safety

Salmonella typhimurium is a major animal and human pathogen, which can be directly transmitted from animals to people. It is also the most common type of *Salmonella* in New York State dairy cattle. Recent focus on improved farm management practices aims to minimize the transmission of the disease from dairy cattle to people. However, there is continued concern among public health officials and the dairy industry about the potential that certain antibiotics used in dairy herds - for disease prevention, treatment of illness, and growth enhancement may help select for strains of *Salmonella (*including *S. Typhimurium)* resistant to antibiotics. Some of these drugs also are currently used in human medicine.

In a two-year study, funded by US Department of Agriculture/CSREES, a research team from the College of Veterinary Medicine's Department of Population Medicine and Diagnostic Science - led by Lorin Warnick, DVM, PhD, and including Patrick McDonough, MS, PhD, and Yrjo Grohn, BVSC, DVM, MPVM, PhD - is combining clinical, epidemiology, and bacteriology experience to analyze antibiotic use and treatment information for *S. Typhimurium* infected dairy herds and to determine resultant levels of drug-resistant

Salmonella. The study includes 65 herds in the state receiving clinical service from 45 different veterinarians. "We are very appreciative of the support and participation of practicing veterinarians and farm owners who are working with us in this project," says Warnick.

The goal is to gather scientific data for use in developing additional management practices that might reduce the risk of emergence of drug-resistant zoonotic pathogens and to decrease food-borne and direct transmission of resistant strains from cattle to people. In a second project funded by USDA, Warnick is collaborating with colleagues at Michigan State University, University of Wisconsin, and University of Minnesota to study risk factors for *Salmonella* and *Campylobacter* infections and antibiotic use and drug resistance in dairy cattle in US northern tier states. The three-year study will analyze data from 130 dairy herds. "This is one of several large studies across the country trying to understand the ecology of enteric pathogens in livestock so we can make management practice recommendations to improve food safety," he says.

GOAL 3 -- A HEALTHY, WELL-NOURISHED POPULATION

Improving the health of our population through food/nutrient-based strategies will become increasingly important in the next five years in achieving health goals designed to reduce preventable mortality and morbidity in the United States. These strategies will be of special significance to USDA because they will serve as important bridges between the country's food production and health sectors. These strategies will be particularly valuable to approaches that seek to empower individual consumers in taking increased responsibility for their health, assure that our food system is consistent with health goals, and refashion our health system, particularly approaches most concerned with cost containment through prevention of chronic, debilitating diseases.

Research areas of current interest include (1) the study of glucose, lipids, vitamin E and homocysteine in cardiovascular disease, obesity, and/or diabetes, (2) role of various nutrients in fetal neural and cognitive development (e.g. genetic polymorphisms and folic acid metabolism), retinoic acid and gene transcription, (3) nutrition and cancer (e.g. modes of action of selenium and vitamin E, role of predominant plant based diets, and the physiochemical properties of dietary fiber), (4) the role of nutrition in the regulation of inflammation (e.g. effects of dietary fat on the expression of genes during the inflammatory response), (5) maternal nutrition during pregnancy and lactation, (6) postpartum weight retention, (7) fetal metabolic imprinting and its relationship to chronic disease, (8) neurohormonal and psychological influences on eating behavior, (9) food security, (10) domestic and international food and nutrition policy, (11) iron and other micronutrient deficiencies, (12) nutritional impact of parasitic infections, (13) behavioral determinants of food choices, (14) dietary assessments among ethnic minorities, and (15) social patterns of obesity and weight control.

The most recent dietary guidelines reemphasize the increased reliance on plant-based foods as a means of controlling caloric consumption, reducing fat intake, modifying the composition of ingested fats, enhancing the consumption of foods associated with reduced cancer risk, and simultaneously insuring that macro- and micronutrient needs are met. For the first time the dietary guidelines also provide information to consumers who restrict their consumption of animal foods completely or rely on only selected few to meet their dietary needs. Future research activities must explicitly recognize the health goals, policy aims, and consumer practices that support these guidelines.

Thus, future research investments will be made in activities that (1) explore how complex genetic interactions determine developmental and other physiological pathways (and thus specific phenotypes) under diverse nutritional conditions (The impending description of the human genome make this an especially exciting opportunity.), (2) capitalize on an improved understanding of the determinants of human behavior to design effective interventions for behavior change related to nutrition, (3) analyze outcomes of food policy options related to food security, health, and disease prevention, and (4) enhance international collaborations that recognize the globalization of the US food supply.

PERFORMANCE GOALS FOR INITIATIVES RELATED TO GOAL 3

Improves the health, nutrition, and safety of communities and individuals.

- Increase citizen participation in local health and safety policy decisions
- Expand knowledge of health behaviors that effect women's health status
- Increase fruit and vegetable consumption

Indicator Data Specific to Goal 3

(For each indicator, both actual and annual target results are included, the latter in parentheses.)

INDICATOR 3.1 The total number of refereed or peer reviewed articles or materials reporting research on human nutrition and health or health promotion and the number of related patents, licenses, or varieties issued.

Year	# refereed items	# patents, licenses, varieties
2000	100 (300)	2 (2)

OBJECTIVE 3.1 To achieve a healthier, more well-nourished population.

INDICATOR 3.1.2 The total number of persons completing non-formal nutrition education programs on better management of health risk factors (e.g., obesity, hypertension, etc.) and the total number of these persons who actually adopt one or more recommended nutrition practices to reduce health risks within six months of completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually adopt practices
2000	33826 (35000)	17426 (16500)

OBJECTIVE 3.2 To annually increase consumer awareness, understanding, and information on dietary guidance and appropriate nutrition practices.

INDICATOR 3.2.1 The total number of persons completing non-formal nutrition education programs that provide dietary guidance to consumers and the total number of these persons who actually adopt one or more recommended Dietary Guidelines within six months after completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually adopt recommendations
2000	57527 (38000)	23886 (19000)

OBJECTIVE 3.3 To promote health, safety, and access to quality health care.

INDICATOR 3.3.1 The total number of persons completing non-formal education programs on health promotion and the total number of these persons who actually adopt one or more recommended practices within six months after completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually adopt practices
2000	25529 (20000)	7482 (12000)

OBJECTIVE 3.4 To annually increase the level of individual and family safety (or reduce risk levels) from accidents in the homes, schools, workplaces, and communities.

INDICATOR 3.4.1 The total number of persons completing non-formal education programs on home and workplace safety and risk reduction and the number who actually adopt one or more recommended practices within six months after completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually adopt practices
2000	10973 (4500)	8745 (2000)

OBJECTIVE 3.5 To annually increase the effectiveness of constituent and citizen participation on public policy issues affecting health community decision-making.

INDICATOR 3.5.1 The total number of persons completing non-formal education programs on public policy issues affecting health community decision-making and the total number of these persons who actually become actively involved in one or more public policy issues within six months after completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually become involved
2000	5861 (2500)	2982 (500)

Resources Allocated to Goal 3 (FFF and Match)

Dollars x 1000 and (FTE) or (SY)

	FY2000 Target	FY2000 Actual
Extension Total	3,758 (50.2)	3,812 (51.2)
Research Total	1,295 (8.0)	484 (3.0)

Impact Examples Related to Goal 3

An Apple a Day Really May Keep the Doctor Away: Cornell Apple Findings a Boon to NY and US Apple Industry

Many Americans turn to expensive dietary supplements in their quest to reduce their risks of chronic diseases, such as cancer and cardiovascular disease, as well as some of the functional declines associated with aging. Particular attention has been focused on anti-oxidant supplements like vitamin C, vitamin E and beta-carotene. While it has long been known that fruits and vegetables, such as apples, can provide anti-oxidant and health benefits, most research has focused on individual nutrients such as vitamin C, vitamin E, and beta-carotene. But clinical trials have shown that the individual antioxidants do not appear to have consistent preventive effects, so taking supplements like vitamin C pills or single-nutrient pills may not provide the same benefits that people can get from simply including fresh produce, like apples, in their diet.

Using apples as the source of these healthful plant substances, researchers in the College of Agriculture and Life Sciences at Cornell University found that a combination of substances in the fruit may be more effective at providing these health benefits than a single nutrient. They also found that these substances produce some powerful antioxidant activity and anti-cancer activity. In laboratory tests, it was determined that a combination of plant substances in apples-phytochemicals such as flavonoids and polyphenols-provide significant anti-oxidant and anti-cancer benefits beyond what single antioxidants such as vitamin C can provide. The antioxidant value of 100 g apple is equivalent to 1,500 mg of vitamin C. It was also found that the phytochemicals in apples inhibited the growth of colon cancer cells cultured in petri dishes and helped neutralize free-radicals that can damage the body's cells and genes. Comparing the anti-cancer activity of phytochemicals extracted from apple skin and apple flesh, it was found that apple skin inhibited colon cancer cell growth by 43 percent and apple flesh reduced cell growth by 29 percent. Tests on human liver cancer cells were even more effective, with apple skin inhibiting cell growth by 57 percent and apple flesh reducing growth by 40 percent.

From a scientific and human health standpoint, this research provides evidence that consumption of fruits and vegetables may play a significant role in reducing the risk of chronic diseases such as cancer. The findings also suggest that in order to improve their nutrition and health, consumers should be getting anti-oxidants from their diet, and not from expensive nutritional supplements that do not contain the important combination of phytochemicals found in fruits, vegetables, and other whole foods. In addition to the scientific impact, this research has a critical economic impact on NY State and US apple growers and apple industry, as the New York Apple Association plans concentrate much of their future marketing strategy around these findings. At a December 2000 board meeting, NY Apple Association president Jim Allen touted this effort as a "savior of the NY apple industry," which had been dealing with the effects of decreased demand and a 20 percent drop in wholesale prices over the past five years. According to the NY Apple Association, demand for apples has already risen following widespread publicity on the research, which was first published in "Nature" in June of 2000 and received international media attention. New York's 674 apple growers produced 25 million bushels in 2000, with a value of $135-million. Apple growers in other states are also cashing in on these findings, using this new information to promote their apples as well.

Helping Anglers Answer the Question, "Should my family eat the fish I catch?"

Recreational fishing is a multibillion-dollar industry. Many anglers would like to eat the fish they catch. Eating fish can provide health benefits. However, in the U.S., more than 6.8% of river miles, 15.8% of lake acres, 58.9% of coastal waters, and 100% of Great Lakes waters are covered by health advisories (USEPA Fact Sheet, 1999) with recommendations to limit or avoid eating fish because of concerns about chemical contamination. Contaminant risks may be higher for certain populations, such as women of childbearing age, children, and

those who rely on sport-caught fish for cultural or economic reasons. Risk management and communication research is necessary to help anglers and their families decide which, and how much, sport-caught fish they should eat.

Research in the Human Dimensions Research Unit in Cornell's Department of Natural Resources has improved our understanding of human attitudes and behaviors related to fish consumption health advisories. Studies have included exploratory work to determine what factors influence citizens' understanding of and response to these advisories, as well as program evaluation research to assess the impacts of various risk communication approaches. Research has also addressed factors influencing risk perception, assumptions of risk management, methods to assess fish consumption, and challenges of institutional coordination in these programs (which often include health, environmental quality, and fishery management agencies).

Results from this research program led to writing, under contract to USEPA, the major guidance document on risk communication associated with fish consumption health advisories, now used widely by states and tribes. In addition, these results are used in EPA's ongoing assistance efforts to states and tribes, including annual conferences and workshops in which key risk management findings can be disseminated and applied by health advisory program staff nationwide. Current efforts focus on applying these results to a major, national conference on effectively communicating health risks from fish contaminants, targeting potentially high-risk audiences such as women of childbearing age, children, and minority or economically-disadvantaged populations who may depend on sport-caught fish for cultural and/or food needs.

Determinants of Human Food Intake

There is little doubt that we, as a Nation, are getting fatter. Current views of what determines our body weight are that it is determined almost exclusively by biological factors. According to this view, the solution will also be biological; i.e. take drugs to reduce body weight. We have been challenging this view and are suggesting that the major determinants of food intake are environment. Therefore any attempt at treating and preventing overweight and obesity must be environmental in nature.

We have examined the behavior of eating in children from one to six weeks under various conditions of changing diet, environment, dietary composition, and frequency of eating. In addition we have conducted several laboratory studies to determine under what conditions people eat and how much. The answer in brief is that we have found that the major factor that governs how much people eat is how much they are served. The more they are served, the more they eat, and the more they eat, the more they are going to weigh. When eating behavior of humans is closely analyzed, we find very little evidence that our normal eating behavior is controlled by biological factors, except in times of nausea and fever when eating behavior is strongly influenced by biological factors. However, even when fasting, overeating, or exercise upsets energy balance, food intake is not affected.

If our work is correct, then reducing serving sizes, reducing fat content of the diet, and providing people with more opportunity to expend energy, could curb the rising tide of obesity. Needless to say, reducing the amount of obesity in the State and in the Nation would have a major impact on the cost of our health system

Senior Fitness For Fun

After an assessment of availability of senior citizen fitness programs, the local Rural Health Alliance determined there was a great need for a senior fitness program to be offered at different sites in the county, utilizing a nursing home-hospital based model.

The Ithaca College School of Gerontology was contacted. They, in turn, furnished the grant funding for an associate of The Cornell University Gerontology Research Institute to provide community team training at two sites where the senior fitness classes would take place. A local fitness instructor was then hired to conduct the 11-week series of classes.

A total of 100 seniors participate weekly in three senior fitness classes, one class held per week, at locations including four nursing homes in two communities, and area hospital, and at a senior citizens center. The Senior Fitness for Fun "FRESH" tracking program was developed (Flexibility, Respiration, Endurance, Strength, Health). Seniors rate their weekly changes in each area, based on a 1 (lowest) to 10 (highest) scale. Week one classes showed lower rates (3-4) of fitness coming into class progressing to higher rates (7-8) at the end of 11 weeks. Positive response has been received from individual participants who have noted overall improvement in their breathing and stamina when walking; also hand/wrist flexibility when performing tasks such as crocheting and working at their computers.

Vitamin A and Proper Development in the Young

The long term goals of Dr. Andrew Yen's research are to understand the cellular, molecular mechanisms by which retinoic acid, the biologically active metabolite of vitamin A, controls cell proliferation and differentiation in a cultured human hematopoietic precursor cell. Vitamin A is a dietary factor necessary for proper development in the young. Since their discovery in 1987, the retinoid activation of RAR's and RXR's leading to transcriptional regulation has been the standard paradigm for the mechanism of action of retinoic acid. He recently reported that another signaling route to the nucleus is also used by retinoic acid. Retinoic acid causes a MEK dependent activation of the ERK2 MAPK. This event is necessary for retinoic acid to regulate the cell cycle and differentiation. In particular using the well studied HL-60 human promyelocytic cell line as an in vitro model which responds well to retinoic acid, retinoic acid-induced G0 cell cycle arrest and myeloid differentiation require MEK activation. To characterize upstream events that lead to activation of MEK, MAPK or RAF, we have analyzed the requirements for RAR or RXR activation in order to cause MAPK and RAF activation. The induced increase in RAF phosphorylation depends on presentation of both RARa and RXR receptor activating ligands. HL-60 cells were initiated in culture with 10-6 M RAR or RXR selective retinoid ligands, as well as a combination thereof. The combination of both the RARa selective ligand plus the pan-RXR ligand causes an increase in RAF phosphorylation, which is comparable to that caused by retinoic acid. In contrast the ligands used singly are not as effective.

Consistent with the involvement of both RARa and RXR in activating this signaling pathway, presentation of both RARa and RXR activating ligands is also needed to induce MAPK activation. Retinoic acid is known to induce MEK-dependent MAPK activation, which antecedes RAF phosphorylation. Since neither the RARa nor RXR ligand by itself is as effective at causing RAF or ERK2 activation, but the combination is as effective as retinoic acid, the data argue against a non-nuclear effect of the ligands in causing RAF activation or MAPK activation. Taken together the data are consistent with a need for retinoid-regulated transcription through RARa and RXR transcription factors in order to cause RAF activation.

The data indicate that retinoic acid causes an unanticipated activation of both MAPK and RAF which depends on activation of an RARa and RXR simultaneously. Surprisingly, the activation of MAPK and of RAF are both MEK dependent suggesting that retinoic acid activates MEK which leads to MAPK and RAF activation. This is an atypical dependence in the case of RAF, and distinguishes retinoic acid induced RAF activation from that typical of growth factors. Furthermore the retinoic acid induced RAF activation seems to be PKC independent, unlike the RAF/MEK/MAPK signaling by many growth factors. This is an initial characterization of a novel transcriptional regulatory pathway for retinoic acid. This may lead to new methods for increasing the efficacy of retinoic acid.

GOAL 4 – GREATER HARMONY BETWEEN AGRICULTURE AND THE ENVIRONMENT

Improving the integrity of our environment and maintaining the ecological systems that enable human prosperity will continue to be high priorities of society, and therefore high priorities of its publicly supported research and educational institutions for the next five years. Growing human populations cause growing consumer demands on the agriculture and food system, which magnifies the challenges of balancing agricultural production and food processing with stewardship and protection of the environment.

CUAES has invested heavily in science to avoid and mitigate impacts of agriculture on the environment. We view the long-term sustainability of agriculture as being inexorably linked to environmental quality. As part of our strategy, we are emphasizing a higher level of integration of research and extension to accelerate: identification of problems, focusing scientific effort to resolving problems, field testing and evaluation of technology and cultural practices, and introduction of environmentally superior innovations/practices to the agricultural community.

The research program is necessarily broad, with complementary thrusts in:

1. Minimization of chemical inputs--(a) research to improve pest management in plant agriculture, (b) development of viable biological control of pests, (c) improved cultural practices (plant systems management), (d) plant and animal breeding research to improve pest resistance and minimize nutrient inputs, (e) soil-plant systems investigations to improve nutrient management, and (f) technological innovations to reduce pathogens associated with animal agriculture.

2. Development of agricultural practices that minimize negative impacts on other natural resource values—(a) protect the integrity of water quality, fish and other aquatic resources, wetlands, terrestrial wildlife habitat, forests, and aesthetic considerations; (b) minimize consumption of energy and petroleum-based materials on farm.

3. Development of environmentally friendly and profitable alternative agricultural products—(a) identify new products and production methods that result in less impact on the environment, (b) develop markets and design marketing strategies that increase profitability of environmentally friendly agricultural products.

4. Improvement of waste management associated with the agriculture and food system–(a) reduce quantity of on-farm waste, (b) improve management of farm-produced waste, including quality and disposal, (c) reduce quantity of waste in food processing, (d) improve management of waste produced in food processing, including quality and disposal, (e) develop scientific understanding of potential for use of agricultural land for environmentally safe application of municipal sewage sludge.

Future research investments will continue to be made in fundamental and applied science areas leading to improvements in chemical management, nutrient management, waste management, and habitat protection on the farm; energy conservation on farm and in food processing; waste management associated with food processing; and natural resource stewardship.

Issues, Opportunities and Constraints

Issues--Accelerated time frame of society's expectations for "cleaning up agriculture" versus reality of pace of science progress, especially given modest funding levels; public image of agriculture and AES system

Opportunities—Keen interest of excellent scientists to address the problems and discover solutions; public support for this kind of work; graduate student interest is high

Constraints—Lack of sufficient federal funding directed at this area so that science can be accelerated (need facilities improvements, fellowships for best grad students, research operating dollars, etc.)—society's desire for improvements in this area are not matched with financial commitments required to do the job at the rate we all would like; AES's can move some FFFs to this need, but many other agricultural production needs exist that make it very difficult to redirect large portions of the FFF research portfolio.

PERFORMANCE GOALS FOR INITIATIVES RELATED TO GOAL 4

Improves the quality and sustainability of human environments and natural resources.

Ensure quality and conservation of water supply
Promote environmental stewardship and sound decision making about the management of natural resources
Promote community, agricultural, and residential environmental enhancement
Prepare youth to make considered environmental choices
Enhance science education through the environments

Indicator Data Specific to Goal 4

(For each indicator, both actual and annual target results are included, the latter in parentheses.)

INDICATOR 4.1 The total number of refereed or peer reviewed articles or materials reporting research on agricultural, natural resource, and environmental policies, programs, technologies and practices and the number of related patents, licenses, or varieties issued.

Year	# refereed items	# patents, licenses, varieties
2000	349 (255)	1 (2)

OBJECTIVE 4.1 To develop, transfer, and promote adoption of efficient and sustainable agricultural, forestry, and other resource policies, programs, technologies, and practices that protect, sustain, and enhance water, soil and air resources.

INDICATOR 4.1.2 The total number of persons completing non-formal education programs on sustaining and/or protecting the quantity and quality of surface water and ground water supplies and the total number of these persons who actually adopt one or more water management practices within six months after completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually adopt practices
2000	18005 (15000)	7940 (5000)

OBJECTIVE 4.2 To annually increase producer adoption of agricultural production "best practices" that conserve, protect, and/or enhance the soil resources on or adjacent to agricultural production sites or land uses.

INDICATOR 4.2.1 The total number of persons completing non-formal education programs on conserving, sustaining, and/or protecting soil resources and the total number of these persons who actually adopt one or more soil conservation practices within six months of completing one or more non-formal education programs.

Year	Output: # persons completing programs	Outcome: # who actually adopt practices
2000	12767 (6500)	2221 (3250)

OBJECTIVE 4.3 To annually increase the effectiveness of constituent and citizen participation on public policy issues affecting agricultural production, the environment, and ecosystem integrity and biodiversity.

INDICATOR 4.3.1 The total number of persons completing non-formal education programs on public policy issues affecting agricultural production and ecosystem integrity and biodiversity and the total number of these persons who actually become actively involved in one or more public policy issues within six months after completing one or more of these programs.

Year	Output: # persons completingprograms	Outcome: # who actually become involved
2000	74277 (30000)	22521 (2000)

Resources Allocated to Goal 4 (FFF and Match)

Dollars x 1000 and (FTE) or (SY)

	FY2000 Target	FY2000 Actual
Extension Total	3,184 (50.4)	3,184 (50.3)
Research Total	2,150 (13.6)	2,177 (12.0)

Impact Examples Related to Goal 4

Detecting New Exotic Insect Threats and Followup Surveys

Cornell's Department of Entomology, under the leadership of E. Richard Hoebeke, aggressively monitors the arrival and spread of foreign insect pests in the United States. His CUAES federally-funded Hatch project, Exotic Pest Detection in Northeastern North America, involves survey sampling and insect collecting in areas along the northeastern seaboard that are especially vulnerable to invasion by exotic organisms. At the very heart of pest detection is accurate and timely identification of potential pest threats. Correct identification is vital for distinguishing exotic species from native ones and for establishing containment or management programs. Exotic species continue to breach America's first lines of defense, inspection and quarantine, at a rate of approximately 12-14 species per year. Once established, alien species are capable of colonizing and spreading unimpeded into the landscape, sometimes with devastating ecological and economic results. Such might be the case with the Asian long horned beetle, which was detected in 1996 in New York City and in 1998 in Chicago; in both urban settings it was found infesting live street trees. This exotic forest pest, native to China, hitchhiked its way into North America via infested wood crating and pallets.

The goals of this pest detection/survey project are the early detection of immigrant agricultural and forest pests, evaluation of their pest status, and the implementation of control or eradication programs. For example, for the Asian longhorned beetle, a block-by-block, street-by-street visual survey has been conducted in Brooklyn and Amityville, N.Y., and also in three separate areas in Chicago. Infested trees are being destroyed by cutting, chipping, and incinerating all affected wood. Educational efforts with local residents and survey teams have helped to garner support for the eradication and replanting programs. A grant from the USDA-ARS has enabled collaborative work on a revision of the genus Anoplophora, an Oriental group of approximately 45-50 species, and to produce an illustrated handbook for the identification of all species of the genus Anoplophora. For the period 1996-2000, a visual survey for the viburnum leaf beetle and its feeding damage in New York State found this exotic beetle's presence in at least 27 counties, mostly in western, central, and northern regions. Surveys in 2000 in neighboring states found it in one county each in Vermont and Pennsylvania. To date, heavy defoliation has been reported by homeowners and landscapers in the Rochester, Buffalo, and Syracuse metropolitan areas. In November 2000, another important and serious bark beetle was discovered in a Christmas tree plantation in the Rochester area. The red-haired pine bark beetle, Hylurgus ligniperda, is a known vector of root rot pathogens (including blue stain disease) in conifers in other countries where it has been accidentally introduced, such as Chile, South Africa, and New Zealand. This exotic beetle is native to Western Europe. Measures are now taking place to define the geographical distribution of these exotic pests in the eastern U.S. and to determine their potential pest status.

The most visible impacts that these detection/survey efforts have had are best exemplified in the Asian long horned beetle program in NYC and Chicago. Despite some success to date, the Asian long horned beetle has not been completely eradicated. As of January 2000, nearly 5,000 infested trees have been removed and destroyed in Brooklyn and Amityville, N.Y., and nearly 1,400 trees have been destroyed in the Chicago regulated zones. Eradication, tree restoration, and educational activities will continue in New York and Chicago until this potentially devastating forest pest is under control or eliminated entirely. As a direct consequence of the detection of Asian long horned beetle in the United States, the U.S. government has imposed strict trade regulations with China. Because the life stages of the Asian long horned beetle are found in solid wood packing material, such as crating, pallets, and dunnage, in the future all such wood originating from China must be heat-treated, fumigated, or treated with wood preservatives to ensure pest-free status.

Cormorant Impact on Fisheries

The double-crested cormorant has increased in abundance across the Great Lakes region, including Oneida Lake, New York's premier walleye lake. At the same time, walleye and yellow perch populations have declined in the lake. The angling public around Oneida Lake and elsewhere blame cormorants for declines in different fish species. Conclusive evidence of effects of cormorants on fish populations is lacking.

Cornell researchers identified amount and composition of fish in cormorant diets and compared this to long-term patterns of mortality in walleye and yellow perch in Oneida Lake. Evidence of a cormorant effect on these species include the timing of the population decline with the increase in the bird population, an increased mortality of these fish at age classes (age 1-3) selected by cormorants, and a magnitude of fish removed by cormorant similar to the number of fish missing compared with earlier relationships between age classes in the long term data series. Finally, this increased pre-adult mortality is sufficient to cause the observed decline of yellow perch but not walleye. Additional problems for the walleye population include lower early age survival. Cormorants do not significantly affect these younger fish.

The studies of fish and bird populations on Oneida Lake represent one of the few documented analyses of the effect of cormorant on fish populations were bird predation can be put into perspective of changes in mortality patterns between different age groups. This data is important for the development of a nation wide management plan for cormorants. More locally, the NYSDEC has instigated a non-lethal control program to remove cormorants during the migration period to reduce fish consumption by these birds and effects of this control program will be evaluated over the next several years by following survival of the walleye and yellow perch in the lake. Results and experience from this lake will be used for evaluating the need for similar programs across New York State and the nation.

Ecological Impacts of Zebra Mussels in New York's Waters

The exotic zebra mussel and its relative the quagga mussel now inhabit many of New York's finest waters. The response of these lakes to invasion by these tiny mollusks has not been well understood. Studies on the ecological impacts of zebra and quagga mussels have been completed in Oneida Lake, NY and the eastern basin of Lake Erie. In Oneida Lake, the most dramatic changes have been associated with an increase in water clarity, a decrease in algae biomass, and an increase in near shore aquatic plants. Contrary to prediction in both lakes Oneida and Erie is the lack of a whole water column decline in algal productivity. We attribute the lack of a water column decline in algal productivity to the compensatory effect of increased water clarity resulting in deeper penetration of photosynthetically active light. In Oneida Lake, we have found no evidence that mussels have had a negative impact on young yellow perch growth, biomass, or production. However, increased early life mortality of both yellow perch and walleye may be indirectly attributed to zebra mussels due to possible increased vulnerability of these fish to site feeding predators resulting from clear water.

Despite an order of magnitude increase in grazing intensity associated with dreissenid mussels and a decline in algal biomass, open water production at primary, secondary, and tertiary levels of the food web has not declined accordingly. However, zebra mussel induced water clarity may expose larval fish in open waters to increased predation thereby impacting their early life survival. These findings allow managers to put the effect of zebra mussels on fish in perspective and to develop management strategies in zebra mussel infested waters.

New York Gap Analysis Project

Balancing economic development, human population growth, and needs for conservation of biodiversity is challenging and requires accurate information about the kinds and distributions of elements of biodiversity. A national initiative, the Gap Analysis Program (GAP), now under the direction of the Biological Resources Division/U.S. Geological Survey, is designed to provide information useful for conservation of biodiversity. Using geographic information systems (GIS) technology, maps of land cover and distributions of plants and animals are overlaid upon maps of public lands (e.g. state forests, state wildlife management areas, federal refuges, national parks, or national forests). Those areas where there are high varieties of species not occurring on managed lands are considered "gaps" in a total system of landscape management that can contribute to long-term conservation of biological diversity.

Since 1992, Cornell has hosted the New York Gap Analysis Project (NY-GAP). Early in the development of the nationwide Gap Analysis Program, the Department of the Interior decided to implement gap analysis at the state level through its system of Cooperative Fish and Wildlife Research Units, like the NY Unit based in Cornell's Department of Natural Resources. With the Cooperative Unit here at Cornell, along with the advanced GIS capabilities of the Cornell Institute for Resource Information Systems, CALS was uniquely positioned to secure Federal funding for NY-GAP. Gap analysis is, of necessity, a broadly-based, multi-disciplinary, multi-agency effort. Over the course of the project, NY-GAP included more than a dozen agency and organizational cooperators, with substantial cooperation from the NYS Department of Environmental Conservation (NYSDEC) and the NY Natural Heritage Program. In addition, cooperation and collaboration occurred among a variety of Cornell departments and units. The lead organization for the NY-GAP effort is the NY Cooperative Fish and Wildlife Research Unit (USGS, Biological Resources Division), located in Cornell's Department of Natural Resources, and the lead agency cooperator at the state level is NYSDEC. NY-GAP was completed in December 2000, at a total cost of approximately three cents per acre.

The complete NY-GAP digital database, including satellite imagery, is more than 20 gigabytes in size (equivalent to more than 2.7 million pages of printed text). Geographic distribution maps for more than 350 species of terrestrial vertebrates are included in the database, along with maps of the boundaries of more than 4 million acres of public lands. The NY-GAP database also includes a map of land cover for the entire state (30 million acres) at a scale of 1:100,000, with more than 40 land cover types mapped at ten-acre resolution. It is the first time ever that a land cover map of this detail and quality has been produced for all of NY, largely from satellite imagery. Names of land cover types follow the naming conventions of the National Vegetation Classification System. Distribution of parts of the NY-GAP database for public use will be accomplished during the first half of 2001, using CD-ROM and web-based technologies. The information will be available to decision makers in more than a dozen state and federal land management agencies, as well as to town, county, and regional planning groups throughout NY.

An Application of Gap Analysis in Planning for Conservation of Biodiversity in the Hudson River Valley

Conservationists generally agree that loss of biodiversity at all scales is an issue of international proportions. Balancing economic development, human population growth, and needs for conservation of biodiversity is challenging. Because of their successful leadership in the NY Gap Analysis Project, researchers in Cornell's Departments of Natural Resources and Crop and Soil Sciences were asked by the NYS Department of Environmental Conservation to assist in planning for biodiversity conservation in the Hudson River Valley (HRV). The HRV study area is a fifteen-county area bordering the Hudson River, from Albany to New York City. Gap analysis is an application of geographic information systems (GIS) to facilitate planning for biodiversity conservation (for more information, see http://www.dnr.cornell.edu/gap/gap.htm).

Working with the NY Cooperative Fish and Wildlife Research Unit and the Cornell Institute for Resource Information Systems, Cornell researchers have developed a Hudson Valley GIS database, drawing upon data they have developed for the statewide Gap Analysis Project. The database maps the distributions of terrestrial vertebrates from the HRV study area and makes it possible to determine what proportions of the terrestrial vertebrate diversity of the HRV can be found within state parks, state forests, and other public lands in the region. Knowing which public lands have potential to contribute to maintaining regional biodiversity can guide agencies in planning for biodiversity conservation on lands they manage. Knowledge of the locations where "hot spots" of high species richness can be found also can guide planners in reducing the effects of development activities on local and regional biodiversity.

The fifteen counties and 351 towns of the HRV represent 13.5% of the land area of New York State and contain 54% of New York's human population. At the same time, an assemblage of amphibians, reptiles, birds, and mammals representing 83% (324 species) of the total terrestrial vertebrate species richness of NY has been documented from the Hudson Valley by Cornell researchers, using gap analysis methods. Millions of human inhabitants of the HRV are beneficiaries of the biological richness represented by this diverse region. Among state agencies responsible for management of public lands in the HRV, the NYS Department of Environmental Conservation and the NYS Office of Parks, Recreation, and Historic Preservation are responsible for managing more than 85% of the public lands in the region. Many of those public lands have heretofore undocumented potential for conservation of biodiversity in the HRV.

Research in Cornell's Department of Natural Resources Benefits Grassland Bird Conservation

For the past ten years, conservationists working for state and federal agencies and for non-governmental organizations throughout the Northeast have recognized that many kinds of birds that use grasslands for nesting have been declining. Declining species include Upland Sandpiper, Horned Lark, Vesper Sparrow, Savannah Sparrow, Grasshopper Sparrow, Henslow's Sparrow, Eastern Meadowlark, and Bobolink. Many of these species are identified as locally threatened or endangered in more than a dozen northeastern states, from Virginia to Maine. In many instances, the declines of these species parallel declines in agricultural land use at state and regional scales.

At the local scale, researchers affiliated with the NY Cooperative Fish and Wildlife Research Unit in Cornell's Department of Natural Resources partnered with the U.S. Forest Service to study the needs of grassland birds nesting on the Finger Lakes National Forest, the only national forest in New York State. Working with other agencies at a regional scale, including the U.S. Fish and Wildlife Service and the Biological Resources Division of the U.S. Geological Survey, a seventy-page booklet, "Ecology of Grassland Breeding Birds in the Northeastern United States B Literature Review with Recommendations for Management," was prepared, describing approaches to management for conservation of grassland birds in the Northeast. The booklet is aimed at land management practitioners interested in conservation of grassland breeding birds on the lands they manage.

Research on Finger Lakes National Forest has demonstrated compatibilities between the needs of grassland birds and management of grasslands for grazing of livestock. The results have been integrated into a cost-effective management plan for the national forest that provides for conservation of grassland birds alongside traditional use of public lands for grazing. Similar approaches have been integrated into land-use management on other federal lands, including Department of Defense lands (e.g. Ft. Drum Military Reservation) and refuges of the U.S. Fish and Wildlife Service. Finger Lakes National Forest is nationally recognized by birdwatchers, a constituency group estimated to include more than 50 million participants in the U.S. alone, as a "destination" for seeing a variety of grassland breeding birds. Resource managers in New York and twelve additional northeastern states are using the booklet, "Ecology of Grassland Breeding Birds in the Northeastern United

States - Literature Review with Recommendations for Management," to guide land management decisions to achieve regional conservation of grassland birds.

Collaboration with The Nature Conservancy at French Creek Watershed (Chautauqua County)

The French Creek watershed in New York and Pennsylvania is the most biologically diverse aquatic system in the northeast. It supports 111 species of fish and mussels, five times the regional average. Overall, the watershed harbors 12 globally rare species. The watershed also contains a diverse agricultural economy. In the creek's New York headwaters, dairy farming is the mainstay of the economy. Seventy-two farms are estimated to be located in the French Creek Watershed, half of which are adjacent to stream corridors. In this type of activity, manure management is a primary concern in order to protect watershed. The key to handling manure in an environmentally sound manner is to follow practices that ensure manure will be applied at the proper time to minimize runoff, and at the proper rate to minimize leakage into ground water. In addition, farmers have been encouraged to fence livestock out of French Creek and to take steps to reduce stream bank erosion caused by farming activity.

Since 1993, a coalition consisting of The Nature Conservancy, Cornell Cooperative Extension of Chautauqua County, USDA Natural Resources Conservation Service, and Chautauqua County Soil and Water Conservation District has worked with individual farmers to reduce threats to French Creek's biodiversity including siltation from eroded banks, nutrient runoff from fertilizers and manure, and alterations of natural hydrology. This has been accomplished through best management practices (BMPs), while helping farmers remain profitable. Collaboration between the Nature Conservancy and the Department (DNR) date back to 1990 when David Gross organized several faculty visits to the watershed. Mark Bain has made a sustained effort since 1994 including development of baseline biological data (GIS-based). Recently, the Nature Conservancy received a multi-year grant from the Kellogg Foundation to evaluate the economic and conservation effects of their efforts. David Gross collaborated over the past two summers with Wayne Knoblauch in the Department of Applied Economics and Management (AEM) in the conduct of two studies. The 1999 Summer Project conducted by AEM graduate student Carlos Santos assessed farmers' experiences with the nutrient management planning process. The 2000 Summer Project conducted by AEM graduate student Katie Mullen provided an assessment of farmer practices and attitudes regarding stream bank protection.

Overall, the French Creek watershed effort has had a positive impact on farmer's awareness of environmental issues. The Nature Conservancy (working with their partners) is viewed as encouraging farmer stewardship in a credible and respectful manner. The nutrient management planning project affirmed that the technical and financial assistance efforts had maintained or increased the profitability of the farms. The stream bank protection project has resulted in a set of recommendations that The Nature Conservancy will use to increase the awareness of farmers to stream bank protection, improve program design, and expand the outreach effort.

Copper Bands Prevent Economic Losses from Snails in Grapes

In some parts of the Finger Lakes and in Niagara County—and across Lake Ontario in Canada--striped snails have lately taken to clambering around in grape canopies just at harvest time. While it appears they eat neither leaves nor fruit, these snails can still cause extreme economic hardship for grape growers. The effect of striped snail is like that of hail—it may not hit often, but when it does it can mean a total loss. For if one snail turns up as a processor samples the load—as has happened each year since 1998—the company will reject a grower’s entire lot of grapes.

It seems likely that the snails were always in the canopies during summer months, but went back to the ground as temperatures dropped in the fall. Perhaps it’s the milder winters and warmer growing seasons of late that have kept the snails on the vines into the harvest season. Now the challenge is to keep the snails off the vines

entirely. Tim Martinson of the Finger Lakes Grape Program has researched a variety of insecticides, baits, mechanical controls, and fungicides. He has found that barriers made of copper strips are 100% effective in preventing snails from moving into the grape canopy. Although the initial expense for materials and labor is high, the barriers should provide excellent control for several years at virtually no risk to the environment.

The wholesale price on a truckload—20 bins—of grapes is $5,400, so a grower who has their entire load rejected because of a snail in one bin stands to lose a lot. Martinson estimates that materials and labor cost to install copper strips on an acre (600 vines) of grapes would cost approximately $80 per acre and would last five years. (By comparison, spraying copper fungicides at the base of the vines to deter snails would cost roughly $20 per acre per year.)

An Integrated Framework for Improved Management of White-tailed Deer

White-tailed deer are causing an array of economic, esthetic, and health-related impacts to stakeholders throughout the East. Deer once were scarce and management regulations still reflect that perspective. Concurrently, participation in hunting, the primary means to control deer abundance, is declining in many eastern states. Increased knowledge is needed to match the level of acceptable impacts with capabilities of deer management, specifically to: (1) better understand the level of acceptable impacts from deer; (2) develop innovative methodologies to determine whether hunting can remain a viable control mechanism for deer; and, (3) determine what changes are needed in regulations, education and communication to enhance the effectiveness of hunting to control deer numbers.

Research conducted by personnel from Cornell's Department of Natural Resources (DNR) on the ecological and social components of deer management found that for some areas of New York hunting, as previously practiced, either currently is or soon will be an insufficient mechanism for population control. Based upon this research, new approaches for deer management are being developed. To facilitate implementation of these approaches DNR personnel provided frequent consultations and 3 workshops for the New York Department of Environmental Conservation (NYSDEC) deer management team and several non-governmental organizations. DNR also has received funding to examine new deer management methods in Pennsylvania.

NYSDEC deer managers are rapidly adopting new innovations for controlling deer populations. DNR personnel are working closely with the NYSDEC to test these techniques in the field. DNR and NYSDEC personnel also are working with local landowners to provide additional authority and control over managing overabundant deer on their properties. Baseline research also has been completed in Pennsylvania.

Sweetgrass, a Culturally Significant Native Plant

Sweetgrass (Hierochloe odorata) is a culturally significant plant in demand in the indigenous communities of New York that is often in short supply. In discussions with program advisory committees it was determined that restoration and horticultural management techniques needed to be studied and shared with Native Communities.

A partnership was established connecting Native resource users, USDA, and Sea Grant/Cornell. Plant samples were obtained from several Native American cooperators and supplied to the USDA plant materials lab at Big Flats, NY. Here, they were nurtured to produce large quantities of sweetgrass plugs, which were returned to the communities to establish sweet grass gardens. In addition plant management techniques were researched from the literature and studied in the field and a 4-page publication about the care and management of sweetgrass was produced. In a capstone event to the project, twenty-five community resource managers from six Native American reservation communities attended a day long workshop at Big Flats that highlighted sweetgrass and other cool weather grasses that could be used for silage and as cover crops. Here, too, they were introduced the research and education capabilities of the plant materials lab and the educational partnership between USDA

and Sea Grant/Cornell Cooperative Extension. Future programming efforts will expand upon the use of cool weather grasses as agriculturally viable crops and the Native Community/USDA/ Sea Grant partnership that found its genesis with the sweetgrass project.

The native plant sweetgrass has been cultivated in large quantities and supplied to plant dozens of resource plots across the State. Thus a supply of plants has been produced as a source for a native plant thought to be in decline. In addition a network of native resource managers has been identified and linked in a partnership to non-native resource managers most specifically Cornell Cooperative Extension and USDA-NRCS, and the plant materials facility at Big Flats. The project manager was contacted by a Master's candidate at SUNY College of Environmental Science and Forestry doing research on sweetgrass as a direct result of this network in native communities. This resulted in a new source of management information to be shared with resource managers.

Schuyler County 2000 Household Hazardous Waste/Farm Pesticide & Used Tire Collection Day

Household hazardous waste, leftover farm pesticides and used tires are concerns to residents due to the health and safety risks to family, groundwater and clean air. Tires are not only a fire hazard, but also a breeding ground for mosquitoes, which is of special concern due to the recent spread of the West Nile Virus. In addition, illegal dumping of these items is not only a health hazard, but also spoils the aesthetics of our rural area.

Cornell Cooperative Extension of Schuyler County has maintained an ongoing educational program about safe storage and disposal of these items, plus alternatives to use of hazardous materials and maintenance tips for extending the life of tires. In addition, we have worked to ensure regular collection of hazardous items.

Results to date include increased awareness of safe storage and disposal of these items, plus alternatives to use of hazardous materials and maintenance tips for extending the life of tires:

320 informational packets distributed; in combination with a series of paid advertisements and media releases

This program has been replicated in 3 other counties to date.

2 tons of household hazardous waste and farm pesticides collected from 121 residents and 14 farmers

24 tons of used tires were collected from 300 residents and 2 municipalities

Understanding Oocyst Contamination to Improve Manure Management

The aims of this research are to determine oocyst inactivation rates, establish patterns of oocyst distribution, and to better understand modes of oocyst dissemination. In one experiment, we set out to confirm and define previous field observations on the effects of freeze-thaw events. The water content and soil type had significant effects on oocyst viability relative to the number of freeze-thaw cycles. Oocysts in soil with a lowest water content were inactivated most quickly. Oocysts in soil with the least clay had the lowest inactivation rates. Oocysts in water had an inactivation rate that was near the inactivation rate observed for oocysts in low clay content soil with 78% water. Overall, the freezing and thawing of soils had a significant impact oocyst survival, and the excellent fit of the models may make it possible to utilize the known number of freeze-thaw events to determine the likelihood of a soil to contain this pathogen. The objective of a second study was to determine inactivation rates of oocysts inoculated into three soil type, a silt clay loam, a silt loam, and a sand loam. Oocyst inactivation was significantly greater in the sandy soil than the silt or clay soils. A third study examined the spatial associations of oocyst survival in the field. Soil maps for the percentage of viable oocysts at each site were formed. Using the graphical representations, comparisons were made as to soil parameters and the percentage of viable oocysts present at each point over the course of the study. Initial examination of the data shows that the technique has great promise for ultimately assessing the effects of different soil parameters on oocyst viability in the field.

The work to date has markedly improved our understanding of the survival of oocysts in soil. The modeling of the effects of freeze-thaw events in different soil types may allow us do develop means of assessing the risk posed by different soils on which manure has been land applied. We are also beginning to develop an understanding of how oocysts may survive to markedly different extent on the same field with the goal being to define those aspects of a field that are at the greatest risk of remaining contaminated.

GOAL 5 – ENHANCED ECONOMIC OPPORTUNITIES AND QUALITY OF LIFE FOR AMERICANS

Economic and social well-being are deeply intertwined through opportunities for healthy human development that is nurtured by strong families and communities. Over the next five years, the significance of the local community in economic and human development will become increasingly important as federal and state governments continue to devolve authority and accountability for employment, education, public health, social services and general enhancement of a more self-reliant population.

Cornell's research program in these areas includes faculty from the College of Human Ecology and the College of Agriculture and Life Sciences. Their interests are in economic development (especially in rural communities), human development from pre-natal through elderly stages of the life-course, and design that centers on human environment, health, and well-being. Research areas of current interest include the following:

The Economy

Collaboration with New York State business and industry in fiber science such as ceramic composites, adhesion problems in fiber glass reinforced circuit boards, and fatigue of joints in plastic pipes, and application of computer-assisted design and manufacturing to the textile and apparel industry through the Apparel Industry Outreach that provides educational programming to firm in the New York metropolitan area and throughout New York State;

Health and welfare economics, local economic effects of changes in the health sector including mandated managed care for Medicaid and Medicare recipients, consumer behavior in medical care choice and disease prevention, effects of taxation policies on alcohol consumption, health impact of unemployment, and the effects of public finance policies on low-income households and development of human capital;

Family-based businesses and the interplay between family dynamics, inter-generation transfer of ownership, and economic viability, and time-use in households as it affects household and non-household productivity;

Management of the nonprofit sector including improved techniques for planning and evaluation, inter-organizational collaboration at the community level, strengthened volunteer involvement in local communities, and organizational change.

Family and Community

Human development and family functioning, including cognitive and personality dynamics, biological bases of personality and abnormal development, language development and intellectual growth in infancy and early childhood, the effects on human growth and development of parenting practices, family and school environments and child care programs, and the impact rural work opportunities and community resources on retirement and life-transition decision making;

Health care cost and quality including finance and organization of health care, employer-financed health insurance, the effects of managed care on service quality, equity and access, and Medicaid and Medicare policy, health and menopause among rural women;

Social welfare and family policies and programs including issues of child support, foster care, adoption of hard-to-place children, the effects of divorce on children, and management, leadership and evaluation of human service organizations, food security and food resource management;

Rural economic and community development including local government and business collaborations on job development and community decision making, rural housing quality and community vitality including issues of affordability, energy efficiency and structural integrity, rural housing conditions and children's psychological development, youth development and mentoring, housing for the elderly and disabled, interior design including furniture and facilities for the elderly, Alzheimer's patients, and child care facilities.

The Human Environment

The effects of the physical environment on the workplace and employee including innovative workplace design, non-territorial offices, technological infrastructure, work processes, and formal and informal organizational policies and practices, home-based telecommuting and virtual work environments, the effects of ergonomic factors such as office lighting, computer stations and ventilation systems on employee health and productivity, impact of environmental toxicants such as low-level lead exposure on child development, air and water quality and toxic substance safety for households and communities;

Innovative uses of computers in design decision making and design education, creative problem solving, human/computer interface issues, and visual, historical and cross-cultural bases of interiors, apparel and textiles;

Health and safety issues including apparel design that protects employees from workplace contaminants and injury including HIV and other blood borne pathogens, development of new methods to determine skin exposure from pesticide contaminated clothing;

Fiber science applications to understand the mechanics of fibrous materials, the micromechanics of failure processes, plasma surface modifications, and the development of fiber-based synthetic prostheses and surgical aids.

Future investments in research should be targeted at efforts that (1) link empirical findings to planned economic development and other extension programs; (2) integrate economic with other social science perspectives for a deeper understanding of the influence of family, organizational and community factors on long term development of human capital; (3) integrate biological and psychological approaches to healthy human development; (4) strengthen collaboration among and between business and community organizations in furtherance of economic development and the quality of community life; (5) speed the diffusion of scientific innovation to commercial development that benefits small business and community-based enterprise, (6) integrate the social sciences with information science and its application.

PERFORMANCE GOALS FOR INITIATIVES RELATED TO GOAL 5

Develop the competence and character of youth and adults in families and communities.

build strong families;
develop capable, responsible, and caring young people;
promote healthy, supportive communities;
increase financial well-being
support informed housing choices

Strengthen the economic and social vitality of communities.

empower communities so that they are viable, dynamic, and sustaining;
expand skills of both the current and future workforce;
leverage and apply private and public sector resources wisely;
enhance small business development and management; and
develop, enhance, and retain a strong agricultural industry.

Indicator Data Specific to Goal 5

(For each indicator, both actual and annual target results are included, the latter in parentheses.)

INDICATOR 5.1 The total number of refereed or peer reviewed articles or materials reporting research on community or family economic or social well being.

Year	# refereed items
2000	201 (200)

OBJECTIVE 5.1 To increase the capacity of communities and families to enhance their own economic well-being.

INDICATOR 5.1.2 The total number of public officials and community leaders completing non-formal education programs on economic or enterprise development and the total number of these public officials and community leaders who actually adopt one or more recommended practices to attract new businesses or help expand existing businesses within six month after completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually adopt practices
2000	1972 (3500)	643 (850)

OBJECTIVE 5.2 To annually improve the financial status of families through financial management education programs implemented in which CSREES partners and cooperators play an active research, education, or extension role.

INDICATOR 5.2.1 The number of persons completing non-formal financial management education programs and the total number of these persons who actually adopt one or more recommended practices to decrease consumer credit debt or increase savings within six months after completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually adopt practices
2000	10115 (10500)	6329 (4000)

OBJECTIVE 5.3 To increase the capacity of communities, families, and individuals to improve their own quality of life.

INDICATOR 5.3.1 The total number of persons completing non-formal education programs on community decision making or leadership development and the total number of these persons who actually become actively involved in one or more community projects within six months after completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually become involved
2000	16199 (6500)	9215 (3000)

OBJECTIVE 5.4 To annually increase the incidence of strong families resulting from non-formal education programs.

INDICATOR 5.4.1 The total number of dependent care providers completing non-formal education programs and the total number of these dependent care providers who actually adopt one or more new principles, behaviors, or practices within six months after completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually adopt new principles, etc.
2000	8522 (7500)	6365 (3200)

INDICATOR 5.4.2 The total number of persons completing non-formal education programs on parenting and the total number of these persons who actually adopt one or more parenting principles, behaviors, or practices within six months after completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually adopt principles, etc.
2000	8779 (20000)	5308 (8500)

INDICATOR 5.4.3 The total number of persons completing non-formal education programs on youth development and the total number of these persons who actually adopt one or more youth development principles, behaviors, or practices within six months after completing one or more of these programs.

Year	Output: # persons completing programs	Outcome: # who actually adopt principles, etc.
2000	31861 (18000)	23454 (11000)

Resources Allocated to Goal 5 (FFF and Match)

Dollars x 1000 and (FTE) or (SY)

	FY2000 Target	FY2000 Actual
Extension Total	4,842 (80.6)	4,982 (82.3)
Research Total	1,825 (11.5)	1,507 (9.0)

Impact Examples Related to Goal 5

Small and Large Farms Benefit from Agriculture Workforce Educational Program

Since 1990, total milk production has increased over 5% in NYS due to a 14% increase in milk production per cow. Research has shown a positive relationship between milk production and profit (Dairy Farm Business Summary). To keep pace with this growth, farm owners need to know the most recent advances in agriculture and also be able to hire and train employees to work in this changing environment. In the NWNY area, over 2100 people are required to run these dairy farms. As these farms increase in size, they are hiring people with little or no prior experience working on farms. Both employees and current farm owners have limited time to increase technical knowledge. Therefore, there is a need for education that provides basic skill training for new employees as well as providing skill upgrade training for current farm owners and employees.

Cornell Cooperative Extension is in the unique position to have connections with all phases of farm employment. Over the last 5 years, four different agriculture worker certifications programs have been developed as a result of recommendations of the NWNY Advisory Committee. These programs include Milker Training, Field Crop Technician Training, Herdsperson Training and new for 2000, Calf Managers Training. These training programs have been coordinated with many local agencies: BOCES, Job Training Development Bureaus, Department of Labor, area Cornell Cooperative Extension counties, agriservice and farm businesses. Each of these trainings combines over 30 hours of classroom and on farm skill development. Grants have been received from the NYS Economic Development Corporation to support the hiring of agriservice professionals to co-facilitate trainings with Cornell Cooperative Extension Specialists.

Over 250 participants have completed the trainings since 1995. Some participants have attended more than one training and several farms have sent more than one person from their farm to the trainings. One farm manager noted, "The training provides employees a better understanding of the whole farm picture, instead of just their current job." In 2000, Herdsperson and Calf Manager Trainings were taught and 48 participants completed the trainings. The main benefits of participation, as stated by employers, is an increase in employee interest in the farm operation, having employees ask more questions about the farm, and an increased enthusiasm for farm employment. These benefits are particularly important because farm owners continually say that an enjoyment of farming and a better learning attitude are the most limiting factors when trying to find responsible employees.

Using pre- and post-training evaluations, overall skill level and job responsibility increased as a result of the training. Key areas for increased skill development are: blood collection, hoof care, determining dry matter intake, and accurate heat detection. These skills provide the basis for improved herd health and increased milk production in dairy herds. While increased responsibility has not resulted in immediate increased wage, one farm operator said that "part of their job is to learn and grow and as they do they increase responsibility and increase wage." Each of these improvements increases employee productivity and increases employee retention.

Power Partner Program

Low-income, low-literacy consumers in NYS frequently find themselves unable to meet the cost of electricity for their homes. Many have a significant unpaid past due bill owed to the utility putting them at risk for the shut off of their electric service. Often they are forced to choose between paying their electric bill and providing for the other basic needs of their families. While lack of sufficient income is a factor in their inability to pay their bills, lack of knowledge with regard to handling the resources they do have has also been identified as a significant contributing factor.

A team of Extension Educators headed by Cortland County CCE worked with NYSEG Customer Advocates to develop an educational component for NYSEG's Power Partner program that would assist low-income customers in developing the financial management skills necessary for financial independence. A money

management calendar with accompanying newsletters and a workshop were developed and provided to each NYSEG customer who participates in the program. One on one counseling has also been offered to the participants in Cortland County through the family budget counseling program. Additional program materials were provided to county associations for use with other low-income, low-literacy audiences who are not NYSEG customers.

During a recent statewide survey participants in the program have reported that because of their involvement with the Power Partner program they are now using a spending plan(92%), they pay their bills on time(88%), and they report having enough money to meet their monthly expenses(66%). The participants identified the educational materials designed by Cornell Cooperative Extension as a major factor in their behavior change. Locally, of 72 active participants, 65 are current on their plan to pay off their arrearage and 12 have completed the program, thus eliminating their debt to NYSEG. Several report that they have begun to set aside money in an emergency fund to help prevent them from falling behind again in the future. As a result of this collaborative effort, extension educators across NYS have a high quality tool to use when they work with low-income, low-literacy audiences.

Welfare to Entrepreneurship

Welfare Reform legislation has set time limits, eligibility requirements and opportunities to help transition dependent social service recipients to independence. Training programs need to encourage self-employment as an option to wage employment. To accomplish the goal of self-sufficiency and help communities grow, limited income individuals need to develop and enhance their personal and business skills.

Building on Cornell Cooperative Extension of Albany County's successful years of working with limited income individuals and helping individuals start their own business, a small business training program was designed for limited income individuals. Working with dozens of community organizations and businesses, eligible and interested TANF individuals were recruited. The small group participated in seven months of personal development workshops, technology trainings, and business start-up classes, including support services such as financial counseling. A research study conducted by Cornell is evaluating the "Making Dreams Come True" business-training program.

After completing a seven-month business-training program, seven TANF recipients have a better life.

They are financially more stable.

All seven participants completed budgeting sessions, financial management classes, and credit counseling. They identified previous credit/money concerns and repaired them.

All seven individuals completed the training requirements for an IDA (Individual Development Account) savings program.

Three participants opened their savings accounts and are still saving.

They have improved their living conditions.

Six individuals have moved or have applications pending to move to better housing.

They are computer literate (and their families have access to a computer)

All seven completed an intensive computer training and have experience and expertise in several computer programs. Everyone in the group has a computer in their home and uses it to continue to improve their computer skills.

They have increased their knowledge and learned what is needed to start and successfully run a business.

All seven completed business plans

Everyone was "matched" with a business counselor who is available for ongoing business assistance.

They are now employed

One participant became registered as a family childcare provider.
One participant was approved for a loan to purchase a cab company.
Two individuals have been employed since graduation in positions w/ opportunities for advancement.

They are contributing to the economy

Three months after graduation, six of the seven participants are no longer receiving public assistance.

School Age Institute

The increasing need for quality after school programs has become inherently important as the population of school age children increases and more of them are being left home alone. Documentation has shown that more juvenile accidents and crimes occur between the hours of 3:00 PM and 6:00 PM, the crucial time between after school and when most parents return home from work. One way to have a quality after school program is to make sure staff are qualified and well trained in the issues of child development, safe childcare practices and appropriate activity planning.

The School Age Institute was an innovative approach to meet the training needs of the direct care staff of after school programs located in the City of Rochester. Through hands on training experiences, 13 school age staff from six different locations, received an intensive program covering, components of quality childcare, the 4-H program and projects, age appropriateness, discipline and guidance, school age environments, play for school agers, stress and resiliency in children and conflict resolution skills. This was accomplished through monthly classes held over nine months. Each class was 3 hours long. Each after school program was enrolled as a 4-H club, making all 4-H programs available to each center and their clients.

The Early Childhood Education Quality Council of the City of Rochester collaborated with Cornell Cooperative Extension to recruit participants and assist with resources. This partnership enables Cornell Cooperative Extension to identify centers where the most need prevailed.

All 13 participants completed the entire course, and through evaluation have shown implementation of information from the classes at their sites. All six sites have re-enrolled in the 4-H program as it was deemed a valuable experience for the youth involved. Over 450 youth who attend these after school programs now have leaders who are well trained and thus should be receiving a quality program.

Community Tree Buying Pilot Project

Municipalities across Central New York have begun urban forest replanting efforts following the devastating effects of local storm events, such as the 1998 Labor Day Wind Storm. The desire to replace the lost green infrastructure that provides a host of benefits to municipal residents is of great interest to local leaders. However, as with any natural storm event, funding for these efforts presents problems for most communities. Further, replanting trees does not come with guaranties of survival, such as the case with replacing concrete structures. Thus, local municipalities have expressed a desire for a cheap, reliable, planting technology coupled with technical assistance and training to achieve replanting their green infrastructure.

In an attempt to provide research knowledge as a community solution, CCE of Onondaga County undertook a pilot community tree planting project. Nina Bassuk at Cornell University has pioneered bare-root planting of large diameter trees on municipal street tree applications. Cornell faculty research suggests the use of bare-root technology will provide higher survival rates resulting in wiser use of public tax dollars. CCE staff worked with the primary nursery supplier to offer a bulk order discount to participating municipalities. CCE staff utilized videos of Nina's research with the nursery's discount to convince seven local municipalities to bulk order bare

root trees. CCE, in collaboration with NYS Department of Environmental Conservation, provided 'how to' training for participating municipal crews.

Seven municipal tree committees collaborated through bulk ordering, training workshops, and shared delivery to replant trees lost in local storm events. As a result, 300 trees were planted at an estimated overall cost of$15,000 with estimated savings of $45,000. Overall, partnership of municipalities has resulted in communities helping each other while enhancing the environment.

Cornell Cooperative Extension Comprehensive Bicycle Safety Program

The Cortland County Millennium Bicycle Route is a seven-mile on-road bicycle route created to help promote bicycle safety and wholesome, heart-healthy family activities in Cortland County. In addition to promoting safe cycling practices and offering opportunities for families and individuals to participate in Millennium Bicycle Route events and activities, the route has also served to create more awareness among motor vehicle operators with regard to bicyclists and bicycle safety issues.

A presidential initiative, the White House Millennium Trail project recognizes efforts to bring communities together to "Honor the Past Imagine the Future" by developing trails that connect people to their land, their history, and their culture. The Cortland County Millennium Bicycle Route has been designated and commended by the White House for its efforts to promote bicycle safety, healthy heart and family-oriented activities. Cortland¹s Millennium Bicycle Route culminates more than two years of work by a Cooperative Extension Bicycle Safety Educator, a Cortland County Health Educator, a Sheriff¹s Deputy, the County Youth Bureau Director, and other members of the Cortland County Bicycle Safety Coalition. The group worked closely with a Bicycle and Pedestrian Engineer from New York State Department of Transportation (NYSDOT) to create the scenic on-road route. The energetic group arranged to have all the route signs donated by NYSDOT and posts for the City portion of the route donated by the City of Cortland Department of Public Works and the Cortland County Highway Department, so the route did not cost Cortland County one penny to implement.

4-H Youth Development/After School Child Care Initiative

The need for safe, educational after-school programs has been identified as a major challenge in New York State. Research has demonstrated that youth are most vulnerable to a variety of health and safety problems during the hours between the end of school and the return of working parents to the home. This problem is even starker in a rural community where there are limited child-care options for working and lower income families. In addition, recent changes to the standards and licensing requirements for child care providers have led to many local providers closing shop, creating something of a child care crisis in many parts of rural New York State.

Cornell Cooperative Extension of Greene County obtained funding in 1998 through the Office of Children and Family Services SAFE PLACES program to initiate an after school child care program in the Windham-Ashland-Jewett Central School. In the fall of 1999 this program was expanded to include new sites in Cairo and Durham school districts through additional funding from OCFS. There are now over 100 youth enrolled at the three sites with all funding originating from the OCFS Advantage After School Program initiative. The program emphasizes positive social interactions, violence prevention, community service, and completion of homework. Additional extension resources and programs in nutrition, health and safety, and agriculture and natural resources are also incorporated into each program site.

On a daily basis, approximately 100 youth participate in a three-hour after-school educational program licensed by the New York State Child Care Council. As the programs become more established in year two, stronger partnerships are resulting with the schools and the community at-large. Youth are now having opportunities to

become engaged in other after-school activities such as sports and other youth clubs. Feedback from parent participants is indicating that the after-school programs have added a great deal of peace of mind and stability to families who no longer are concerned about the safety and well being of their children during the after-school hours. There are waiting lists for participation in two of the three program sites. Parents appreciate the ability to meet and talk with staff on a daily basis to hear how their child is doing in the program and how they are interacting with other children. Homework time has also been very positively received. Parents are also pleased with the increased opportunities for informal interaction and socialization with a broader group of children that the after-school program provides.

"Independence Through Transportation" Program

Welfare-to-work residents who are currently employed often have multiple issues related to securing reliable transportation in order to keep their current jobs or to qualify for higher-paying, more secure positions. Research shows that Food Stamp recipients and other low-income audiences typically have difficulties managing food and financial resources. Our local D.S.S secured funds through an "Independence through Transportation" grant to establish a partnership to help meet transportation needs for these residents. The program allows qualified individuals participating in social service programs, to purchase an automobile and to repay the loan with no interest penalty. Participants needed to receive budget assistance usually with very short notice given their circumstances and sometimes-immediate need for a vehicle.

CCE Onondaga was contacted in the fall of '99 by the Department of Social Services to provide individual and small group budgeting sessions for residents who qualified for the "ITT" program. We developed lessons based on the needs and learning abilities of the participants referred through D.S.S. agencies utilizing existing resources including one from the University of Wisconsin titled: Planning To Stay Ahead. We negotiated in our contract with D.S.S. to require that each individual who qualified for the program engage in a 2- hour budgeting session with our CCE educator prior to obtaining a vehicle. We negotiated with the Rescue Missions Auto Donation Center, the contract agency that provides the reconditioned vehicles; to provide this program at their site so the participants could combine their budgeting session and meet the contact person for their vehicle at the same time and place. Coordination of efforts helped to minimize the time and effort spent by the program participants to secure a vehicle needed for employment. CCE made every effort to schedule participants who contacted us within a few days for their initial budgeting session.

To date our CCE educator has counseled 31 participants; five who have chosen to receive additional healthy living skills counseling sessions after purchasing their vehicles. Seven males and 24 females have completed counseling; four with language barriers were assisted with the help of translators.

The program has assisted several participants to make these positive changes:

Three participants have been able to move off the bus line to not only a cheaper apartment, but a better one as well.

Eight to date have been able to secure better paying jobs or increase the amount of hours worked so they are able to increase earnings often with reducing total related work time (including transportation time).

90% of the participants who received budget counseling maintained the agreed upon repayment schedule. (This rate was much lower for residents who received a vehicle prior to the CCE contract for budget education was included.)

60% who have used the food resource/budget management tips and community resources that we recommended have reported reducing food other non-fixed budget costs.

One mother of 4 was unable to spend time with her family due to working a night shift shared that after completing our budgeting program and securing her vehicle she was able to qualify for a day job with better pay and become a participating member of her family again!

Onondaga County has requested that CCE continue to partner to provide household budget management education through the second phase of this project during 2001. The new Wheels for Work program will assist an additional 50-100 low-income residents with a vehicle and additional benefits (including limited-time auto insurance, AAA memberships, car seats, etc.) to improve employment opportunities.

e-Business Economic Vitality

There has not been a coordinated effort addressing the rapid emergence of e-business in Orange County. While many organizations provide services, and educational programs exist in several different organizations, there has been limited discussion of what the county needs to do to position itself to capitalize on the enormous potential of this internet.

CCE of Orange County, working in cooperation with Orange County Partnership, the county economic development organization, hosted a conference that brought together leaders in e-business from educational institutions, government agencies, and service providers. The conference focused on what the county should be doing to take advantage of the New Economy to increase its competitive advantage.

Initial results include:

30 people representing private business, local government and educational institutions attended the conference, many of whom have not worked together in the past.

New collaborations with local business have developed as a result

Orange County Partnership is initiating an e-Business committee that will help develop e-business efforts in the county.

Cornell Cooperative Extension of Orange County has been invited to participate on the local Chamber of Commerce's Electronic Commerce Committee providing enhanced opportunities for economic development efforts in the county

STAKEHOLDER INPUT PROCESS

During this reporting period, Cornell Cooperative Extension and the Cornell University Agricultural Experiment Station utilized the stakeholder input process elucidated on page 29 of the approved FY2000-2004 Plan of Work.

Each of CCE's 55 county extension associations continued to work closely with stakeholders in their counties via stakeholder participation in their local governance (i.e. board of directors) and program guidance (i.e. advisory committee) structures. Formal advisory committees were also used to guide New York City Extension programs. Over 2500 stakeholders were engaged and heard through these local mechanisms. In addition, well over 60,000 stakeholder volunteers from all walks of life continued to participate and assist in the direction, priority setting, and delivery of extension programs throughout the state.

CCE and CUAES also continued to encourage and depend on program governance and advisory committees to guide program decision-making, with over 100 such groups capturing the advice and expressed needs of over 1000 individuals. These groups are designed to invite the input and suggestions of consumer, community leaders, scientists, educators, entrepreneurs, and other clientele.

Lastly, CCE and CUAES decision makers continued to channel and amplify communications on stakeholder needs through the joint (extension and research) Statewide Program Committee (SPC) structure and process. These SPCs are composed of researchers, campus-based extension educators, county-based extension educators, and external stakeholders. They not only help to heighten research-extension program integration, but also inform, guide, and help review research and extension effort.

Since submission of the Plan of Work in July 1999, the number of SPCs has expanded to 12, as a new SPC in Agricultural and Food Systems Economic Vitality was successfully chartered. Other chartered SPCs include those in: Community and Economic Vitality, Crop and Soil Management, Dairy Industry Competitiveness and Profitability, Design and Technology, Environmental and Natural Resources Outreach, Fruit Industry Competitiveness and Profitability, Human Development, Landscape Horticulture, and Vegetable Industry Competitiveness and Profitability.

In fall of 1999 and 2000, county associations and SPCs submitted priority areas for research and extension program attention. Subsequently, the CCE and CUAES directors referred faculty to these lists of priority areas as part of the annual calls for preproposals. These lists are then referenced and used by the directors when allocating federal formula funding (Hatch and Smith-Lever). SPCs were also asked to review (for relevancy and potential impact) virtually all the research and extension project/program preproposals requesting federal formula funds. Lastly, SPC-identified priorities are used to call for special Research/Extension Integration Grants preproposals, which not only must directly address SPC needs, but must have local extension association participation, research-extension integration elements, and multi-disciplinary effort. Submitted preproposals are then reviewed by the appropriate SPC. To date, 70 such projects have been funded since 1994 for a total of $1,142,000, with funding pending on 13 new projects for FY 2001-2002.

Clearly, stakeholder input is critical to the success of all CCE and CUAES programs, projects and activities. We believe the local and statewide process and structures extant in New York directly engage and benefit the process of gaining stakeholder input into program decisionmaking. Nonetheless, changes and refinements to our current system are under active consideration or implementation and will be reported on in the future.

PROGRAM REVIEW PROCESSES

The research and extension review processes outlined on pages 31-32 of the approved plan were implemented as described. We anticipate a number of changes and enhancements in these processes in the coming year and will describe those in our 2001 annual report.

MULTISTATE AND JOINT ACTIVITIES

Our multistate, multi-institutional, and multi-disciplinary activities occur within the same stakeholder involvement and program development processes as in-state activities and as such are directed to priority needs of priority audiences. Our program development structure for federal formula funds is interdisciplinary by definition (see pages 29-30 and 36 of approved plan). All projects are expected to outline expected outcomes and report against them. We are working to strengthen specific documentation of multi/joint programs and have included evidence of such activity directly in our pre-proposal and reporting criteria. The fundamental purposes of these efforts are to strengthen quality of programming by bringing together required disciplines and to assure efficient use and maximum leveraging of federal formula funds. The sections below and Appendices C and D provide additional detail.

MULTISTATE EXTENSION ACTIVITIES

Multistate extension activity is documented in Appendix C. Since final guidelines for multi-state extension activities were not available until well into the program year, for non-contractual multi-state extension activities we have relied on reports of collaboration with other states as identified by investigators and administrators. In the process of compiling this information, faculty were made aware of the need to better document and expand upon multi-state partnerships.

INTEGRATED RESEARCH AND EXTENSION ACTIVITIES

During 2000 we continued and expanded upon our integrated research and extension collaborative strategy as outlined in the approved plan of work. Two positions were added during the year to strengthen this collaboration – an Assistant Director for Research and Extension and a Research and Extension Planning and Accountability Associate, greatly enhancing our ability to promote and document integrated activity. Integrated approaches are our norm and continue to be strengthened. Specific documentation of integrated activities is included in Appendix E.

MULTI-COUNTY INITIATIVES

Multi-county initiatives are fostered through active encouragement of formal and non-formal program partnerships. At present time, there are 8 regional extension program teams involving 30 counties in which Cornell University is a formal funding partner. In addition, at least 12 collaborative relationships involving at least 30 counties exist without formal Cornell sponsorship. In the last quarter of 2000, Cornell Cooperative Extension conducted an extensive planning process one outcome of which was to commit to significant expansion of multi-county and regional program approaches. Results will be included in future annual reports.

CIVIL RIGHTS

While not requested as part of the plan of work annual report, it is important to note that civil rights considerations were addressed in significant ways during 2000. Cornell University participated in an extension and research compliance review during Fall 2000. While we are still awaiting our written report, the process was helpful in identifying needed improvements in practices and procedures. Since this was the first time that the research community was involved in such a review, there now is significantly greater awareness of civil rights implications of the work of research faculty and administrators. For the extension program, the review resulted in renewed emphasis on training and local compliance procedures. Special emphasis was placed on improving documentation of EEO and EPO efforts through our accountability system.

Appendix A – Assignment of Research/Extension Impact Statements to CSREES Goal Themes

Goal 1 Themes

- Agricultural Profitability (12)
- Animal Production Efficiency (11)
- Ornamental/Green Agriculture (11)
- Agricultural Competitiveness (7)
- Urban Gardening (6)
- Small Farm Viability (5)
- Diversified/Alternative Agriculture (4)
- Home Lawn and Gardening (4)
- Plant Health (4)
- Plant Production Efficiency (4)
- Plant Genomics (3)
- Plant Germplasm (3)
- Grazing (3)
- Invasive Species (3)
- New Uses for Agricultural Products (3)
- Apiculture (2)
- Managing Change in Agriculture (2)
- Biotechnology (2)
- Biobased Products (1)

Goal 2 Themes

- Food Safety (12)
- Food Security (3)
- Foodborne Pathogen Protection (2)
- HACCP (2)

Goal 3 Themes

- Human Nutrition (31)
- Human Health (18)
- Health Care (1)

Goal 4 Themes

- Natural Resource Management (10)
- Integrated Pest Management (9)
- Water Quality (8)
- Biological Control (7)
- Forest Resource Management (7)
- Wildlife Management (6)
- Biodiversity (4)
- Forest Crops (3)
- Nutrient Management (3)
- Agricultural Waste Management (2)
- Recycling (3)
- Hazardous Materials (2)
- Wetlands Restoration and Protection (2)
- Endangered Species (1)

Pesticide Application (1)

Goal 5 Themes

Youth Development/4-H (31)
Leadership Training and Development (18)
Workforce Preparation (17)
Family Resource Management (14)
Child Care/Dependent Care (12)
Community Development (11)
Parenting (8)
Jobs/Employment (7)
Agricultural Financial Management (7)
Promoting Business Programs (6)
Aging (4)
Children, Youth, and Families at Risk (4)
Home Safety (2)
Home-Based Business Education (2)
Tourism (2)
Youth Farm Safety (2)
Promoting Housing Programs (1)

Appendix B – Title Listing of Extension and Research Impact Statements for Year 2000

1999 NY Master Forest Owner/COVERTS Program Summary

2000 Putnam County Youth Forum
2000 Renovation of Vegetable and Flower Beds at Harts Brook Nature Preserve and Arboretum
2000 Right-of-Way Training for Consolidated Edison Employees
4-H Assisted and Therapeutic Riding
4-H Camp Bristol Hills
4-H Camp Overlook Youth Development
4-H Clubs and the Community
4-H Portfolio
4-H provides continued Life Experiences
4-H Riding Independence for Disabled Equestrians (4-H RIDE)
4-H Teen Council
4-H Vehicle Safari
4-H Youth Development
4-H Youth Development/After School Child Care Initiative
40 Keys to Success Asset Mini-Grant Workgroup
4th Grade Conservation Field Days
Adaptation of Traditional Cultivation Methods to Contemporary Development Issues at the Pueblos of Acoma and Zuni, NM
Advancing Youth Development
Advancing Youth Development Training
After school food and nutrition class series
Ag Economic Development Position (Washington and Saratoga Counties)
Ag-Stravaganza
Agricultural Educator
Agricultural Preservation and Profitability
Agriculture Economic Enhancement/Vitality
Agriculture, Forestry and Economic Development
Agriculture Program Farm Stand Survey Project
Agriculture Workforce Certification Program (AWCP)
Agroforestry Alternatives For Damaged Sugar Bushes
Agroforestry workshop at ginseng conference leads to forest farming learning trials with landowners
An apple a day really may keep the doctor away: Cornell apple findings a boon to NY and US apple industry
An Application of Gap Analysis in Planning for Conservation of Biodiversity in the Hudson River Valley
An Integrated Framework for Improved Management of White-tailed Deer
Anger Management
Assessment of Immunocontraceptive Vaccines for Controlling Reproduction in White-tailed Deer
Assets Coming Together for Youth Initiative (ACT)
Assuring the Safety of Foods Processed, Prepared, and Sold in Retail Food Stores
Be Smart...Don't Start -Tobacco Prevention Education Program (K-6th grade program)
BILT (Building Independence for the Long Term)
Biodegradable Hydrogels to Deliver Drugs, Repair Tissue
Biorational control of viburnum leaf beetle, a new landscape pest in the U.S.
BMR Sorghum Sudan research
Buffalo in Bloom
Building Parenting Skills: A Program Evaluation
Calf Managers Increase Skills to Reduce Calf Death

Cancer Therapeutics
Chautauqua Direct Market Project
Chemung Basin River Trail Partnership
Children, Youth and Family Well Being
Collaboration with The Nature Conservancy at French Creek Watershed (Chautauqua County)
College Interview Program
Community 3R's (Reduce, Reuse, and Recycle) Center for Waste Prevention
Community Clothes Closet
Community Economic Renewal: Layoffs at the Paper Mill Stimulate Action in Clifton and Fine Townships.
Community Economic Renewal: Visioning, community leadership, & capacity building in Tioga County, NY.
Community Food Security
Community Outreach & Marketing Campaign in High Risk Radon Areas
Community Tree Buying Pilot Project
Community-based Deer Management Research and Education
Composting as a Component of Sustainable Agriculture
Connecting all plants
Conservation Genetics and Genomics
Control of invasive plants
Control of parasitic honey bee mites with formic acid
Copper Bands Prevent Economic Losses from Snails in Grapes
Cormorant impact on fisheries
Cornell Conducts Training Program for New York Tax Preparers
Cornell Cooperative Extension Comprehensive Bicycle Safety Program
Cornell Cooperative Extension/Rural Health Alliance of Delaware County Conducts A Pilot Senior Fitness Program
Cornell Environmental Inquiry Outreach to Schools
Cornell Faculty Discuss New Ideas for Teaching and Advising During the Annual Thornfield Experience
Cornell Faculty Improve Pesticide Application Techniques
Cornell Food Science Summer Scholars Program for Undergraduates
Cornell Food Scientists Work to Prevent Contamination of Dairy Products with Mycobacterium paratuberculosis and Listeria monocytogenes
Cornell "Grow Your Greenhouse!" Business Management Conference
Cornell Plant Breeders Develop a High Yielding Wheat Variety
Cornell Plant Breeders Develop Disease-Resistant Birdsfoot Trefoil Variety
Cornell Program Addresses Food and Water Safety
Cornell Small Business Workshop
Cornell University Master Beekeeper Program
Cornell's Department of Biometrics Prepares Effective Information Managers and Assessors
Cornell's Educational Programs Improve the Quality and Safety of Dairy Products
Cornell's Environmental Statistics Program Helps Scientists Evaluate Environmental Data
Cornell's PRO-DAIRY Program Enhances State's Dairy Industry
Cornell's Undergraduate Business Program Seeks Accreditation
Cortland Family Resource Center
Dairy Farm Waste Management Educational Program for Professional Engineers
Dairy Feeder Training
Dairy Fellows Program Graduates Agricultural Leaders
Dairy Program Committee
Delaware County Agricultural and Farmland and Protection Plan
Detecting New Exotic Insect Threats and Follow-up Surveys
Determinants of Human Food Intake

Development of adaptive impact management: a novel approach to wildlife management
Diagnostic Guide Helps Greenhouse Growers Properly Identify Plant Problems
Diet and Genes
Diversity Awareness & Action
DNA fingerprinting of Listeria monocytogenes and detection of human listeriosis outbreaks
Down-on-the-Farm Day
e-Business Economic Vitality
Early Steps Curriculum Grades Pre-K - Five
Earn-a-Buck at the Arnot Forest
"East Smart New York" "Supercupboard" Program; Nutrition Education Programs
Eat Smart New York
Eat Smart New York - Food Stamp Nutrition Education Program
"Eat Smart New York" "Supercupboard" Program; Nutrition Education-Adult Audiences
Eat Smart New York-Fun with Food Youth Program
Eat Smart NY...in Cortland County!
Ecological impacts of zebra mussels in New York's waters
Economic Food Shopping
Education about Genetically Engineered Crops in Agriculture
Educational Programs of Cornell Animal Scientists Have Helped the New York State Poultry Industry Remain Competitive in a Keen Marketplace
Effects of Unemployment on Mental Health
EFNEP (Expanded Food and Nutrition Education Program
EFNEP in the BEGIN Program
Elder Learning and Seniors Pedagogy
Emphasizing Youth Development
Employee Training for Farm Businesses
Enhancing Biological Control of an Important Pest of Crucifers
Enhancing County Capacity for Natural Resource Management Programming
Environmental Awareness Field Days
Family and Consumer Sciences
Family Budget Counseling/Money 2000+ Program
Family Business Viability in Economically Vulnerable Communities
Family Development Training and Credentialing
Family Economics and Resource Management
Family Focus Even Start Program
Family Resource Management - 1st Time Home Buyers
Family Resource Management - Power Partners
Family Resource Program
Farm Biosecurity awareness and training
Farmers' Market Nutrition Program 2000
Farming Alternatives Program
Farmland Protection
Fifth grade food and nutrition class series
Financial Futures
Financial Management Education
Food Safety
Food Sense
Food Stamp Nutrition Education Program
Forest Management: Balancing Economic Opportunity with Stewardship
Forest Management For Private Landowners

four County North Adirondack Agricultural News
Fresh from the Garden
Fundamental Research Leads to Harpin, a New Biopesticide
Garden Mosaics Project (Buffalo)
Genetic Diversity Garden
Getting the Most out of Your Feeding Program
Getting up-to-date biology, including labs, into pre-college classrooms
Global Seminar on Environment and Sustainable Food System Provides Model for Multinational Instructional Systems
Golden Nematode-resistant Potatoes
Government Leadership in the New Millennium
Grand Care Program
Grass and Alfalfa, Grass Forage Production & Farm Sustainability
Graze New York
Grow and Learn After School Program
Guidance Issued to Wheat Producers and Processors on Toxin-Producing Fungus
Healthy Heart Program
Healthy Heart Worksite Wellness
Healthy Living Program
Healthy Parents-Healthy Baby
Helping Anglers Answer the Question, "Should my family eat the fish I catch?"
Helping consumers mitigate deer damage on their properties
Hempstead Town 4-H After-School & Summer Programs
Hispanic farmer/Producer Development Program
Home Electrical Safety for Seniors
Home Management Skills
Home-A-Syst/4-H FREY Group
Horse Proram Serves Youth and the New York Equine Industry
Horticultural Distance Learning
Horticultural Producers Conference
Hudson Valley Can Do Project
Hudson Valley Hail Damage Recovery Efforts
Hunger Task Force of Orange County
Hydroponics Science Education with the Police Athletic League/South Bronx Center
Impact of Increased High School Graduation Requirements
Implementation of the Niagara County Agricultural and Farmland Protection Plan
Improved Dairy Foods
Improving Community Health
Improving Public Involvement in Natural Resource Management Decision-Making Processes
Improving the Competitiveness of NY Beef Producers
Improving the Efficiency and Profitability of Family-Owned Small Farms
Improving the Health of Children
Increasing Forest Landowner Awareness of Forest Stewardship
Increasing Marketing Opportunities for Livestock Production
Increasing the consumption of fruits and vegetables
"Independence Through Transportation" Program
Independent Living Skills Training Program
Infusing the "Youth Development" Approach into New York State Programs and Policies
Institute for Community College Development at Cornell
Integrating Human Culture and Horticulture

Integrating Organic Gardening Education into N.Y.State Master Gardener Program
International and Local Expansion of Cornell's Family-Based HIV/AIDS Intervention
IPM Tactical Agricultural Teams (TAG)
Jefferson County Sheep Association
Keuka Lake Looking Ahead
Laboratory and Field Studies Produce Broccoli with Resistance to Black Rot Disease
Landscape & Tree Care Professional Training
Lawn and Landscape Management Training
Leadership Genesee
Leatherstocking's Promise
Legislative Tour
Litle Ones' Library
Livestock Production and Marketing
Living With Your Newborn
Long Eddy Water District
"Love to Sew for You and Me"
Low-Investment Parlor Tour
Master Gardener Program
Measuring Financial and Economic Performance
Mentoring Program
Modernizing Buckwheat
MONEY 2000+ Family Budget Counseling
Multi-cultural Program Increases Awareness of International Interdependence
National Collegiate 4-H Club at SUNY Oswego
New book answers question, "What is a species?"
New Farmer Development Program
New Farmers/ New Markets
New Traps Help Manage Pesky Barn Flies
New Web-based Course in Sustainable Development: ABEN 299
New York Agriculture in the Classroom
New York Gap Analysis Project
New York State Commodity Profiles
Nutrient Management Planning and Environmental Issues
Nutrition Educators Provide Life Skills with Nutrition Training
Nutrition, Food Safety & Health, Community Nutrition Education Program (CNEP)
Nutrition Information Program
Nutrition Programming
NY FarmNet trains NYS USDA/FSA staff in Communicating Effectively with a Stressed Clientele
Online Guidance for Children to Avoid Injury at Computers
Orange County Equal Opportunity/Equal Employment
Oswego County Chapter of the Service Corps of Retired Executives (SCORE)
Oswego County Even Start Program
Outreach Nutrition Education Program
Outreach to Clients of Human Services Agencies
Overcoming Arachnophobia
Parenting Education
Parenting Skills Workshop Series at the Ontario Co. Correctional Facility
Performing Arts 4-H Club, The Backstage Kidz
Pesticide Education Outreach

Phosphorus Reduction Through Precision Animal Feeding
Potato late blight
Powdery mildew resistance in cucurbit crops
Power Partner Program
Power Partners - Money Management Program
Practical Intelligence for Teens
Preserving and Enhancing Natural Resources/Heritage Tourism Initiative
Preventing Listeria monocytogenes contamination of Ready to-Eat seafoods and other foods
Program for Effective Parenting
Providing Safe Food for the Homeless and Destitute
Public Issues Education on Genetically Engineered Foods and Crops
Public Policy Education
Putnam County West Nile Virus Task Force
Radon Testing in Chemung County
Rearin' to Shearin' Sheep Clinic
Recruitment
Reduced pesticide strategy for control of parasitic honey bee mites
Reducing Microbial Risks in Fruits and Vegetables with Good Agricultural Practices
Research and Education in Organic Farm Systems
Research in Cornell's Department of Natural Resources Benefits Grassland Bird Conservation
Responding To An Increase In Mennonite & Amish Clientele
Restoring Coastal Ecosystems
Rethinking Rice Production
Risk Reduction Strategies for Non-Community Water Suppliers
Rockland Teen Theater
Role of Starch Granule Size and Morphology in Viscosity of Dispersions
Rotational Pasture Groups
RSVP Bone Builders
Rural Safety Camp Creates New Partnerships
Safe Environments for Children
Safety Education
SAREP summer camp
Schenectady Community Gardens
Schenectady County Horticulture Job Training Program
School Age Institute
Schuyler County 2000 Household Hazardous Waste/Farm Pesticide & Used Tire Collection Day
Schuyler County 2000 Household Hazardous Waste/Farm Pesticide & Used Tire Collection Day
Science Club for Middle School Girls
Senior Fitness For Fun
Septic System Education
Showing schools how to reduce risks and pests
Small and Large Farms Benefit from Agriculture Workforce Educational Program
Small Farm Program
Sportfishing and Aquatic Resources Education Program (SAREP)
Staff Development
Statewide Diversity Catalyst Team
Statewide Teen Ambassador Retreat
Strengthening Local Markets for Ag Producers
Strong Motivation Accompanies First Time Home Buying Goal

Sugar Maple
Sullivan County Water Quality Coordinating Committee (SC WQCC)
Sustainable aquaculture
Sweetgrass, a culturally significant native plant
Symposium on Downtown Revitalization
Talking with Kids about AIDS
TEAM Nutrition
Technology Transfer for Tef Improvement in Ethiopia
Teen Assessment Program
Teen Leadership Institute
The Competitive Advantage for Apparel Manufacturing in New York
The Expanded Food and Nutrition Education Program Makes a Difference in New York State
The "Smart Marketing" Newsletter Series
Tomato fruit weight gene links plants and humans
Trained Logger Certification Program
Training for Lenders Improve Credit Availability for Agriculture
Tree School 2000
Updating the Food Safety Knowledge of Food Inspectors
Urban 4-H Summer program
"Urban Delights:" City Wide Youth Farm Stand
Vegetable guidelines on web keep growers up-to-date
Venison Donation Program
Very Special Volunteers
Village of Haverstraw Farmers Market
Vital work being done to diagnose plant diseases.
Volunteers Focus on Youth Development
Walks and Talks
Warren County Fair Superintendent Program
Water Tasting Contest and Water Week
Welfare to Entrepreneurship
West Nile Fever Public Outreach
Western District 4-H Kids Forum
Wild Over Work
Winter Raspberry Production
Wireless Technologies to Enhance Learning
Work experience at Farmers' Markets
Worker Protection Moc Inspection Workshops
Workforce Development Training
Working With a Diverse Audience
WORKplus for Out-of-School Youth
Wyoming County Family Life Program
Youth Conduct Research in Urban Community Gardens
Youth Leadership Development
YouthNet Program