

# 2007 North Carolina A&T State University Extension and North Carolina State University Research and Extension Combined Annual Report

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## I. Report Overview

### 1. Executive Summary

2007 CSREES Research and Extension AREERA Annual Report

Executive Summary

North Carolinians are the beneficiaries of an array of research and extension efforts designed to better their lives and to make their state a better place in which to live. These efforts are administered by two entities: the North Carolina Agricultural Research Service and North Carolina Cooperative Extension. This report documents 2007 research and extension programs in North Carolina.

North Carolina Agricultural Research Service

North Carolina State University is North Carolina's 1862 land-grant university and the only Research I land-grant institution in the state. The North Carolina Agricultural Research Service, located within the College of Agriculture and Life Sciences at N.C. State University, serves not only as the college's agricultural, environmental and biological sciences research arm but also provides the research foundation in these areas for educational activities within academics and extension. The Agricultural Research Service is the principal state agency for research in agriculture, life sciences and forestry. Its research projects involve the following North Carolina State University colleges.

- Agriculture and Life Sciences
- Forest Resources
- Physical and Mathematical Sciences
- Engineering
- Veterinary Medicine

In addition, the Research Service administers projects in the School of Human Environmental Sciences at the University of North Carolina-Greensboro. Within the College of Agriculture and Life Sciences at N.C. State University, the Agricultural Research Service coordinates research in 18 departments and works in partnership with the North Carolina Cooperative Extension Service and Academic Programs.

The mission of the Agricultural Research Service is to develop the knowledge and technology needed to:

- Improve the productivity, profitability and sustainability of industries in agriculture, forestry, and life sciences;
- Conserve and improve the state's natural resources and environment; and
- Improve the health, well-being and quality of life of all citizens of North Carolina.

In FY 2007 Research Service personnel include 397 tenured and tenure-track research faculty accounting for approximately 207 full-time scientist equivalents, most on shared appointments with academics or Extension. Working with these faculty members are more than 404 research professors, researchers, research assistants, professional support staff and graduate students; 421 laboratory or field technicians, and other technical support; and 137 clerical/other staff. These faculty members and support personnel conduct basic and applied research in 645 projects, of which 23 are multistate, to support more than 70 commodities as well as many related agribusinesses and life science industries. Altogether, this includes 90 official commodity groups and agricultural industry associations.

North Carolina Cooperative Extension

The College of Agriculture and Life Sciences at N.C. State University and the School of Agriculture and Environmental Sciences at North Carolina A&T State University work collaboratively to provide educational opportunities that are relevant and responsive to the needs of individuals, communities, counties and the state, thus achieving their shared land-grant missions. At the heart of this partnership is North Carolina Cooperative Extension.

North Carolina Cooperative Extension's mission is to help people put research-based knowledge to work for economic prosperity, environmental stewardship and an improved quality of life. To address ever-changing needs, the organization operates under a dynamic long-range plan of work, a plan that changes as circumstances dictate. The plan encompasses three major focus areas. These focus areas, which are of concern statewide, are:

- To strengthen the economy through profitable, sustainable and safe food, forest and green industry systems;
- To protect the environment and natural resources;
- To empower youth and families to lead healthier lives and become community leaders.

To achieve the plan's 50 major objectives, specialists at the state's two land-grant universities work hand-in-hand with field faculty serving in all 100 North Carolina counties and on the state's Cherokee Reservation. Objectives within the four major program areas specifically target limited resource audiences, and North Carolina Cooperative Extension programs at N.C. A&T State University are guided largely by these targeted objectives. Parameters are included for every objective that may be used to measure the success of Extension programs with both limited- and unlimited-resource audiences.

The work of Cooperative Extension professionals is coordinated with the efforts of the North Carolina Agricultural Research Service. Indeed, about 100 of the 350 Extension faculty within the N.C. State University College of Agriculture and Life Sciences have joint appointments with the Agricultural Research Service.

In addition to this alliance with research faculty, Extension benefits from the input of a well-established statewide system of lay advisers, who represent the state's diverse population. In addition to this advisory system input, each county routinely conducts an environmental scan to determine emerging needs and appropriate educational responses. These scans give residents, advisers, commodity group representatives, volunteers and other clients the opportunity to ensure that local programs meet local needs and priorities.

To ensure that underserved and underrepresented audiences are among those included in program development and implementation, Cooperative Extension established a new civil rights plan that features computer monitoring of program participation by gender and race, including goals and plans for assuring that all persons have equal access to any Extension organized group. A permanent Diversity Task Force monitors programs, suggests policy, and develops and conducts training for the organization.

Funding for Extension programs is provided by Smith-Lever appropriations, state and county funds, plus public and private grants. As a proportion of overall spending, grants and contracts have become increasingly important. These funds have helped Cooperative Extension address emerging challenges in innovative ways, but declining or flat levels of appropriated support from federal, state and county governments pose significant challenges for meeting program objectives.

Stakeholder input undergirds all of Extension's efforts, as it did and continues to do in planning and implementing the five-year AREERA Plan of Work. This report reflects impacts of the joint educational programming efforts of the North Carolina Cooperative Extension Service of N.C. State University and the Cooperative Extension Program of N.C. A & T State University. This report also updates and highlights accomplishments and impacts of research conducted through the North Carolina Agricultural Research Service, emphasizing high priority areas in agriculture and life sciences for North Carolina now and in the near future. The research and extension programs documented here are helping North Carolina's population of more than 9 million citizens address critical challenges facing them today and in the future.

Additional North Carolina Cooperative Extension program accomplishments and success stories can be found at <http://www.ces.ncsu.edu/AboutCES/>, and <http://www.ag.ncat.edu/extension/>.

Planned Program Overview Summaries

Altogether, the Research and Extension AREERA plans encompass nine broad planned program areas. These include:

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Plant Production Systems and Health

- Economic Systems
- Natural Resources and Environment
- Animals and Their Systems, Production and Health
- Agricultural, Natural Resource and Biological Engineering
- Food Production Systems: Development, Processing, Quality, and Safety
- Human Nutrition and Health
- Families and Communities
- Youth Development

Summaries for each of the nine program area accomplishments follows:

► Plant Production Systems and Health

North Carolina has a strong agricultural economy which has become more diverse over the past 15 years to meet the demands of a changing population and market opportunities. However to remain competitive in a changing national and global agricultural economy and take advantage of local marketing they must adopt more efficient production practices and continue to diversify. Many growers are now producing specialty crops including medicinal herbs, specialty melons, heirloom fruits and vegetables, various crops for the state's growing Hispanic and Oriental populations, kenaf, sea oats and grapes for wine and nutraceutical properties. Nursery, greenhouse and vegetable crops contribute over \$1.1 billion to farm gate and their value is increasing yearly. Additionally consumer concern over food quality and nutrition has fostered an increasing demand for organically produced fruits and vegetables. North Carolina growers have diversified to meet this demand and as a result North Carolina consumers are benefiting through increased diversity of fresh, locally grown, produce in the marketplace. While this diversification has been good for North Carolina growers, it has placed demands on the NCARS to develop and deliver information on sustainable programs for producing, protecting from pests and pathogens, harvesting, storing, and marketing these commodities. The introduction of new pests and the development of pests resistant to commonly used pesticides are also providing NCARS scientists challenges to provide management strategies for them. Although the target audience for this research is North Carolina growers, much of the research and many of the extension programs have regional, national and international impact.

As a result of changes in the national and global agricultural economies, many growers have turned to alternative crops while other growers have elected to take advantage of high grain prices and much of the land previously planted to cotton is now being planted to corn and soybeans. The higher grain prices and conversion of land to grain crops, has had a cascading effect on the production of other crops and on livestock production costs. Energy costs remain high and have had major impacts on profitability as well. Extension programs have sought to help crop and livestock producers manage increased production costs through changes in production practices.

To assist growers in taking advantage of the opportunities the new agricultural economy has created, extension programs, workshops, and field tests/demonstrations have been conducted at the county, regional and state levels to inform growers on alternative income sources, including commercialization of native species and the production of various ornamentals, fruit crops and vegetables, organic production methods, and agro-tourism. These activities draw audiences of all types and levels of experience, including new producers and existing producers, and large scale, limited resource and part-time producers. Topics addressed include cultural practices and alternative marketing channels and strategies and management of production in response to market demand. Marketing initiatives have included creating grower associations, promoting the use of local farmers markets, starting pick or cut your own operations, and combining agro-tourism and direct marketing. Other extension programs sought to assist farmers in managing increased production costs through changes in production practices.

In addition to challenges in producing and marketing both new and old crops, some of these crops are threatened by new pests or pests that have become resistant to commonly used agricultural chemicals. For example Asian soybean rust and glyphosate-resistant weeds are two new challenges faced by North Carolina growers. Campus specialists have worked closely with county agents and producers on strategies to manage these serious problems.

Research and extension activities by faculty in the NCARS and NCCE are creating new opportunities to increase profitability of existing crops and to take advantage local, national and international markets. Among those activities within each knowledge area are:

#### Plant Genome, Genetics, and Genetics Mechanisms

• With collaborators at the Donald Danforth Plant Science Center, recombinant soybeans were created that lack the major known seed allergens. These plants are a platform that can be used to investigate food allergy to soybean.

• A normalized genomic library from seeds and leaf tissues of peanut was created with more than 25,000 unique sequences. With cooperators, the library was "cleaned up" and prepared to submit to the national genomics depository and single sequence repeat markers were identified.

• Tomato plants with altered gravity responses were sent from NCSU to the International Space Center in 2007 for evaluation for growth of crops in space.

#### Plant Genetic Resources

• A new early ripening strawberry variety, 'Galleta', with good quality and large fruit size was released.

• Four new hybrids of the 'Sprite' type cantaloupe are being released for North Carolina growers: 'NC-Sparta' (medium size fruit), 'NC-Sapphire' (large fruit), 'NC-Star' (small fruit), and 'NC-Stella' (round fruit). They are oriental crisp-flesh melons with white skin, white flesh, and high sugar.

• Peanut cultivars developed by the peanut breeder at NCSU were grown on over 71% of the seed acreage in North Carolina in 2006 (an estimate of commercial production in 2007) and also on over 71% of the seed acreage in the Virginia-Carolina production region.

• Development of dwarf, sterile ornamental forms of Buddleja will allow continued deployment of this widely used ornamental shrub in the landscape without the risk of invasive spread into natural ecosystems and native plant communities. A new variety, developed at NCSU, with very low seed set and a compact, dwarf growth habit, was released by Proven Winters as 'Blue Chip'.

• Two online potato databases were developed. One, the NCSU Potato Database is populated with data collected on all experimental and released varieties trialed by NVSU since 1995. The other, the NE1031 Potato Database (<http://potatoes.ncsu.edu/nesrch.php>), is a regional database with agronomic data from eight eastern US states and three Canadian provinces.

#### Plant Product Quality and Utility

• NCSU researchers aided in the development of a newly commercialized plant growth regulator, Configure, which has improved the production quality of hosta and Christmas cacti.

• Plants are being engineered to enhance production of the important vitamin B6 to increase nutritional content.

• The sweetpotato certification program has contributed to the continuing sustainability of the sweetpotato industry in North Carolina, and has improved the overall quality of seed (planting stocks) and the commercial crop. Significant increases in yield

(20% or more) have been reported by researchers and growers.

#### Plant Management Systems

- Studies have shown that if 50% of the farmers in the Tidewater region adopted best management practices such as water control structures, nutrient management planning, or optimum N fertilizer timing, the resultant N runoff would be reduced by approximately 25%. Reducing fertilizer N use by 10% on these farms would save farmers approximately 6.6 million pounds of N or \$3.3 million per year and substantially reduce N the Albemarle-Pamlico Estuarine System.

- Brambles (blackberries and raspberries) are emerging as a new high value crop in North Carolina. Evidence of this industries' growth include: a 50% increase in blackberry acreage, the formation of a commercial growers, and release of a new raspberry 'Nantahala'.

- Heirloom tomatoes are an alternative crop with good market opportunity for some North Carolina farmers. Farmers are selling organic heirloom tomatoes direct to the consumer and receiving very high prices (often over \$3 per pound) from very loyal customers who return week after week throughout the season. Conservative estimates indicate that gross returns of over \$100,000 per acre can be obtained.

- Two high tunnels were constructed at Center for Environmental Farming Systems to compare production of grafted heirloom tomatoes in the field with production in high tunnels. Tunnel yields were 25 days earlier and remained higher through the end of the growing season. Several workshops were conducted on both grafting and high tunnels and a number of growers either using grafting and tunnels in their operation or are considering it.

- Seven new farmers began transitioning approximately 1400 acres to organic grains in 2007.

#### Basic Plant Biology

- Components of the cellular machinery that is involved in degradation of abnormal or foreign secretory proteins have been identified and characterized. Preventing the action of this protein may enable the improvement of expression of genetically-engineered proteins and the amelioration of grain quality problems associated with protein accumulation.

#### Insects, Mites and Other Arthropods Affecting Plants

- New pest management strategies in sweetpotato were shown to reduce insect damage by as much as 78% compared to untreated sweetpotato, resulting in increased marketable yield. Grower surveys in North Carolina reveal that concurrent with the adoption of these new practices, the number of foliar insecticide sprays applied to sweetpotato fell by 37% from 2004 to 2006.

- The Turffiles website is receiving more than 11 million "hits" per year making it the most sought after university turf website in the country and 50% of the inquiries are insect pest related.

- Amplified Fragment Length Polymorphism (AFLP) was used to build a genetic map of one of the most destructive insect pests in the US, *Heliothis virescens*, which attacks cotton, tomato, tobacco and other crops. *H. virescens* is closely related to another insect species, *H. subflexa*, which cannot feed on any of these crops. By genetically crossing these two species our AFLP technique has been used to preliminarily map the location of three genes that enable *H. virescens* to feed on crops.

#### Pathogens and Nematodes Affecting Plant

- Field studies identified the conditions for the use of foliar fungicides which can increase corn yield by over 14 bushels per acre. Based on the rapid increase in the use of fungicides in corn this information could save growers \$10 to \$15 per acre by reducing excess fungicide applications.

- Nematode damage is a serious problem to crops worldwide. Fundamental research on the infection process by root knot nematodes is uncovering information that can be used to protect plants against these damaging pathogens. Over one hundred parasitism genes of cyst and root-knot nematodes were identified.

- A blackberry certification program was developed by the Micropropagation Unit at NCSU to micropropagated virus-tested and true-to-type, certified blackberry plants to certified growers in the US and other countries.

- A complete genome sequence was obtained for the root-knot nematode *Meloidogyne hapla*, permitting a full accounting of the genetic arsenal of this parasite. Similarly, many plant genes expressed in response to root-knot nematode invasion of resistant and compatible host were identified.

- The fungicide program developed and refined in NC for downy mildew of cucurbits has been used and validated everywhere cucumbers are grown commercially and downy mildew occurs (approximately 25 states). Growers are avoiding the use of

expensive fungicide that do not work because of fungicide resistance.

- The forecasting system for downy mildew of cucurbits available on the Internet is accessed more frequently than ever before. Website use peaked in 2007 with 94,621 hits during the month of August.

- Recommendations for the control of fairy rings on turf developed at NCSU reduced the cost of control from \$3,000/acre to \$430/acre. If all golf courses in North Carolina implemented these recommendations, this would create a potential savings of \$3.8 million for the state's golf course industry.

#### Weeds Affecting Plants

- Approximately 99, 95, and 50% of the cotton, soybean, and corn acreage in North Carolina is planted to a herbicide-resistant cultivar. Research and extension programs have focused on how best to manage weeds in these herbicide-resistant crops. Crop yields have increased, input costs have remained the same or been reduced, and quality problems such as foreign matter contamination have been reduced. The overall value to North Carolina cotton and soybean producers is estimated at \$50 million.

#### Integrated Pest Management Systems

- The Consortium for Integrated Pest Management has managed, for 3 years, the ipmPIPE program, an almost \$10 million program to monitor and project the occurrence of Asian soybean rust and other soybean invasives in the US. This program involves over 40 states and saved American soybean farmers as much as \$300 million in the first year alone.

- New pest management strategies in sweetpotato have been shown to reduce insect damage by as much as 78% compared to untreated sweetpotato, resulting in increased marketable yield. Grower surveys in North Carolina reveal that concurrent with the adoption of these new practices, the number of foliar insecticide sprays applied to sweetpotato fell by 37% from 2004 to 2006. ►

#### Economic Systems

The increasingly diverse population of North Carolina faces many economic and social challenges. There is a great need for North Carolina citizens to better understand global economic issues as well as acquire basic knowledge about how global economic forces interact with the local economy to enhance local economic prospects. Research and Extension efforts are provided to assist people in implementing programs that promote sustainable economic development, responsible management of financial assets, and make families more secure financially. Economic system analysis depends critically on an individual decision maker's response to incentives, programs, and the economic environment. Agricultural production remains an important source of farm income throughout North Carolina so programs designed to assist farmers create added value are important. Some of the initiatives undertaken and their results include:

- 1720 Tax preparers gaining needed knowledge for accurate tax return preparation by participating in Extension workshops throughout the state of North Carolina.

- Over 75 new organic and agritourism markets by individual entrepreneurs as a result of guidance from Extension.
- More than 3720 growers adopting improved business management practices in their operations; and 275 registered attendees at estate, legal planning and financial management schools.

- For both the dairy and poultry industries there is the need for the development of a sound research and outreach program in organic grain (both for feed and for direct human consumption) to meet the needs of the six or seven local organic milling operations that exist across the state. This has occurred at CEFS in eastern North Carolina with the leadership of NCSU in partnership with producers and NCA&TSU. Staggering increases in the price being offered for grain especially organic (prices have at least doubled over the past year from already high prices of \$7.00- \$10.00 bu. Outdoor hog production continues to be pushed by market interest. Several large scale buyers are looking for pork that is raised according to standards of treatment, nutrition, and health. One buyer alone purchased \$1,000,000 worth of pork raised in that way. The NCA&TSU outdoor hog program has worked with NCSU, local extension and through the collaborative project NCChoices in this area. One market alone reports a tripling of vendors selling meat products in the market (from 5 to 16) in the past two years.

- A significant amount of analysis of commodity market conditions and the forces driving these markets has been undertaken research/extension faculty. This includes comparisons of local and national prices over a 25 year period in an effort to put the current circumstances into context. In addition, analysis has been undertaken on formulating the most appropriate strategies in these environments for North Carolina growers. Some of this work has resulted in North Carolina growers taking action and making informed marketing and risk management conditions and establishing price floors that will ensure a profit in 2008.

- Extension educational programs focused on ways to evaluate new enterprises, how to start a new business, and the cost and returns of new enterprises. Farm families were able to make informed decisions about the economic viability of new value-added and alternative agricultural enterprises for their farm. Families used the information to make informed decisions concerning the

profitability of adoption of new enterprises. Losses from unprofitable enterprises were minimized. Profitable enterprises were added.

- Economists developed a herbicide risk index using label information and elicited farmers' preferences for various economic and environmental factors as index weights. Using this method, it was determined that total herbicide use on Roundup Ready soybeans was significantly less risky to farm operators and their families and to the environment than the total herbicide use on conventional soybeans.

► Natural Resources and Environment

North Carolina supports one of the nation's most diverse agricultural production systems. The state also possesses a very diverse mixture of natural resources. The coastal plain of Eastern North Carolina is home to most of the row crop agriculture in the state and much of the animal industry. The coastal plain is also home to the North Carolina sea coast and the state's remarkable sounds and estuaries. In Western North Carolina, agriculture, although less intense, is still a very large economic player, which must share space with much more rugged and mountainous terrain in that part of the state.

Because agriculture, tourism, development, and natural resource preservation are all critically important to the well being of North Carolina's people and economy, significant research and extension efforts are underway to assure that the state can maintain a strong agriculture and a clean and healthy environment. Water quality, air quality, species diversity, pathogen movement, wetland preservation, and development/conversion of rural land are all topics of great interest and activity. Adult and youth educational efforts in many environmental areas are ongoing and many interesting and positive outcomes can be reported.

- 2,063 individuals went through the certification or recertification process for animal waste application operators. 533 producers were also trained to properly calibrate manure application equipment.

- 2,916 people were identified as users of Integrated Pest Management (IPM) in North Carolina.

- More than 5,000 individuals and producers adopted one or more best management practices regarding pesticide use.

- More than 20,000 individuals actively participated in environmental awareness programs (such as Project Learning Tree, Project WILD, Aquatic WILD, Catch Clinics, Wildlife Habitat Judging, Environmental Field Days, Hunter Safety, etc.)

- NC CES Regional Training Centers under the Soil and Water Environmental Technology Center (SWETC) are being further developed throughout the state of North Carolina. For example, the Lake Wheeler Training facility is the focus of training on: watershed and wetland management, storm water control, stream restoration, on-site wastewater management, sediment and erosion control, waste management by land application, nutrient management, and composting. Some 2007 findings and impacts from Research in this area were:

- A spatially explicit landscape-level model was developed for analyzing the biological and economic consequences of alternative land-use patterns. The biological model incorporates habitat preferences, area requirements and dispersal ability between habitat patches for terrestrial vertebrate species to predict the likely number of species that will be sustained on the landscape. The economic model incorporates site characteristics and location to predict economic returns for a variety of potential land uses.

- Ozonation within commercial broiler houses to reduce ammonia emissions was investigated. Results indicated that ozone may reduce ammonia concentrations within broiler houses; however, no clear improvements in broiler live performance were observed.

- Research and monitoring indicate that within a few years restored wetlands provide many of the functions and values of natural wetlands. Tidal brackish-water creeks designed to drain a restored wetland, were constructed at North River Farms in Carteret County. The riparian areas associated with this drainage system were graded to the elevations required to support inter-tidal marshes. Native vegetation adapted to each elevation and salinity zone was planted to creating new fish and wildlife habitat.

- NCSU is evaluating the hydrology, plants, and soil properties in the Carolina Bay that will be restored to a wetland. Studies have been done before restoration and after. It is also evaluating similar properties in natural bays, to determine what the proper conditions need to be to restore the hydrology, soils, and vegetation in the drained bay. New remote sensing technologies are being tested to evaluate sediments inexpensively to identify where the wetland might fail. Detailed hydrologic modeling will be used to test scenarios for restoring hydrology.

- Research has been conducted to evaluate the risk of various pesticide exposures to the early life stages of freshwater mussels. These efforts have led to the development, publication, and utilization of an internationally approved standard guideline for conducting toxicity tests with early life stages of freshwater mussels through the American Society for Testing and Materials.

- NCSU scientists discovered the phenomenon of water-column nitrate inhibition of North Carolina's most important seagrass habitat species, *Zostera marina*. The data indicate that nutrient loading reductions are critical in enabling re-establishment of *Zostera* meadows in areas where the habitat has been lost; and that seagrasses less sensitive to nutrient pollution should be used in efforts to re-establish habitat in nutrient over-enriched waters.

•Applied research and extension activities have promoted the adoption of water quality best management practices by North Carolina beef producers. Research has demonstrated that compacted loafing areas in the riparian area lead to excessive rainfall runoff, and loading of nutrients and sediment into surface waters. Surface water quality is being monitored on five North Carolina beef farms to assess water quality and to explore how land use practices influence water quality. An award program, "North Carolina Environmental Stewardship Award" has been developed to recognize beef producers that promote and practice environmental stewardship. These programs have increased awareness of North Carolina beef producers in regards to water quality issues and have led to increased adoption of water quality BMPs.

► Animals and Their Systems, Production and Health

Faculty and staff at North Carolina State University have been engaged in a wide array of research and related projects to increase the competitiveness of North Carolina animal agriculture and improve its global economic position. These efforts are very broad in scope, impact, and clientele served. Major concerns include improving animal health, production efficiency, and profitability while at the same time improving overall environmental conditions and ensuring the sustainability of our rural communities. These concerns receive intense effort for integrated animal agriculture as well as for diversified, alternative, and small independent producers. Projects were conducted within university campus resources and across the state working cooperatively with North Carolina producers, citizens, and other stakeholders. For example, researchers have made fundamental steps in the commercialization of flounder culture that can lead to maximizing the economic viability of flounder farming in North Carolina. In addition, the first private southern flounder hatchery in the U.S. has been established with current annual production projections around 100,000 lbs. The economic potential of flounder farming in the United States could reach five-to-10 times the value of the hybrid striped bass industry within the next 10 years. Researchers have reduced effluents from Hybrid Striped Bass (HSB) ponds by more than 50% which corresponds to an almost 25% savings in pumping costs. Improving the management of HSB ponds in North Carolina, through simple changes in current practices, may bring the industry into an environmentally sustainable means of ensuring the long term survival of this vital industry. Scientists at North Carolina State University and Northwestern University have utilized egg-laying chickens as a model for studying prevention strategies of ovarian cancer. Current research is poised to examine proteomic blood borne markers in chickens that may correlate with those present in humans. This model will enhance the ability of medical researchers to identify potential markers to help verify and determine the efficacy of cancer chemopreventive drug regimens. This model may support the development of acceptable preventive programs and provide for an early detection mechanism for ovarian cancer. The extension and outreach programs of North Carolina Cooperative Extension support the efforts of large integrated animal operations, commercial feed manufacturing, and small niche market producers through training and resource materials. Additional examples of other successes experienced this past year include: giving old broiler breeder males enough to eat maintained their mating ability and increased the growth rate of their broiler progeny by 2%; optimum brooding for broilers resulted in saved propane gas and improved bird performance; documentation that a key enzyme of lipid metabolism (carnitine palmitoyltransferase) develops rapidly in the newborn piglet to accommodate the postnatal supply of fatty acids via milk lipids; demonstrated that a cow herd with higher management levels suffers less during a year with extreme drought than a herd with minimal management; and identification of genetic lines of boars whose sperm production is not impacted significantly by exposure to elevated ambient temperatures. ► Agricultural, Natural Resource and Biological Engineering

In 2007, the planned program of Agricultural, Natural Resource and Biological Engineering was very active through Research and Extension activities. Nearly 13,000 and 23,000 direct and indirect contacts were made in this planned program area through extension activities including workshops, conferences, trainings and field days. The impact of these educational programs was far-reaching. For example, 2,500 people reported involvement with some sort of stormwater BMP implementation. A new extension program in alternative fuels was established at NC State. This program seeks to assist with technology transfer from the laboratory bench top to the field. The transfer is focused on demonstrating how processing techniques and cropping systems specifically selected for the region can be implemented to improve farm profitability and increase energy independence. These projects include ethanol production from cotton stalks, ethanol production from sweet sorghum, torification of wood chips, and identifying new sources of seed oil. Research activities in Agricultural, Natural Resource and Biological Engineering include:

•The initiation of a 2-yr study to measure ammonia emissions, in-house ammonia concentrations, and bird performance (e.g., bird weight, feed conversion) from commercial broiler houses that receive different rates of PLT®. This study will also evaluate ammonia emissions from stockpiled litter receiving the above treatments.

•The development of an ammonia emissions model for prediction emissions from broiler litter has been focusing on estimating ammonia emission fluxes from litter properties (the TKN content, pH, moisture content, and total carbon content), the mass transfer

coefficient  $K_m$  and ventilation rate  $Q$ . Several sets of experiments were conducted. Based upon experimental results from a dynamic flow-through chamber system, a preliminary statistical modeling approach was established for ammonia emission flux estimation.

- Research and a patent on a continuous-flow struvite crystallizer for removing phosphorus from waste water and concentrating it in a product (struvite) that has value as a feed ingredient for animals or as a slow-release fertilizer, especially for horticultural or golf course turf applications.

- Completion of research on the high pressure pasteurization of human milk. This was the first time that high hydrostatic pressure had been applied to human milk. While LTLT pasteurization provides a safe and nutritious product, it renders some biochemically active proteins inert. The kinetics of HHP processing favor microbial destruction with retention of protein functionality.

- Collaborative research across several departments and with industrial partner, Novozyme North America, Inc. in bioethanol production from lignocellulosic materials such as switchgrass and coastal Bermuda grass. Genetic techniques have been developed to lower the lignin and increase the cellulose contents in transgenic switchgrass. Various pretreatment technologies (acid, alkaline, microwave, and pyrolysis pretreatments) have been tested to improve the digestibility of both switchgrass and coastal Bermuda grass and efficiency of fermentable sugar generation from the grasses.

#### ► Food Production Systems: Development, Processing, Quality, and Safety

Despite the fact that our food supply is considered to be among the safest in the world, each year 76 million Americans are still stricken with foodborne illness, and some — mostly the very young, elderly, and the chronically ill — die as a result. Hospitalization costs for these illnesses are estimated at more than \$3 billion annually with cost estimates from lost productivity even higher. To reduce these health risks and associated costs, consumers need access to a safe and secure food supply. The issues associated with food safety and security are broad and complex, making it essential to conduct broad-based applied research studies and to develop education programs for each segment of the food chain – food producers, processors, handlers and consumers. The well being of the United States and its citizens depend on a safe and secure food production and delivery system. Therefore, protecting the stream of resources from the farm to processors and distributors, and ultimately to consumers, is of utmost priority. To address all aspects of safety and quality in the food system, research and Extension educational efforts are carried out at the production level, the harvest and marketing level, the processing level and the preparation level. Additionally, with the diverse production systems found in North Carolina, the research and education must be conducted over a broad spectrum of commodities and situations. The knowledge areas for this program area are primarily focused on identifying problems and solutions to quality maintenance in storing and marketing fruits and vegetables, field crops and animal products; ensuring that food products are free from toxic contaminants; and protecting food and feed supplies from harmful microorganisms and naturally occurring toxins. Some of our achievements are as follows:

- Extension educational programs resulted in 1620 participants successfully passing the food safety certification examination.

- Hazard Analysis and Critical Control Points (HACCP) educational programs conducted by Extension educated 1109 program participants. Reports from the HACCP training participants indicate an increased knowledge and appreciation level for assuring that food is properly processed, handled, stored, prepared and served in to assure that hazards related to food safety are recognized and prevented on a continuous basis throughout the entire food handling process.

Some selected Research programs led to the following results:

- An integrated system for heat transfer monitoring and validation has been developed and tested for continuous flow thermal aseptic processing of foods containing large particulate components. By February, 2008 the FDA no rejection letter is scheduled to be provided allowing commercial operation of the 1st ever continuous flow low acid shelf-stable microwave heated product. This is sweetpotato puree in Snow Hill, NC-YAMCO, utilizing Department of Food Science, NCSU technologies.

- We continue to focus efforts on evaluating various magnetic capture technologies, including antibody and nucleic-acptamer bound beads for the capture of Salmonella. In this regard, we have developed an antibody-based recirculating magnetic capture method which, when coupled with PCR, is capable of detecting 1 colonizing forming unit of Salmonella in 25 ml of chicken carcass rinse. We have also reported exquisite detection limits (for some products, as low as 10<sup>-1</sup> plaque forming units/25 g) using a similar protocol but with cationic particles and RT-PCR for the capture and detection of hepatitis A virus in foods.

- Outbreaks of Escherichia coli O157:H7 in apple cider and orange juice have led to new concerns about the safety of acidified

foods in general. Many of these products cannot be heat processed due to the loss of desirable texture and flavor. It is possible that *E. coli* O157:H7 can survive for extended periods in some acidified foods. Recent research has shown that, depending on pH and acid concentration, distribution times and conditions, a five log reduction in cell numbers may not occur before consumption of the products.

- Crystallization events in oils from a range of peanut cultivars were evaluated using differential scanning calorimetry (DSC) and advanced rheological testing. Significant ( $p < 0.05$ ) variation in oil crystallization was documented, with high-oleic oils being the last to crystallize under equivalent cooling conditions. Crystallization was strongly correlated to oil fatty acid profiles with good agreement between DSC and rheological measurements. Similarly, liquid oil viscosity and density were also strongly correlated to oil fatty acid profiles. This research proves there are both significant and practical differences in crystallization propensity among commercially available peanut oils. Furthermore, obvious strategies are outlined to breed and/or process peanuts with improved oil physical properties. This work could open new markets for peanut oil in both food and biodiesel applications.

- Fundamental and usable technologies are provided through the development of quantifiable and validated sensory languages for dairy products. The role that specific chemicals(s) play on sensory perception of specific flavors lays the groundwork for an understanding of how to control, maximize, or prevent formation of specific flavors and/or flavor profiles in foods which helps to maximize quality and market demand.

- This past year we completed our research on the high pressure pasteurization of human milk. This was the first time that high hydrostatic pressure had been applied to human milk. While LTLT pasteurization provides a safe and nutritious product, it renders some biochemically active proteins inert. The kinetics of HHP processing favor microbial destruction with retention of protein functionality. We were able to shown both greatly improved biochemical activity in HHP samples over LTLT samples and destruction of four bacterial pathogens of concern.

- North Carolina growers produce good quality hybrid striped bass. The industry wants to expand production to meet demand for these fish whole on ice year round. However, recent research has shown that muddy/earthy off-flavors are encountered during summer months in these fish. This off-flavor problem has resulted in farmers receiving complaints from customers that could taste this very undesirable off-flavor and therefore rejected the fish. Our studies have documented the issue and identified initiatives to prevent the problem from reoccurring. This is especially important now, when hybrid striped bass is gaining increasing popularity and the market is more competitive.

- Researchers have developed methods for the computational assessment of the toxicity of chemical mixtures. These methods will be of use to environmental managers in assessing the health risks associated with chemicals in the environment.

- Considerable quantities of edible meat from trimmings and deboned carcasses of meat, poultry and fishes continues to be wasted, and many smaller pelagic fish species are hardly utilized for food, being converted primarily to fish meal for animal feed. Food Science researchers, working in conjunction with colleagues at the University of Massachusetts and the University of Florida, have developed two important processes to address this challenge. Firstly, a new method of recovering and refining such meats, which removes fat, connective tissues (including skin) and bone, was developed. Secondly, a method of solubilizing and injecting this meat protein into intact fillets and cuts of meats, poultry and seafoods was developed. This technology has now been commercially implemented into the seafood industry: four commercial manufacturing plants are now online (3 in the US; 1 in Iceland), with one additional national and three additional international facilities to be underway by the end 2008.

► **Human Nutrition and Health**The importance of promoting nutrition and wellness throughout life has been clearly established. Dietary factors are associated with five of the ten leading causes of death in North Carolina and the United States. Programs that provide consumers with research-based information and strategies for behavior change on healthy eating and physical activity are imperative. Participants must be informed and empowered to make positive lifestyle changes to optimize health. No time is more important than childhood to promote healthy eating and health practices. Children in North Carolina do not consume enough fruits or vegetables and have diets that are low in fiber and higher in fat than recommended. Children in North Carolina need quality nutrition education to help positively influence their food choices. For nutrition education efforts to be effective they must also include parents and care givers. Helping families make informed decisions about their nutrition will help ensure that North Carolina's children grow to reach their full mental and physical potential. Overweight in children in North Carolina continues to rise. Treatment of overweight and obesity is difficult. Preventing overweight and obesity in children is essential to address this issue. Demographic changes in North Carolina's population continue to impact nutrition and health issues. The fastest growing age group in the state is the 65 years-and-over segment. The elderly run disproportionate

**Total Actual Amount of professional FTEs/SYs for this State**

Year:2007	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	394.0	35.0	415.0	0.0
<b>Actual</b>	408.0	35.0	403.0	0.0

## **II. Merit Review Process**

### **1. The Merit Review Process that was Employed for this year**

- Internal University Panel
- External University Panel
- Combined External and Internal University Panel
- Combined External and Internal University External Non-University Panel
- Expert Peer Review

### **2. Brief Explanation**

For Cooperative Extension, during the 2007 plan year, North Carolina Cooperative Extension conducted a rigorous and detailed review of its major programmatic thrusts. The review process included departments at both universities (NC State and NC A&T State Universities); the state's 100 counties including the Cherokee Indian Reservation; the state's Advisory Leadership System members; and local Advisory Leadership Councils for each of local administrative units. The Long Range Plan has been under review by state program leaders and advisory systems throughout the state as greater efforts are focused on assuring program relevance and programs that result in impacts the public is willing to support. Practicing Extension professionals who actually implement the various programs implemented the needs assessment process that involved 22,438 of the state's citizens. The state program leaders and the assistant administrator for state programs have also intensified their leadership roles as key merit reviewers. The other merit review group is the AREERA program area chairs. Collectively, all of these individuals provide a significant internal merit review of programs taking into consideration the needs and expectations expressed in the stakeholder input process.

For the North Carolina Agricultural Research Service, a thorough scientific and merit review of each proposed new or revised research project is made at the departmental level prior to submission to the NCARS office. This departmental review consists of two parts: an informal review (PI's responsibility) and a formal review (Department Head's responsibility).

The informal review was performed on the initiative of the PI through interactions with other faculty, both within and outside of the department, and with various stakeholders outside the university. The stakeholder input comes from routine interactions with individuals or with groups at meetings, conferences, field days, etc. Keep in mind that primary stakeholders vary greatly between different research projects within NCARS. PI's interact with appropriate representatives of stakeholder and scientific groups. Consultation with faculty and stakeholders during the informal review phase should include inquires regarding both the scientific soundness of the proposed research and the relevance to the appropriate stakeholder groups' needs. In this formative stage, comments and suggestions from other faculty and stakeholders may be more productive and useful than those received later through the formal review process. All input should be considered and appropriate adjustments made as the research project outlines are developed.

The formal review process summarily involves the Department Head providing for a formal review of all proposed new and revised research project outlines prior to submission to NCARS. This review must be done by at least three faculty members with general knowledge of the proposed research subject area. At least one of these reviewers is from outside the PI's home department. If the proposed research involves complex, unusual, and/or extensive statistical procedures, the outline is also reviewed by the departmental statistical liaison. Each reviewer is asked to comment on the research being proposed from two perspectives: (1) the scientific soundness of the hypothesis, objectives and procedures described in the outline; and (2) the relevance, or merit, of the research based on the previous work and present status of current work described in the outline and the reviewer's own knowledge of the needs in this research area.

The Department Head's office sends the draft outline to the selected reviewers asking for their comments within a specified time frame. The Department Head then requests that the comments be submitted both to his/her office (to be retained in the project's file) and to the PI. The PI makes appropriate revisions and submits the revised outline to their Department Head with an explanation regarding any reviewer comments that were not addressed in the revision. The Department Head confirms that comments were appropriately addressed and makes a final determination on the relevance of the proposed research. After Department Head approval and completion of the necessary CRIS Web Forms, the final project outline is forwarded in electronic form to NCARS for processing.

For multistate research project reviews, those research projects originating in the Southern Region that NCARS faculty are participating in receive merit and peer reviews according to guidelines established by the Southern Association of Agricultural Experiment Station Directors (SAAESD). These guidelines can be found at the following URL: <http://www.msstate.edu/org/saaesd/infobook/guide/guide.htm> Similar review processes exist for multistate projects originating in other regions.

Proposed multistate research projects that were not processed through the SAAESD received merit and peer review by the following process. Project PI's submit a written project proposal conforming to an outline format typical for the institutions involved. At the very least, the proposal contains a title, justification, review of key literature, objectives, procedures, duration, personnel (with time commitments and funding arrangements (at least for the first year)). The institution with the highest resource commitment to the project takes the lead in coordinating the review. The process is an amalgamation of local peer review procedures. Upon mutual agreement, the administrators of the project PI's decide on the number of reviewers and the home institution of these reviewers. If a multistate project includes an extension component, then appropriate extension reviewers are included in the review panel. Multistate projects may run for up to five years and must include an annual review of progress towards achieving objectives.

All of these procedures were conducted as planned through out the 2007 fiscal year.

### **III. Stakeholder Input**

#### **1. Actions taken to seek stakeholder input that encouraged their participation**

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of selected individuals from the general public

**Brief Explanation**

North Carolina Cooperative Extension System has an active advisory leadership council for the state and for each of the one hundred counties and the Cherokee Indian Reservation. The Advisory Leadership System is a major partner in the continuous and dynamic review of program development including program planning, implementation, and assessment of Extension programs. The Advisory Leadership System has major responsibility in obtaining stakeholder input through out the program development process. Members of the State Advisory Leadership System and county Advisory Leadership Council represent geographical, cultural, ethnic, and economic diversity of the state's population. In addition to Advisory Leadership Councils, each county has specialized committees with responsibilities for review of overall programming, collaborating in needs assessments and environmental scans, and marketing extension programs and impacts. These specialized committees provide specific program input for individual commodities, issues and ongoing program needs. Membership on both the council and the specialized committees represents the diversity of the respective county population including under-served populations and retired professionals from business, extension and other relevant organizations and agencies. While the advisory council will meet quarterly, the specialized committees will meet at least annually to discuss accomplishments and needs still to be addressed and techniques to market extension. This system is monitored administratively to assure that stakeholders provide such program input and actions.

At the state level, a statewide advisory council provides programmatic inputs, review and guidance for the overall program functions for the North Carolina Cooperative Extension Service at North Carolina State University. This group meets quarterly as well as for special meetings to meet organizational review and input needs. This council is made up of influential individuals who represent a broad scope of the diverse population in North Carolina and who have distinguished themselves as respected and responsible knowledgeable leaders who can provide local perspectives into a statewide organization. In addition to being an integral part of the overall State Advisory Council, the Extension Program at NC A&T State University is also guided by a cadre of citizens who make up the Strategic Planning Council. The Strategic Planning Council includes community leaders, collaborating agency and organization representatives and individuals representing non-governmental organizations.

The Strategic Planning Council meets three times a year. One joint meeting is held annually with the State Advisory Council. Networking and collaboration between the State Advisory Council and the Strategic Planning Council is facilitated by chairs of both advisory groups and as well as two members who serve on both councils.

Thus, Cooperative Extension has a planned, proactive process for ensuring significant stakeholder input into program direction. The process ensures that programs are reviewed and overall needs assessed on a continuous basis, but no less than once every two years. However, with the respective advisory groups functioning on a much more frequent basis, stakeholder input produces continuous program review, allowing for adjustments as local needs change.

To ensure appropriate, inclusive, and adequate stakeholder input, the organization implements an environmental scan in each county and on the Cherokee Reservation every other year. These scans are conducted by a diverse group of extension employees, volunteers, clientele, commodity groups, and county residents. The scans provide a wide base of needs, issues, trends, and emerging issues that are representative of diverse groups throughout the county. In 2007, a needs assessment was completed in each of the 101 Cooperative Extension's county administrative units. Each administrative unit conducted independent assessments using primarily: surveys, personal interviews and group meetings. Each unit prioritized the top seven needs/issues that stakeholders had identified. There were 3,736 groups involved in the county assessments. Data were obtained from 22,438 individuals altogether.

Stakeholder input utilized in determining research directions is received through numerous associations. NCARS interacts with 90 official commodity and agricultural industry associations from within North Carolina. A College of Agriculture and Life Sciences administrator is appointed as the official liaison for each of these associations and attends at least one, and sometimes more, of their meetings or conferences each year. During these meetings, opinions and facts related to the needs and concerns of that industry sector are obtained through both formal presentations and informal conversations with attendees. The NCARS representative is always introduced early in the meeting so that any individual there can contact them and discuss whatever issues they desire. In addition, the college has employed a Director of Commodity Relations, who reports directly to the Dean and coordinates the activities of the liaisons. This individual also has responsibility for working with any association that has a need or concern relative to the college's programs, particularly if it might involve any state or federal legislation.

Of the 90 state agricultural industry associations, 24 provide funding to various research projects annually, usually on a competitive basis. In these cases, the association board give NCARS information on high-priority research areas to be used in the request for proposals, and the board decides which proposals to fund. This is the most targeted type of stakeholder input, having a direct effect on research activities within NCARS

NCARS leadership team interacts deliberately and frequently with leaders in the North Carolina Agricultural Foundation, N. C. Farm Bureau Federation, N. C. State Grange, North Carolina Department of Agriculture and Consumer Services, the N. C. Agribusiness Council and numerous other allied organizations that provide insight on research needs and priorities. These groups and organizations assist in program reviews, as well as advocate for the NCARS agenda by promoting the importance of agricultural and life science research.

Many of the departments within the College of Agriculture and Life Sciences have formal advisory groups with stakeholder members that meet on a regular basis to provide input and guidance into the department's research programs.

There are 21 such advisory groups among the 18 research departments that meet at least once per year, and their membership includes a total of over 200 stakeholders from a wide range of agricultural interests. In addition, there are currently nine formal centers within the college with industry advisory boards that meet at least twice per year, adding another 60 stakeholders providing NCARS administrators and scientists input and direction from research programs.

**2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them**

**1. Method to identify individuals and groups**

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

**Brief Explanation**

As indicated in the POW regarding stakeholder input, a very deliberate initiative is continuously underway by Research and Extension to meet, listen, involve, and interact with any and all stakeholders, whether traditional or non-traditional. Such efforts continue in a highly proactive manner as indicated by the 22,438 citizens of North Carolina being involved in a recent needs assessment process.

Also, commodity association members and representatives, County Commissioners, State Legislators, and many other leaders and policy makers both at the local and statewide levels have varying influence and interactions regarding program direction, issues identification, budgets and their priorities, staffing and developing plans of actions. This is a huge on-going function that is engrained in the program planning and implementation for both Research and Extension in North Carolina. It is our on-going intent to involve and serve the citizens of this state in the most effective ways possible to enhance the quality of their lives and economic well-being.

**2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them**

**1. Methods for collecting Stakeholder Input**

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public

**Brief Explanation**

Cooperative Extension used mailed surveys, electronic/web surveys, telephone surveys, one on one interviews, focus groups, and community forums to collect the stakeholder inputs for the needs assessment and program prioritization process.

The North Carolina Agricultural Research Service (NCARS) is committed to seeking, receiving and utilizing input from all stakeholder groups, including under-represented groups and the general public. A significant portion of the input from individuals throughout the state comes from interactions of research scientists with county-based Extension personnel and directly with producers, industry and other agribusiness representatives. Approximately 100 research faculty also have Extension appointments. These faculty are the primary day-to-day communication link between agribusiness, county extension centers and NCARS. Because their research and extension activities are directed toward the development-implementation phase of new knowledge and technology, they are constantly relating industry needs and suggestions to other researchers whose emphasis is more in the discovery phase. In addition, these faculty interact with county Extension personnel in such a way that input from individual consumers is also effectively communicated to NCARS administration and faculty.

To enhance our efforts to connect with stakeholders, the Dean has moved to implement a commodity based workgroup structure in which CALS Research-Teaching-Extension workgroups would be identified that focus on specific commodities or groups of commodities. These work groups facilitate bi-directional flow of information regarding research needs and priorities and outcomes and impacts of our research efforts. Part of the effort involves the work groups meeting annually with the commodity groups for the purpose of sharing mutually beneficial information.

Stakeholder input utilized in determining research directions is also received through numerous associations. NCARS interacts with 90 official commodity and agricultural industry associations from within North Carolina. A College of Agriculture and Life Sciences administrator is appointed as the official liaison for each of these associations and attends at least one, and sometimes more, of their meetings or conferences each year. During these meetings, opinions and facts related to the needs and concerns of that industry sector are obtained through both formal presentations and informal conversations with attendees. The NCARS representative is always introduced early in the meeting so that any individual there can contact them and discuss whatever issues they desire. In addition, the college has employed a Director of Commodity Relations, who reports directly to the Dean and coordinates the activities of the liaisons. This individual also has responsibility for working with any association that has a need or concern relative to the college's programs, particularly if it might involve any state or federal legislation.

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Many of the departments within the College of Agriculture and Life Sciences have formal advisory groups with stakeholder members that meet on a regular basis to provide input and guidance into the department's research programs. There are 21 such advisory groups among the 18 research departments that meet at least once per year, and their membership includes a total of over 200 stakeholders from a wide range of agricultural interests. In addition, there are currently nine formal centers within the college with industry advisory boards that meet at least twice per year, adding another 60 stakeholders providing NCARS administrators and scientists input and direction from research programs.

NCARS receives support annually from college-based foundations, including the Agricultural Foundation, CALS Research Foundation, Tobacco Foundation and the Dairy Foundation. These foundations fund research projects and graduate students on a competitive basis across a wide range of areas. NCARS administration meets with the Research and Extension Committees each fall to hear discussion of priority areas for research activity in all aspects of agricultural production and agribusiness. Then in late winter, these committees meet again to select and approve research projects for funding, which provides another opportunity for input on research priorities.

### **3. A statement of how the input was considered**

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

#### **Brief Explanation**

The environmental scanning process entails obtaining both secondary and primary data on key issues of concern, needs and assets in the community. Secondary data is used to assess the analyzed needs (data and statistics) as well as needs identified/prescribed by experts. Primary data was collected by holding meetings, focus groups and/or interviews with key stakeholders such as Extension Advisory Leaders and county government partners. This combined data and input was used to prioritize and target issues, needs and assets that serve to focus, guide and direct Extension programming. For the Agricultural Research Service, Stakeholder input is especially utilized in determining research directions as well as for gaining program support and advocacy for NCARS research initiatives. For example, the commodity association boards give NCARS information on high-priority research areas to be used in the request for proposals, and the board decides which proposals to fund. This is the most targeted type of stakeholder input, having a direct effect on research activities within NCARS.

Also, leaders in the North Carolina Agricultural Foundation, N. C. Farm Bureau Federation, N. C. State Grange, North Carolina Department of Agriculture and Consumer Services, the N. C. Agribusiness Council and numerous other allied organizations not only provide insight on research needs and priorities, but these groups and organizations also assist in program reviews, as well as advocate for the NCARS agenda by promoting the importance of agricultural and life science research.

#### **Brief Explanation of what you learned from your Stakeholders**

Many issues identified as key concerns by citizens across the state continued to focus on many of the strong programs of Cooperative Extension. In varying degrees, agricultural preservation, sustainability and development was one of several key issues. Nutrition and health were also labeled as key issues. Increasing economic opportunity, business development, and developing community leadership were other key issues. Environmental stewardship and natural resource management were identified across the state as well. A continued emphasis and concern about building strong families and developing responsible youth, as well as educational opportunities for the state's citizens were all labeled as key issues facing North Carolinians.

The North Carolina Agricultural Research Service maintains close ties to the 90 state agricultural industry associations, in which 24 provide funding to various research projects annually, usually on a competitive basis. In these cases, the association boards give NCARS information on high-priority research areas to be used in the request for proposals, and the board decides which proposals to fund. This is the most targeted type of stakeholder input, having a direct effect on research activities within NCARS.

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As greater emphasis is being placed on integrated Extension and Research efforts, top administrators and program personnel hold both Research and Extension appointments and duties. These personnel continuously interface on decisions for program prioritization, budgeting, staffing, and a greater exchange of information from the state's citizens to assure that all audiences are identified and served to the extent that the mission and resources of these Research and Extension programs make such coverage possible.

#### **IV. Expenditure Summary**

<b>1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)</b>			
<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
10935425	3013238	10624011	0

<b>2. Total Actual dollars from Planned Programs Inputs</b>				
	<b>Extension</b>		<b>Research</b>	
	<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
<b>Actual Formula</b>	6199057	1107245	10653898	0
<b>Actual Matching</b>	12262759	1107244	52771177	0
<b>Actual All Other</b>	12911092	264614	35504458	0
<b>Total Actual Expended</b>	31372908	2479103	98929533	0

<b>3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous years</b>				
<b>Carryover</b>	61892	0	29887	0

**V. Planned Program Table of Content**

S. NO.	PROGRAM NAME
1	Plant Production Systems and Health
2	Economic Systems
3	Natural Resources and Environment
4	Animals and Their Systems, Production and Health
5	Agricultural, Natural Resource, and Biological Engineering
6	Food Production Systems: Development, Processing, Quality, and Safety
7	Human Nutrition and Health
8	Families and Communities
9	Youth Development

**Program #1**

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Plant Production Systems and Health

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	10%	10%	10%	
202	Plant Genetic Resources	10%	10%	10%	
204	Plant Product Quality and Utility (Preharvest)	5%	5%	5%	
205	Plant Management Systems	20%	20%	20%	
206	Basic Plant Biology	10%	10%	10%	
211	Insects, Mites, and Other Arthropods Affecting Plants	10%	10%	10%	
212	Pathogens and Nematodes Affecting Plants	15%	15%	15%	
213	Weeds Affecting Plants	15%	15%	15%	
216	Integrated Pest Management Systems	5%	5%	5%	
<b>Total</b>		<b>100%</b>	<b>100%</b>	<b>100%</b>	

**V(C). Planned Program (Inputs)**

**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	105.0	6.0	173.0	0.0
<b>Actual</b>	104.0	6.0	173.0	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1067822	175986	4922109	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
2974648	175986	25001463	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
3584835	60664	18092726	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

•Conduct discovery research on plants and plant systems using tools genomics, metabolomics, and proteomics •Develop improved crop varieties using traditional and genomic approaches •Introduce/discover new plants for food use and the green industry •Develop systems for production of plants for biofuels •Seek new uses for plants and plant byproducts •Develop production systems for organic farmers •Develop diagnostic techniques for indigenous and introduced pathogens •Partner with industry •Develop sustainable production systems for both large scale and limited resource farmers •Enhance IPM programs through new techniques and strategies •Set up applied research/demonstration plots •Write papers for scientific community •Prepare publications for grower and homeowner audiences •Develop web sites to deliver information to grower and homeowner audiences •Conduct workshops, meetings, and other focused educational programs for farmers, commodity groups, and industry.

**2. Brief description of the target audience**

• The scientific community • Regulatory agencies • Agricultural chemical companies • Agribusiness • Commercial and limited resource farmers • New and Part-time farmers • Homeowners • Consultants • News media • General public • Non-governmental organizations • Other public agency staff.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

**Target for the number of persons (contacts) reached through direct and indirect contact methods**

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	453000	950000	12000	23000
2007	352230	1251500	24790	24230

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

Year	Target
Plan:	10
2007 :	7

**Patents listed**

Methods of Inhibiting Ethylene Responses in Plants Using Cyclopropene Amine Compounds  
 Methods of Inhibiting Ethylene Responses in Plants Using Cyclopropene Amine Compounds  
 Methods of Inhibiting Ethylene Responses in Plants Using Cyclopropene Amine Compounds  
 Method for Preventing Ethylene Response in Plants Using Dicyclopropene Derivatives  
 Methods of Blocking an Ethylene Response in Plants Using Dalkylamine Cyclopropene Derivatives  
 A process for the modification of plant viral capsids for use as a therapeutics delivery vessel  
 Ornamental Sweetpatato 'Sweet Caroline Sweet Heart Red' ^'^DISCLOSURE NOT YET FILED'  
 RNA Interference of Parasitism Genes of Cyst and Root-knot nematodes and inhibition of plant parasitism through in planta expression of complimentary double-stranded RNA  
 Ornamental Sweetpotato 'Sweet Caroline Sweet Heart Purple' ^'^NO INVENTION DISCLOSURE FILED'

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

	Extension	Research	Total
Plan			
2007	112	337	449

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Peer reviewed publications produced

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	500	449

**Output #2**

**Output Measure**

- Studies conducted to identify new germplasm and develop new and improved varieties of crops and ornamentals

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	25	30

**Output #3**

**Output Measure**

- Clients to receive plant information via printed publications, fax, e-mails, phone and other contacts via known non-face to face

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	300000	377060

**Output #4**

**Output Measure**

- Educate growers and other clientele through highly focused non-degree credit workshops and other formalized group education

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	950	1690

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O No.	Outcome Name
1	Increased Income as a Result of Production of New or Alternative Crops/Enterprises
2	Increased profit through the adoption of improved nutrient management practices
3	Number of releases of germplasm and varieties with improved yield potential and other qualities
4	New techniques and products developed and released that can be commercialized
5	Increased profit through the adoption of new production practices
6	Number of modern websites developed and operational with new and updated plant systems information.
7	More informed growers through highly focused non-degree credit workshops and other formalized group educational sessions.
8	New IPM programs and techniques that more efficiently control pests using environmentally safe methods.
9	Increased acreage of organic crops and speciality crops.
10	Number of discoveries of mechanisms that regulate the productivity of plants and the microorganisms that interact with them

**Outcome #1**

**1. Outcome Measures**

Increased Income as a Result of Production of New or Alternative Crops/Enterprises

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	500000	1220000

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Many farmers have turned to alternative crops to supplement their income as a result of the demands of an increasingly diverse population, changes in the national and global agricultural economies, and the end of the federal tobacco and peanut programs. As a result North Carolina consumers are realizing the benefit of locally grown, fresh produce produced by both traditional an organic means.

**What has been done**

Studies on the production and marketing of specialty fruits and vegetables for the growing Hispanic and Oriental population, and crops such as kenaf, sea oats, and grapes for wine and nutriaceutical properties have lead to the development of guidelines for the production of these crops under the environmental conditions in North Carolina. Extension programs at the local, regional and state level have provided growers and prospective growers information needed to successfully produce and market these crops.

**Results**

Sprite-type cantaloupes, brambles, winegrapes and heirloom tomatoes are examples of alternative crops that North Carolina growers are now producing. Four new

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
205	Plant Management Systems

**Outcome #2**

**1. Outcome Measures**

Increased profit through the adoption of improved nutrient management practices

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	200000	5523000

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Better nutrient management improves crop production and in many cases increases grower profits by reducing fertilizer costs. Additionally precise use of fertilizers can reduce nutrient runoff into the sensitive estuarian systems in North Carolina.

**What has been done**

Studies have been conducted which focus on optimum fertilizer timing, nutrient management planning, and the use of decision support systems to determine the need for and target fertilizer applications. On-farm tests and grower meetings, along with printed and web-based materials have been used to disseminate this information to growers.

**Results**

A corn fertilization decision support model was shown to reduce fertilizer prices compared to standard grower practices, due to lower P, and frequently lower N. In spite of increased costs of soil test analysis net returns where the model was used were greater than the farmers standard fertilization practices. Use of best management practices was shown to reduce N runoff by ~25%. If growers in the Albemarle-Pamlico Estuarine System reduced N use by 10% with best management practices, farmers would save ~6.6 million pounds of N and \$3.3 million.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
205	Plant Management Systems

**Outcome #3**

**1. Outcome Measures**

Number of releases of germplasm and varieties with improved yield potential and other qualities

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	25	35

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

In order to remain competitive it is important for growers to have available high quality varieties of crops with improved yield potential and pest resistance. Moreover it is important to plant varieties that are adapted to the often severe environmental conditions in North Carolina.

**What has been done**

There are breeding programs within the NCARS for many fruits, vegetables, field crops and ornamental plants produced NC. These vary from traditional breeding programs to those that use cutting edge molecular techniques for identifying genes and introgressing them into crop plants. Procedures are being developed for genetic engineering of important crop plants such as rice, corn, sweet potato, rose, and cassava.

**Results**

New varieties released for NC growers include a new early ripening strawberry variety Galleta with good quality and large fruit, four new hybrids of the Sprite type cantaloupe, and a new variety of Buddleja (butterfly bush, in cooperation with Proven Winters nursery).

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
205	Plant Management Systems
204	Plant Product Quality and Utility (Preharvest)
202	Plant Genetic Resources
212	Pathogens and Nematodes Affecting Plants
201	Plant Genome, Genetics, and Genetic Mechanisms

**Outcome #4**

**1. Outcome Measures**

New techniques and products developed and released that can be commercialized

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	8	13

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

New products and techniques for crop production are needed by American farmers to keep us competitive in both the domestic and international marketplace.

**What has been done**

New techniques are being developed for more efficient use of fertilizer, to reduce water and soil runoff and to more effectively manage pests. Procedures are being developed for genetic engineering various crops.

**Results**

Conservation tillage systems and systems for determining fertilizer rates have been developed that reduce or eliminate water, soil and nutrient runoff from farm fields. Other programs have been developed for minimizing pesticide use. If recommendations for the control of fairy rings on turf developed at NCSU were implemented by all golf courses there would be a potential savings of \$3.8 million for the states golf course industry. Procedures are being developed for genetic engineering of important crop plants such as rice, corn, sweet potato, rose, and cassava and for enhancing production of the important vitamin B6 to increase nutritional content.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
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202	Plant Genetic Resources
201	Plant Genome, Genetics, and Genetic Mechanisms
216	Integrated Pest Management Systems
206	Basic Plant Biology

**Outcome #5**

**1. Outcome Measures**

Increased profit through the adoption of new production practices

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	30000000	19670000

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

With increasing cost of fuel, fertilizers, pesticides and other production costs, growers must use new production practices which increase yield and production costs.

**What has been done**

Studies on cotton, corn, soybean, turf and other commodities have resulted in protocols for more efficient pesticide use and for managing resistant pests and weeds. On-farm tests have demonstrated new production practices and varieties.

**Results**

Studies identified the conditions for the use of foliar fungicides on corn which can increase yield by over 14 bushels per acre. Recommendations for the control of fairy rings on turf developed at NCSU were shown to reduce the cost of control from \$3,000/acre to \$430/acre. Management systems for glyphosate-resistant Palmer amaranth, and systems to reduce risk of weed resistance were developed. Research and educational programs have also focused on how best to manage weeds in these herbicide-resistant crops. Results of cotton seed treatment studies showed that a commercially available product containing beneficial bacteria improved emergence compared to untreated seed and often was equal to a conventional fungicide product.

Extension efforts in corn production have focused on farmer adoption of low rate insecticide seed treatments, transgenic insect protected hybrids, and improved techniques for light interception by corn plants.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
216	Integrated Pest Management Systems
212	Pathogens and Nematodes Affecting Plants
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
213	Weeds Affecting Plants

**Outcome #6**

**1. Outcome Measures**

Number of modern websites developed and operational with new and updated plant systems information.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	10	9

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Many growers now turn to the internet for information on new production practices, methods for producing alternative crops, real time pest alerts and other information.

**What has been done**

New and updated/revised websites have been developed for many commodities to deliver timely information to growers.

**Results**

A website created specifically to address freeze damage that occurred over Easter weekend, 2007, allowed growers of many commodities to make timely decisions on managing the damaged crops. Websites developed for turf, forecasting downy mildew on cucurbits, and integrated pest management continued to be widely used. The Turffiles website receives more than 11 million hits per year making it the most sought after university turf website in the country and 50% of the inquiries are insect pest related. Use of a forecasting system for downy mildew of cucurbits continued to increase in 2007 with 94,621 hits during the month of August. The Consortium for Integrated Pest Management is leading an effort to develop a series of tools and/or information systems to share agricultural pest information and monitor pest distribution and occurrence in the global base. Among these are The Global IPM Technology Database, Southeast Asia IPM Network, West African IPM Network, The Caribbean Fruit Fly Surveillance System, and the NCSU APHIS Pest Forecasting (NAPFFAST) system.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
212	Pathogens and Nematodes Affecting Plants
211	Insects, Mites, and Other Arthropods Affecting Plants
205	Plant Management Systems

**Outcome #7**

**1. Outcome Measures**

More informed growers through highly focused non-degree credit workshops and other formalized group educational sessions.

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	35000	38170

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Modern growers are constantly seeking new production practices and technologies in order for them to remain competitive.

**What has been done**

Workshops, on-farm tests, and demonstrations were held across the state on the production of various fruits and vegetables, new traditional production practices, and organic agriculture.

**Results**

The first annual Invasive Plant Ecology and Management Workshop was held with over 90 attendees. Four workshops were hosted by the Organic Farm Panel for farmers interested in producing organic grains. Other workshops were held on grafting heirloom tomatoes and the use of high tunnels for vegetable crop production. On-farm tests demonstrated new varieties and production practices to growers of many commodities, including cotton, soybeans, peanuts, small grains and various vegetables.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
213	Weeds Affecting Plants
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems
205	Plant Management Systems
204	Plant Product Quality and Utility (Preharvest)
202	Plant Genetic Resources
212	Pathogens and Nematodes Affecting Plants

**Outcome #8**

**1. Outcome Measures**

New IPM programs and techniques that more efficiently control pests using environmentally safe methods.

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	10	12

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

IPM programs have been developed for most commodities over the past 30 years and are widely used by growers. However it is important to incorporate new technologies and products in these programs to more effectively manage pests and keep growers competitive.

**What has been done**

New IPM techniques and strategies have been developed and tested for many crops including sweetpotatoes, turf, cotton, corn and apples.

**Results**

New pest management strategies in sweetpotato have been shown to reduce insect damage by as much as 78% compared to untreated sweetpotato, resulting in increased marketable yield. Grower surveys in North Carolina reveal that concurrent with the adoption of these new practices, the number of foliar insecticide sprays applied to sweetpotato fell by 37% from 2004 to 2006. On-farm tests were established to demonstrate the use of pheromone-based mating disruption and new reduced-risk insecticides to manage codling moth populations. This program increases profitability for growers and reduces old, broad spectrum insecticide inputs into the environment. Extension activities are underway to implement this reduced-risk tactic.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
216	Integrated Pest Management Systems
213	Weeds Affecting Plants
212	Pathogens and Nematodes Affecting Plants
211	Insects, Mites, and Other Arthropods Affecting Plants
205	Plant Management Systems

**Outcome #9**

**1. Outcome Measures**

Increased acreage of organic crops and speciality crops.

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	35000	2500

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

There is an increasing demand for both fresh and processed organic foods by consumers.

**What has been done**

Studies have been conducted to identify suitable varieties and develop practices for the production of organic crops in the warm and wet growing conditions in North Carolina. Workshops have been held to demonstrate organic growing methods to current and potential organic growers and websites have been set up for organic production of small grains and vegetables.

**Results**

Organic grain production has increased significantly. Workshops were conducted to teach farmers how to produce grain crops organically and seven new farmers began transitioning approximately 1400 acres in 2007. Research has focused on producing heirloom tomatoes and other vegetables organically. A 3-year study has shown that high quality organic apples can be produced successfully in western North Carolina and several growers are interested in producing them for local niche markets.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
213	Weeds Affecting Plants
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
204	Plant Product Quality and Utility (Preharvest)

**Outcome #10**

**1. Outcome Measures**

Number of discoveries of mechanisms that regulate the productivity of plants and the microorganisms that interact with them

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	20	26

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

In order to develop new crop varieties with enhanced yield potential, drought and salt tolerance, pest resistance and quality traits it is essential to identify and understand the mechanisms that regulate these traits.

**What has been done**

Mechanisms that control the development of plants and pests that attack them are being studied.

**Results**

Research to understand the development of cotton fibers is resulting in information needed for future improvement of fiber production. Components of the cellular machinery that is involved in degradation of abnormal or foreign secretory proteins have been identified and characterized. Preventing the action of this protein may enable the improvement of expression of genetically-engineered proteins and the amelioration of grain quality. Aflatoxin is a carcinogenic toxin produced by *Aspergillus* fungi, and is a limiting factor for corn production in the southern US and across the world.

Research has identified proteins that impart resistance to fungal colonization, an important step toward the engineering or breeding of tolerant corn varieties.

Identification of novel genes in the rice blast fungus required for pathogenicity represents targets for the development of new anti-fungal compounds.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
206	Basic Plant Biology
212	Pathogens and Nematodes Affecting Plants

## **V(H). Planned Program (External Factors)**

### **External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

### **Brief Explanation**

In 2007, research and extension activities in the Plant Protection Systems and Health Program were primarily affected by environmental conditions and the availability of funds. Field projects were negatively affected by a severe late freeze over Easter weekend and very dry (drought) conditions during the summer. The freeze especially affected research on many fruit crops and field crops (i.e. corn) that were growing at that time and drought conditions during the summer affected field research results on most crops where irrigation was not available. Consequently some research planned for 2007 was delayed until 2008. As a result of the freeze and drought many extension programs were redirected to providing growers information on how to manage freeze-damaged crops and contend with drought conditions. Although most research projects and extension activities were adequately funded, flat or declining budgets at the State and Federal levels reduced opportunities to redirect programs or start initiatives on new and emerging crops.

## **V(I). Planned Program (Evaluation Studies and Data Collection)**

### **1. Evaluation Studies Planned**

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)

### **Evaluation Results**

### **Key Items of Evaluation**

**Program #2**

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Economic Systems

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
601	Agricultural Marketing and Farm Management	30%	30%	30%	
602	Business Management, Finance, and Taxation	25%	25%	25%	
604	Marketing and Distribution Practices	5%	5%	5%	
605	Natural Resource and Environmental Economics	25%	25%	25%	
607	Consumer and Development Economics	15%	15%	15%	
	<b>Total</b>	100%	100%	100%	

**V(C). Planned Program (Inputs)**

**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	14.0	9.0	7.0	0.0
<b>Actual</b>	13.0	9.0	17.0	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
376405	263979	611932	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
951374	263979	2312194	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
134850	140450	1112674	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

We plan to conduct a multiplicity of educational programs and utilize applied research projects to enhance the knowledge base of targeted citizens in North Carolina and other designated areas. This will involve conducting programs that organize farm management schools, conduct meetings on topics such as risk management, net profit calculations, tax preparer schools, and conduct feasibility studies that examine the economics of alternative and traditional enterprises. We will conduct Research projects and Extension programs that provide economic decision support for sustainable agricultural commodities and products that feature changing and new technologies, evaluation of alternative incentive-based systems, risk aversion, public policy, rural communities and labor markets.

**2. Brief description of the target audience**

Agribusiness personnel, tax preparers, financial advisors, limited resource farmers (active, new and potential), farm managers, rural appraisers, supply chain operators, county agents, colleagues, and state department of agriculture specialists, and commodity association board members.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

**Target for the number of persons (contacts) reached through direct and indirect contact methods**

	<b>Direct Contacts Adults</b>	<b>Indirect Contacts Adults</b>	<b>Direct Contacts Youth</b>	<b>Indirect Contacts Youth</b>
<b>Year</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>
<b>Plan</b>	3000	4000	400	800
2007	4500	12750	2360	7100

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

<b>Year</b>	<b>Target</b>
<b>Plan:</b>	0
2007 :	0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>			
2007	38	63	91

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of Non-degree credit activities

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	75	95

**Output #2**

**Output Measure**

- number of county and area tax preparer schools

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	23	25

**Output #3**

**Output Measure**

- registered attendees at estate planning, legal advice, and financial management schools

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	300	275

**Output #4**

**Output Measure**

- enrollees for the Natural Resource Leadership Institute year-long training

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	15	26

**Output #5**

**Output Measure**

- Integrated Research Projects Conducted

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	6	10

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

<b>O No.</b>	<b>Outcome Name</b>
1	Tax preparers gain needed knowledge for return preparation by attending workshops conducted throughout North Carolina.
2	New organic and agritourism markets established by individual entrepreneurs
3	Growers Adopting Improved Business Management Practices

**Outcome #1**

**1. Outcome Measures**

Tax preparers gain needed knowledge for return preparation by attending workshops conducted throughout North Carolina.

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	650	1720

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

NC taxpayers and professional tax preparers are concerned with tax law changes that affect their businesses and those of their clients. Professional continuing education is also desired.

**What has been done**

Professional education short courses and schools have been developed and delivered offering continuing education credits. Business owners in the rural sector are also invited to participate so that the language of tax and their business can be communicated to interested parties.

**Results**

With these opportunities for continuing education professional tax preparers (CPAs, Enrolled Agents, Accountants and others) receive up-to-date information for current year tax filing. These Schools have reached over 1,700 tax preparers, who in turn prepare over 500,000 income tax returns: individual, partnership, corporation, LLC and other types. Consumers of these services can have an increased measure of confidence that documents are prepared correctly and with accuracy because of better understanding of tax law and regulations.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
601	Agricultural Marketing and Farm Management

**Outcome #2**

**1. Outcome Measures**

New organic and agritourism markets established by individual entrepreneurs

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	10	75

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Organics have emerged as an important opportunity for North Carolina farmers. There has been an increase in the number of organic dairies (5) with two local plants distributing organic milk. NC is a leader in organic egg and chicken markets. Also, sales of locally raised pork (and other meats and livestock products-cheeses, eggs) at farmers markets has increased dramatically. One market reports a tripling of vendors selling meat products in the market (from 5 to 16) in the past two years. NCA&TSU and NCSU are working with Farmers Market Managers, NCDA&CS and non government groups to promote safe food handling.

**What has been done**

The need exists for development of a sound research and outreach program in organic grain (both for feed and for direct human consumption) to meet the needs of the seven local organic milling operations that exist across the state. This has occurred at CEFS in eastern North Carolina with the leadership of NCSU in partnership with NCA&TSU. The NCA&TSU outdoor hog program has worked with NCSU, local extension and through the collaborative project NC Choices. It is also working with NRCS and other agencies to evaluate management steps to address environmental issues related to outdoor hog production.

**Results**

For both the dairy and poultry industries there is the need for the development of a sound research and outreach program in organic grain (both for feed and for direct human consumption) to meet the needs of the six or seven local organic milling operations that exist across the state. This has occurred at CEFS in eastern North Carolina with the leadership of NCSU in partnership with producers and NCA&TSU. Staggering increases in the price being offered for grain especially organic (prices have at least doubled over the past year from already high prices of \$7.00- \$10.00 bu. Outdoor hog production continues to be pushed by market interest. Several large scale buyers are looking for pork that is raised according to standards of treatment, nutrition, and health. One buyer alone purchased \$1,000,000 worth of pork raised in that way. The NCA&TSU outdoor hog program has worked with NCSU, local extension and through the collaborative project NC Choices in this area. One market alone reports a tripling of vendors selling meat products in the market (from 5 to 16) in the past two years.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
601	Agricultural Marketing and Farm Management
607	Consumer and Development Economics
602	Business Management, Finance, and Taxation

**Outcome #3**

**1. Outcome Measures**

Growers Adopting Improved Business Management Practices

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	2000	3720

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Livestock and crops farmers must strive for the optimum in enterprise selection, management of resources, and decision making in order to maximize profits for a viable and sustainable farm business.

**What has been done**

Extension agents and specialists at both NCA&T and NCSU extension have conducted numerous business management workshops and other farmer educational programs to assure that our audiences are adequately educated on efficient management practices, record keeping, and tax management.

**Results**

Success examples from Extension business management programs across the state are reflected in two program success stories that follow:

"During the spring of 2007, Cherokee Reservation Cooperative Extension helped 23 small farmers in WNC with financial and business issues. Training over a four week period, farmers improved their farm record keeping in computer accounting, labor law and farm tax preparation. As a result, participants reported a 30% reduction in family stress levels, 78% increased their record keeping abilities and computer comfort level."

"Many factors contribute to profitability, such as amount and type of inputs, farm management decisions, etc. Among topics taught by extension, have been variety selection, plant population, pest management, marketing, and crop fertility. Through a variety of extension programs, growers have benefited economically. For example, two of the higher yielding varieties of corn, soybeans and cotton, which were identified through county variety demonstrations, resulted in significant increase in income to county farmers."

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics
604	Marketing and Distribution Practices
601	Agricultural Marketing and Farm Management
602	Business Management, Finance, and Taxation

**V(H). Planned Program (External Factors)**

**External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)

**Brief Explanation**

An extreme drought throughout the year has required that every business management efficiency be exercised in record keeping, production, and financial management to meet the demanding challenges faced in the simple survival of farm units. Further, commodity prices that have reached levels almost previously unknown has resulted in the need for highly informed decisions regarding enterprise mix and allocation of resources. Of course, ever advancing technologies has led to the need for increased computer competencies, as well as other technological innovations such as precision farming, and the resultant need for accurate decision making regarding the use of such technologies.

## **V(l). Planned Program (Evaluation Studies and Data Collection)**

### **1. Evaluation Studies Planned**

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

### **Evaluation Results**

### **Key Items of Evaluation**

**Program #3**

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Natural Resources and Environment

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	30%	30%	30%	
111	Conservation and Efficient Use of Water	10%	10%	10%	
112	Watershed Protection and Management	15%	15%	15%	
133	Pollution Prevention and Mitigation	30%	30%	30%	
141	Air Resource Protection and Management	15%	15%	15%	
	<b>Total</b>	100%	100%	100%	

**V(C). Planned Program (Inputs)**

**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	45.0	2.0	18.0	0.0
<b>Actual</b>	45.0	2.0	23.0	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
914085	58662	497081	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1516770	58662	4456561	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1458300	25500	1312994	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

Research activities are focused on understanding the processes and situations that create pollution problems from agricultural production (including animal operations, field activities, and processing) and on using natural resources in the most environmentally sustainable ways. With that information in hand, improved management and technological solutions will be proposed and evaluated. Technology transfer will be accomplished through demonstrations, workshops, and publications by Cooperative Extension in concert with the researchers involved.

**2. Brief description of the target audience**

Agricultural producers, environmental and other governmental agencies (action and regulatory), news media, the general public.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

**Target for the number of persons (contacts) reached through direct and indirect contact methods**

	<b>Direct Contacts Adults</b>	<b>Indirect Contacts Adults</b>	<b>Direct Contacts Youth</b>	<b>Indirect Contacts Youth</b>
<b>Year</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>
<b>Plan</b>	8000	17000	200	500
2007	76100	146100	20260	23070

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

<b>Year</b>	<b>Target</b>
<b>Plan:</b>	0
2007 :	0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>			
2007	3	32	35

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Waste Management Certification Programs

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	40	34

**Output #2**

**Output Measure**

- Number of Research Projects Completed on Environmental/Natural Resource Issues

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	5	28

**Output #3**

**Output Measure**

- Number of non-degree credit environmental activities conducted

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	700	711

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

<b>O No.</b>	<b>Outcome Name</b>
1	Number farms first utilizing precision application technologies
2	Number of farms implementing additional best management practices for animal waste management
3	Number of urban households/small farms with low-literacy individuals implementing and/or adopting best management practices to enhance water quality.
4	Number of Waste Management Certifications Gained or Maintained
5	Number of farms implementing improved nutrient management
6	Number of animal production facilities implementing improved air quality management

**Outcome #1**

**1. Outcome Measures**

Number farms first utilizing precision application technologies

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	20	52

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Precision application technologies, whether for plant nutrients or pesticides, "put the materials where the problem is." Each part of a field can receive only what is needed, thus reducing environmental impacts of agricultural production.

**What has been done**

Custom applicators and farmers are utilizing precision application technologies to reduce chemical and fertilizer usage and produce optimal results.

**Results**

For the past decade or so, more and more farmers and applicators have been adopting precision application systems which utilize high levels of machine control coupled with GPS-based application maps to improve production efficiency and reduce environmental impacts.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
133	Pollution Prevention and Mitigation
112	Watershed Protection and Management

**Outcome #2**

**1. Outcome Measures**

Number of farms implementing additional best management practices for animal waste management

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	20	50

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Excess nutrient runoff from animal waste application has been identified as a major contributing factor to eutrophication of fresh and salt water systems in North Carolina, which has led to substantial, negative impacts (e.g., pfiisteria).

**What has been done**

Advanced, alternative waste management practices, which are aimed at reducing the amount of nutrients impacting the state's waters, are increasing in number, as North Carolina replaces the lagoon-sprayfield systems of the 80s and 90s.

**Results**

Nutrient loadings in a number of North Carolina's impacted rivers have been reduced over the past 5 years.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
112	Watershed Protection and Management
141	Air Resource Protection and Management
133	Pollution Prevention and Mitigation

**Outcome #3**

**1. Outcome Measures**

Number of urban households/small farms with low-literacy individuals implementing and/or adopting best management practices to enhance water quality.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	35	100

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Homeowners in urban settings, as well as rural families, often are unaware of the impacts of over fertilization and inappropriate use of pesticides on ground and surface water. Reducing chemical and fertilizer misuse in these settings will have a major positive impact on local and statewide water quality.

**What has been done**

4-H and general public meetings have been held to educate non-agricultural and low-literacy audiences as to what they can do to improve water quality and reduce use of common fertilizers and pesticides used around the home.

**Results**

Over application of fertilizer and other chemicals is being reduced as a result of educational efforts.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
102	Soil, Plant, Water, Nutrient Relationships
133	Pollution Prevention and Mitigation
112	Watershed Protection and Management

**Outcome #4**

**1. Outcome Measures**

Number of Waste Management Certifications Gained or Maintained

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	4000	2063

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

All individuals who are responsible for waste management at animal production facilities are required by the state to be trained and certified.

**What has been done**

Extension is providing education and certification testing for individuals involved with waste management for the animal production industry in North Carolina.

**Results**

Several thousand certifications (either new or renewed) are being issued each year.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

**Outcome #5**

**1. Outcome Measures**

Number of farms implementing improved nutrient management

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	50	280

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Excessive or inadequate application of plant nutrients can lead to environmental impacts and/or crop production problems. Producers are required to apply nutrients at no more than agronomic rates, which helps protect both the environment and the wallet.

**What has been done**

Workshops and fact sheets are being delivered to producers to help them better manage nutrients on the farm.

**Results**

Producers are utilizing soil testing, precision application, yield mapping, and other tools to improve their understanding of the crop's nutrient needs. By applying what is needed at the proper time, both the environment and the farm's economic position are improved.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management

**Outcome #6**

**1. Outcome Measures**

Number of animal production facilities implementing improved air quality management

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	50	75

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

There is substantial concern that the air quality associated with animal production (both in the buildings and downwind from the facility) is not as good as it could or should be. The health of the animals and the workers is of direct concern. Currently, efforts are underway to measure emissions from several production systems to determine what the characteristics actually are.

**What has been done**

Workshops and fact sheets are being delivered to both swine and poultry producers that speak to management practices that improve air quality associated with animal production.

**Results**

Producers are implementing improved waste management systems, which also improve air quality at the facility. In addition, improved in house management (litter management, cleanliness, etc.) are having positive effects on air quality both inside and outside the facilities.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
141	Air Resource Protection and Management

**V(H). Planned Program (External Factors)**

External factors which affected outcomes

- Natural Disasters (drought,weather extremes,etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programatic Challenges

#### **Brief Explanation**

2007 was a difficult year for agriculture and the environment in North Carolina. Warmer than usual temperatures, combined with a severe drought, stressed both animal and crop production systems and also stressed aquatic and terrestrial habitat for wildlife. Forest fires, wild fires, fish kills, and reservoir depletion, are all taking their toll on North Carolina's natural resources and environment. Higher input costs, reduced funding, and other governmental impacts have negatively affected producers, program deliverers, and the general public in a number of ways. In spite of these impacts, most of the outcomes chosen for this program were met or exceeded.

#### **V(I). Planned Program (Evaluation Studies and Data Collection)**

##### **1. Evaluation Studies Planned**

- After Only (post program)
- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Comparisons between program participants (individuals,group,organizations) and non-participants

#### **Evaluation Results**

#### **Key Items of Evaluation**

**Program #4**

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Animals and Their Systems, Production and Health

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
301	Reproductive Performance of Animals	20%	20%	20%	
302	Nutrient Utilization in Animals	20%	20%	20%	
303	Genetic Improvement of Animals	17%	17%	17%	
307	Animal Management Systems	18%	18%	18%	
311	Animal Diseases	10%	10%	10%	
312	External Parasites and Pests of Animals	5%	5%	5%	
313	Internal Parasites in Animals	5%	5%	5%	
315	Animal Welfare/Well-Being and Protection	5%	5%	5%	
	<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	

**V(C). Planned Program (Inputs)**

**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	59.0	2.5	130.0	0.0
<b>Actual</b>	58.0	2.5	95.0	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
965908	183318	2320624	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1336894	183318	12882345	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1282116	5000	7873482	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

This work included broad and extensive research and extension programs. NC Agricultural Research Service scientists conducted research projects to study methods to improve the efficiency of animal production. Research focused on methods to improve reproductive performance, nutrient utilization, and genetic influence on growth and reproduction. Scientists worked to improve animal management systems, decrease the incidence of animal diseases and parasites (external and internal) and improve the management of animal and agricultural pests. Species and commodity groups included in this work include poultry such as turkeys, broiler chickens, and table-egg chickens. This work also included swine, fish such as flounder, and cattle such as beef and dairy, and numerous pests such as house flies. Research included many phases of commodity production such as meat and dairy goats, chicken breeders (both broiler and table egg birds), commercial broilers (commercial refers to those animals produced for meat), breeder turkeys, commercial turkeys, swine breeders, commercial swine, all phases of aquaculture and beef and dairy production. Disciplines involved include nutrition, physiology, reproductive physiology, genetics, virology, bacteriology, microbiology, mycology, entomology, and many animal management systems such as grazing and forage management programs, hatchery management, feeding and drinking water systems, litter and bedding management, lighting programs, and breeder selection and management. A very important part of this work was the transfer technology and knowledge to our stake-holders and clientele. Therefore, an extensive outreach effort through Cooperative Extension was conducted by field and campus based faculty who are based on-site as well as being located across the state and based in local communities. Stake-holders and clientele were directly engaged in many ways including workshops, conferences, discussion groups, one-on-one teaching, demonstrations, field days, short-courses, continuing education classes, and scientific meetings. Indirect methods to reach stake-holders and clientele included long-distance education, newsletters, web sites, newspaper releases, television and radio programs, trade journals, scientific journals, and popular press articles. Participants and programs will be evaluated at least annually for success, progress, and effectiveness. Special educational programs focused on limited resource farmers continue to be a priority for NC A&T focused Extension efforts in pasture based production systems, aquaculture and alternative breeds.

**2. Brief description of the target audience**

The target audience was primarily aquaculture, poultry, livestock producers, small-scale limited resource, beginning and underserved growers and agribusiness personnel in North Carolina. However, since North Carolina producers are some of the best in the world, ultimately, producers and agribusiness personnel across the country and around the world were also the primary audience. In addition, the audience included personnel in other state and federal agencies, local, state and federal politicians, and other stakeholders including the general public.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

**Target for the number of persons (contacts) reached through direct and indirect contact methods**

	<b>Direct Contacts Adults</b>	<b>Indirect Contacts Adults</b>	<b>Direct Contacts Youth</b>	<b>Indirect Contacts Youth</b>
<b>Year</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>
<b>Plan</b>	170000	270000	60000	100000
2007	163260	250000	52520	49200

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

<b>Year</b>	<b>Target</b>
<b>Plan:</b>	5
2007 :	2

**Patents listed**

Transgenic Animals  
Attenuated FNR Deficient Enterobacteria^

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>			
2007	57	149	206

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Highly focused non-degree credit group training activities to be conducted

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	700	764

**Output #2**

**Output Measure**

- Relevant and impacts focused research projects to be conducted

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	100	62

**Output #3**

**Output Measure**

- Youth Livestock Shows Producing Scholarship Income

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	35	35

**Output #4**

**Output Measure**

- Local, Area, Regional, and State Conferences to be Conducted

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	25	64

**Output #5**

**Output Measure**

- Local, Area, Regional, and State Educational Tours to be Conducted

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	30	11

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

<b>O No.</b>	<b>Outcome Name</b>
1	Income Optimized by Livestock Producers Adopting Improved Nutrition Practices
2	Income Optimized by Livestock Producers Adopting Improved Breeding Practices
3	Income optimized through adoption of recommended health and general management practices
4	Youth demonstrating increased skills/knowledge gained by participation in animal projects and events
5	Scholarship Money Gained From Youth Livestock Shows
6	Number of Producers Adopting Best Management Practices that Optimize Income
7	Number Livestock Producers Adopting and Applying Improved Planning and Financial Management Practices

**Outcome #1**

**1. Outcome Measures**

Income Optimized by Livestock Producers Adopting Improved Nutrition Practices

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	3200000	4593474

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Improving feed and nutrition programs for livestock has the potential to improve significantly since feed can be 60-80% of the production costs.

**What has been done**

Agents have worked directly with farmers and livestock producers to provide educational resources and demonstrations that allowed changes in ration formulation and livestock feeding programs which led to improved growth and performance or improved efficiency of production. For example, integrating alternative feeding programs relying less on corn for energy can allow for similar performance at less cost. Another example is that NCSU researchers have found that adding organic trace minerals to broiler breeder diets can, along with proper egg incubation, improve bone development, leg health and bone biomechanical parameters in broilers at processing age. These changes, in turn, led to improved income for these operations.

**Results**

Livestock producers experienced improved animal production which was manifested in \$4.59 million increased income.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
315	Animal Welfare/Well-Being and Protection
301	Reproductive Performance of Animals
311	Animal Diseases
307	Animal Management Systems

**Outcome #2**

**1. Outcome Measures**

Income Optimized by Livestock Producers Adopting Improved Breeding Practices

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	2100000	1745521

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Improving the genetic potential of livestock has led to significant production and performance increases. Continued improvements in genetic potential will serve the farmers by increasing income and reducing output per unit of input. These actions will help farmers remain sustainable.

**What has been done**

Researchers have conducted research programs and demonstration projects that have led to improved genetic potential of livestock growth and/or performance. Research conducted at N.C. State has lead to the identification of boars currently being used in the swine industry that are capable of producing exceptional fertility results with low numbers of sperm. For example, development of prospective tests to identify boars with improved sperm survival in hot weather will reduce the cost of production and accelerate the rate of genetic improvement in swine. In another example, the use of cultured avian germline stem cells has applications in germplasm preservation, poultry breeding, transgenics, and in the pharmaceutical industry. In addition, agents have worked with local farmers to educate them about new genetic lines and the optimal management of these animals.

**Results**

Farmers have experienced an increased income of \$ 1.74 million due to improvements in animal genetics.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
303	Genetic Improvement of Animals
301	Reproductive Performance of Animals
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

**Outcome #3**

**1. Outcome Measures**

Income optimized through adoption of recommended health and general management practices

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	5100000	1791171

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Proper management of livestock is critical for their optimal health and performance. Improvement in care practices can have immediately impact on farm income. Research and outreach (educational) programs for farmers on animal care and management offer continuous opportunities to improve the farming operation and the general welfare of the livestock.

**What has been done**

Numerous research and outreach programs have been conducted to improve the management of livestock. For example, researchers have discovered that control of avian reovirus associated malabsorption syndrome in broiler chickens potentially can increase farm gate revenue by more than a billion dollars annually in the United States. This is important for North Carolina farmers because North Carolina is a major broiler producing state. Results from this work with high selenium yeast has potential to be even more profitable as it can be applied to other infective viruses in poultry and mammals, and can result in larger yields of higher quality meat from greater numbers of animals. In another example, a study to determine the effectiveness of growth promoting implants during the preconditioning period conducted at the Mountain Research Station found that steers receiving growth promoting implants had increased average daily gains compared to steers not receiving growth promoting implants. However, a significant difference in the cost effectiveness of the implants was detected.

**Results**

Farmers adopting improved animal management programs have experienced improvement in animal growth and performance resulting in increased farm income.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
301	Reproductive Performance of Animals
312	External Parasites and Pests of Animals
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection
307	Animal Management Systems
313	Internal Parasites in Animals

**Outcome #4**

**1. Outcome Measures**

Youth demonstrating increased skills/knowledge gained by participation in animal projects and events

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	1600	12478

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Youth participation in animal projects and events can have a significant impact on a youth's development. Some specific areas where a youth can experience personal growth include: learning to accept and manage responsibility, improved self-confidence, improved time management, public speaking, organizational skills, and people skills.

**What has been done**

Youth in North Carolina have participation in many animal projects working with swine, cattle, poultry rabbits, goats, sheep, and aquaculture.

**Results**

In North Carolina, 12,478 youth have been successful in programs where they have enjoyed personal growth and learned about the importance of animal agriculture to their world, nation, and community.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
315	Animal Welfare/Well-Being and Protection
307	Animal Management Systems
303	Genetic Improvement of Animals

**Outcome #5**

**1. Outcome Measures**

Scholarship Money Gained From Youth Livestock Shows

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	100000	123088

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

As public funds available for youth activities decrease, private funding of youth scholarships is imperative for the success of our youth programs. These funds serve to assist youth in pursuing their education and serve to improve the link between the local citizens with their community businesses.

**What has been done**

Youth scholarships have been recruited and established across North Carolina to provide youth with educational funds based on their activity in these projects and events.

**Results**

North Carolina youth have received \$123,088 as scholarships.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
315	Animal Welfare/Well-Being and Protection
307	Animal Management Systems
313	Internal Parasites in Animals
312	External Parasites and Pests of Animals
311	Animal Diseases

**Outcome #6**

**1. Outcome Measures**

Number of Producers Adopting Best Management Practices that Optimize Income

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	9000	12968

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

In order for knowledge from research to have optimal impact on farm income and sustainability, farmers must adopt these practices in a timely manner.

**What has been done**

Agents across North Carolina have worked with farmers individually, in groups,, and collectively to provide education and demonstration programs. For example, the use of radiant tube heaters provided a favorable environment for turkey poults in both new and old brooding facilities; however, gas usage was greater in older houses and the savings in gas in newer houses might not be worth the added costs of using tube heaters in conjunction with traditional hover heaters. In another example, A direct fed microbial product (probiotic) fed to turkey poults improved performance and reduced intestinal tract colonization from an oral Salmonella challenge. Researchers at NCSU have demonstrated a cost effective, small footprint wastewater treatment system that can accommodate wastewater of up to 20,000mg/l BOD and can offer opportunities not only for animal production systems, but all types of biological material (including food) processing as well as municipal and residential needs for gray-water treatment and recycling and conservation of municipal water supplies. Through these educational programs, farmers have learned to integrate new practices into their farm operations.

**Results**

Through agent activities, 12,968 farmers have adopted new practices that will allow them to enjoy improved farming operations and increase their farm income.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
301	Reproductive Performance of Animals
307	Animal Management Systems
302	Nutrient Utilization in Animals
313	Internal Parasites in Animals
312	External Parasites and Pests of Animals
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection
303	Genetic Improvement of Animals

**Outcome #7**

**1. Outcome Measures**

Number Livestock Producers Adopting and Applying Improved Planning and Financial Management Practices

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	6000	6239

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Educational and outreach programs that encourage the proper record and organization skills are needed to improve the potential for success of our farmers.

**What has been done**

Agents have developed and implemented educational programs for farmers to enhance their ability to maintain proper records for their farming operations.

**Results**

Agents have been successful in providing 6,239 farmers successful adoption of improved planning and financial record keeping practices.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
307	Animal Management Systems

**V(H). Planned Program (External Factors)**

**External factors which affected outcomes**

- Natural Disasters (drought,weather extremes,etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programatic Challenges
- Populations changes (immigration,new cultural groupings,etc.)

**Brief Explanation**

All of these factors have affected our state animal agriculture to some degree even though the impact may be difficult to determine. The current drought, lack-luster economy, changes in program funding, public policy changes, new rules & regulations, public priorities (or their perceptions there of) competing programs and population increases, especially along the I-85 corridor, all effect our farmers' abilities to remain sustainable. Most of these impacts have been negative especially the drought, increased population, and the economy (fuel prices in particular). Our farmers will face continuous challenges to remain profitable and sustainable.

**V(I). Planned Program (Evaluation Studies and Data Collection)**

**1. Evaluation Studies Planned**

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Comparisons between program participants (individuals,group,organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.

**Evaluation Results**

**Key Items of Evaluation**

**Program #5**

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Agricultural, Natural Resource, and Biological Engineering

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation	10%	10%	10%	
401	Structures, Facilities, and General Purpose Farm Supplies	5%	5%	5%	
402	Engineering Systems and Equipment	20%	20%	20%	
403	Waste Disposal, Recycling, and Reuse	15%	15%	15%	
404	Instrumentation and Control Systems	15%	15%	15%	
405	Drainage and Irrigation Systems and Facilities	5%	5%	5%	
503	Quality Maintenance in Storing and Marketing Food Products	10%	10%	10%	
511	New and Improved Non-Food Products and Processes	15%	15%	15%	
512	Quality Maintenance in Storing and Marketing Non-Food Pro	5%	5%	5%	
	<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	

**V(C). Planned Program (Inputs)**

**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	19.0	1.0	11.0	0.0
<b>Actual</b>	20.0	1.0	9.0	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
277849	29331	397768	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
695307	29331	1159028	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
809682	0	334962	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

Research and Extension activities have focused on applying and adapting knowledge gained from basic research to agricultural production systems and natural resource pollution prevention. Both "soft" engineering (e.g. unit process engineering) and "hard engineering" (e.g., machines, hardware and sensors and controls) have been a part of the Research and Extension activity. Technology transfer has been achieved through workshops, demonstrations and field days, and publications.

**2. Brief description of the target audience**

The target audience is: agricultural producers, manufacturers of agricultural machinery and food processing and storage equipment, state agencies, watershed stakeholders including municipalities, and the general public.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

**Target for the number of persons (contacts) reached through direct and indirect contact methods**

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	8000	13500	500	600
2007	13930	22990	2230	4600

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

Year	Target
Plan:	0
2007 :	2

**Patents listed**

Farkas, B.E., Lloyd, B.J. and Keener, K.M. 2007. Dynamic Radiant Food Preparation Methods and Systems. U.S. Patent No. 7,307,243 Washington, DC: U.S. Patent and Trademark Office. Issued 12/2007.

Roberts, Lamb, Stikeleather, and Turner Centia

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

	Extension	Research	Total
Plan			
2007	5	39	44

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of Research Projects Completed in Agricultural, Biological and Natural Resource Engineering

Year	Target	Actual
2007	5	31

**Output #2**

**Output Measure**

- Number of Workshops and Trainings Completed in Agricultural, Biological and Natural Resource Engineering

Year	Target	Actual
2007	7	80

**Output #3**

**Output Measure**

- Non-degree credit group activities completed

Year	Target	Actual
2007	20	37

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

<b>O No.</b>	<b>Outcome Name</b>
1	Number of growers implementing improved irrigation and drainage systems
2	Number of stream miles restored
3	Number of stormwater systems installing BMPs
4	Number of food industry companies undergoing equipment and food safety audits.

**Outcome #1**

**1. Outcome Measures**

Number of growers implementing improved irrigation and drainage systems

**2. Associated Institution Types**

•1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	15	16

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Good water management is essential in crop production. Additionally, recent drought has required adoption of more efficient water management equipment and strategies. The wide variety of soils and landscape found in North Carolina require a wide range of water management techniques including controlled drainage

**What has been done**

Growers have converted from sprinkler irrigation to drip irrigation. Much vegetable production, including the majority of tomato production has moved to drip under plastic (plasticulture). Training and advice on how to use irrigation systems to provide cooling and frost/freeze protection has been provided. Extension guidance on controlled drainage to minimize nitrogen losses and improve crop yields continued.

**Results**

Growers used fertigation to correct nutrient deficiencies in fruit and vegetable crops. Several strawberry growers took advantage of irrigation systems to avert costly crop losses (primarily strawberry) during the Easter freeze.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
402	Engineering Systems and Equipment
405	Drainage and Irrigation Systems and Facilities
404	Instrumentation and Control Systems
403	Waste Disposal, Recycling, and Reuse
133	Pollution Prevention and Mitigation

**Outcome #2**

**1. Outcome Measures**

Number of stream miles restored

**2. Associated Institution Types**

•1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	5	7

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Stream restoration is a major need to improve water quality and aquatic habitat in many North Carolina watersheds. Causes of stream impairment include land use changes affecting stormwater runoff, removal of riparian vegetation, and channel straightening or other modifications. Many animal producers and farmers may not know the benefits of these areas and some have traditionally farmed right up to the edge of the creek. Unprotected riparian areas can lead to streambank instability and loss of land, increased transport of nutrients to streams and loss of wildlife habitat.

**What has been done**

NC State University faculty developed a comprehensive education program to improve the practice of stream restoration. This program includes a series of River Course workshops in which over 2000 professionals have learned about stream assessment, design, construction, and monitoring. NC State University has provided leadership since 1998 for the biennial Southeast Stream Restoration Conference, attended by over 500 practitioners, government officials, and academics. More than 50 grant-funded projects across the state are used to demonstrate and evaluate stream restoration practices in a variety of watershed conditions.

**Results**

The quality of stream restoration projects has improved in the past decade, as professionals have gained increased understanding of stream restoration principles and applications. Funding for projects has increased as resource agencies determine that previous projects are successful in meeting water quality and habitat goals. Four-hundred ninety-one people received training related to stream restoration in 2007.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

**Outcome #3**

**1. Outcome Measures**

Number of stormwater systems installing BMPs

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	20	50

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Treatment of urban stormwater runoff has become a primary concern to local leaders throughout North Carolina. A series of both state and national rules has been passed recently including the Neuse Stormwater Rules, the Tar-Pamlico Watershed Stormwater Rules, and the EPA Non-point Source Rules Phase 2, which will impact over 150 communities in North Carolina. Each of these new regulations force communities to implement stormwater education programs, in addition to requiring new and innovative practices be used to treat stormwater runoff.

**What has been done**

Since 1997, demonstration sites have been established not only throughout the Neuse River Basin, but also in the rest of the state. Over 70 demonstration areas are now in place across the state in great part thanks to the work of N.C. Cooperative Extension. Experienced gained with the design and monitoring of these practices has led to a very successful series of conferences, workshops and study tours. Research sites have shown the effectiveness of certain stormwater practices and new design publications have been produced as well. NCSU is a pioneer on bringing stormwater education to the public by the use of 1) the world wide web ([www.bae.ncsu.edu/stormwater](http://www.bae.ncsu.edu/stormwater)) with technical stormwater design modules and a general public information site, 2) Stormwater BMP Design Courses (now BAE 575) taught at NC State, the first of its kind at a land grant institution in the US, and 3) Production of Media shows, PSAs and videos that have been shown in communities across the state.

**Results**

Hundreds of professionals attend Extension events (such as workshops, tours, web courses, NCSU classes) on stormwater treatment annually. In 2007, over 500 people attended the 2nd National Low Impact Development Conference in Wilmington, NC, that was organized by stormwater faculty in BAE. Extension agents are more able to bring effective stormwater education programs to the public, and work in Extension has also led to new design standards used throughout the state by the engineering and regulatory community. Training programs targeted to landscapers, regarding stormwater practice maintenance are the first of their kind in the United States. The general public has been exposed to stormwater management as never before with PSAs running on TV and on the radio, a user-friendly and interactive stormwater resources web site, and a stormwater video made for and shown on TV.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

**Outcome #4**

**1. Outcome Measures**

Number of food industry companies undergoing equipment and food safety audits.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	5	52

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The sanitation and food safety rules that businesses must meet become more stringent every year. The dynamic nature of food safety regulation has established an on-going need for training programs tailored to processors, regulators, and food service operators.

**What has been done**

In 2007, twenty individuals received their federally-mandated certification in Hazard Analysis and Critical Control Point (HACCP) seafood safety monitoring practices. Thirty-six county health inspectors received their certification in seafood retail and restaurant inspection from the UNC-CH School of Public Health. Since 1998, 318 individuals have received their HACCP certification, and 299 environmental health specialists have received seafood inspection training both of which are organized by the Seafood Laboratory and NC Sea Grant. The demand for safety training is expected to increase once the FDA releases it new guidelines in May 2008.

**Results**

With education and technical assistance, our seafood industry has begun to harness functional food ingredients and innovative processing methods to better compete in retail and wholesale markets. Seafood safety education continues to make the seafood industry and restaurant employees much more aware of the hazards associated with seafood and of the handling procedures that enhance the wholesomeness of fishery products.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
503	Quality Maintenance in Storing and Marketing Food Products

#### V(H). Planned Program (External Factors)

##### External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

##### Brief Explanation

A severe Easter freeze re-prioritized some training in the use of irrigation systems for frost protection. An extreme drought also re-directed extension focus towards management strategies and technologies (and associated workshops/sessions) towards water resource management and conservation.

There has been a gradual shift in animal waste management systems from the traditional lagoon/sprayfield systems to alternative systems that may have benefits of biogas production and resource recovery. The state legislature initiated a pilot program aimed at placing energy produced by biogas generated from lagoons onto the electric grid at regulated (augmented) prices. Also, air quality related technology and research has increased in animal agriculture with perhaps a lessening of interest in direct solid and liquid manure management.

#### V(I). Planned Program (Evaluation Studies and Data Collection)

##### 1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Case Study
- Other (Observation)

##### Evaluation Results

An evaluation of the impact of animal waste system training via a designed survey was initiated one year ago and two "batches" of surveys have been sent and returned. These surveys are designed to evaluate change in management and equipment directly associated with the training down through NC State. Ultimately the survey results will be used to estimate the reduction in mass loading of nutrients to waterways due to actions taken as a result of the trainings.

##### Key Items of Evaluation

**Program #6**

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Food Production Systems: Development, Processing, Quality, and Safety

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies	20%	20%	20%	
502	New and Improved Food Products	15%	15%	15%	
503	Quality Maintenance in Storing and Marketing Food Products	10%	10%	10%	
504	Home and Commercial Food Service	5%	5%	5%	
711	Ensure Food Products Free of Harmful Chemicals, Including	10%	10%	10%	
712	Protect Food from Contamination by Pathogenic Microorgani	40%	40%	40%	
<b>Total</b>		100%	100%	100%	

**V(C). Planned Program (Inputs)**

**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	53.0	0.0	60.0	0.0
<b>Actual</b>	53.0	0.0	50.0	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
904436	0	1078057	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1501489	0	4247403	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
2020928	23000	3648638	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

A multiplicity of research and educational outreach programs will be conducted that fit under the broad umbrella of improving the quality, safety, security, and nutrition of food products produced in North Carolina. Specific research projects will identify effective nutritional control strategies for replacement of growth-promoting antibiotics for improving gut function and reducing intestinal colonization and shedding of Salmonella; assessing the incidence, populations, serotypes, genotypes, and antibiotic susceptibility of Salmonella and Campylobacter fecal isolates as a function of farm, bird age, season, management practices, and strategic processing of commercial broiler, turkey, and layer farms; assessing novel antimicrobial strategies for use in reducing foodborne pathogens and biofilm formation on food processing contact surfaces; employing the antimicrobial properties of eggshell membranes for reducing the heat resistance of foodborne pathogens; development of Salmonella-specific inhibitory nanoparticles for preventing intestinal colonization; development of alternative layer molting diets for reducing the risk of Salmonella contamination of shell eggs; characterization of Campylobacter respiratory chain genes for use in developing rational drugs for controlling infection of food animals; conduct ecotoxicological studies to identify chemical pollutant sources that contaminate aquatic human foods; development of a high hydrostatic pressure system for reducing toxigenic histamine-forming bacteria in scombroid fish and vacuum and MAP packaged fresh tuna; develop a more efficient means of producing a high-gelling protein isolate from underutilized fish species and other meat sources that could replace surimi manufacture and improve the quality, sensory and yield characteristics of new and existing muscle food products; development of a Vienna sausage product without casings via an in-tube focused microwave field heating technology; improving the texture and yield of canned/pouched Albacore tuna by controlling precook proteolysis and injection of a tuna-derived protein isolate; application of continuous flow processing of foods and biomaterials using advanced focused microwave technology; and development and testing of tools, methods and devices for rapid sterilization and production of high quality vegetable and fruit purees. A very important aspect of this plan of work is to transfer technology and knowledge to our stakeholders and clientele. Therefore, an extensive outreach effort will involved campus and field faculty located in local communities. Direct outreach efforts will include engaging stake-holders in workshops, conferences, discussion groups, one-on-one teaching, demonstrations, field trials, short courses, continuing education classes, and scientific meetings. Indirect methods will include internet sites and courses, newsletters, press releases, television and radio interviews and programming, trade journals, scientific journals and popular press articles. Participants and programs are evaluated at least annually for success, progress, and impact.

**2. Brief description of the target audience**

Primary food producers, food processors, foodservice operators, county extension agents, state and federal regulatory agencies, commodity associations, news media and consumers. The primary audience is in North Carolina but also extends to audiences in other states (state and federal agencies, local, state and federal politicians and other stakeholders).

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

**Target for the number of persons (contacts) reached through direct and indirect contact methods**

	<b>Direct Contacts Adults</b>	<b>Indirect Contacts Adults</b>	<b>Direct Contacts Youth</b>	<b>Indirect Contacts Youth</b>
<b>Year</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>
<b>Plan</b>	2000	3300	0	0
2007	3390	7780	0	0

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

<b>Year</b>	<b>Target</b>
<b>Plan:</b>	4
2007 :	11

**Patents listed**

Process for making whey proteins having improved thermal stability in beverage applications at neutral pH  
 Method, System and Devices for Conservative Evaluation, Validation and Monitoring of Continuous Thermal Processing of Foods and Biomaterials

Methods and Apparatuses for Thermal Treatment of Foods and other Biomaterials and Products Obtained Thereby (...For Expense Purposes Technology Numbers 04131, 03070, and 03016 are Tracked in 05013..Europe

Methods and Apparatuses for Thermal Treatment of Foods and other Biomaterials and Products Obtained Thereby (...For Expense Purposes Technology Numbers 04131, 03070, and 03016 are Tracked in 05013..)

Methods and Apparatuses for Thermal Treatment of Foods and other Biomaterials and Products Obtained Thereby (...For Expense Purposes Technology Numbers 04131, 03070, and 03016 are Tracked in 05013..)Japan

Methods and Apparatuses for Thermal Treatment of Foods and other Biomaterials and Products Obtained Thereby (...For Expense Purposes Technology Numbers 04131, 03070, and 03016 are Tracked in 05013..)New Zealand

Lactobacillus Acidophilus Nucleic Acid Sequences

Lactobacillus Acidophilus Nucleic Acid Sequences(different#)

Lactobacillus Glucuronidase and DNA Encoding the Same

High Efficiency Transformation using a site-specific recombinase; transformation without selection

Methods and Apparatuses for Thermal Treatment of Foods and other Biomaterials and Products Obtained Thereby (...For Expense Purposes Technology Numbers 04131, 03070, and 03016 are Tracked in 05013..)

### 3. Publications (Standard General Output Measure)

#### Number of Peer Reviewed Publications

	Extension	Research	Total
<b>Plan</b>			
2007	12	67	79

### V(F). State Defined Outputs

#### Output Target

##### Output #1

###### Output Measure

- Highly focused non-degree credit group training activities to be conducted

Year	Target	Actual
2007	500	420

##### Output #2

###### Output Measure

- Relevant and impacts focused research projects to be conducted

Year	Target	Actual
2007	50	55

##### Output #3

###### Output Measure

- Local, area, regional and state conferences to be conducted

Year	Target	Actual
2007	15	25

##### Output #4

###### Output Measure

- Number of firms adopting quality and safety strategies

Year	Target	Actual
2007	50	517

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

<b>O No.</b>	<b>Outcome Name</b>
1	Number of program participants who successfully pass the food safety certification examination.
2	Number of participants completing National Seafood HACCP Alliance Education and other food safety HACCP workshops
3	Number of companies adopting new technologies
4	Number of requests for technical assistance from small business and entrepreneurs for developing new or expanding food processes or systems.
5	Number of new companies in food manufacturing

**Outcome #1**

**1. Outcome Measures**

Number of program participants who successfully pass the food safety certification examination.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	950	1310

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Safe food handling is critical to the health of all of our population. It is critical for food handlers, whether at home or serving the public to know and understand what constitutes safe food handling and those practices to assure that all food that is served or stored is indeed safe.

**What has been done**

Food safety training programs have been conducted by Extension to allow those persons who handle foods to know and understand what practices to follow to prevent food contamination in the storage, preparation, and presentation stages. A specific program called ServSafe is a nationally recognized certification program to assure that food handlers have indeed demonstrated proficiency in knowledge and skills to assure that those who pass the certification examinations are proficient in exercising exemplary and safe food handling practices.

**Results**

Over 50 ServSafe training programs that require sixteen hours of training time to complete were conducted throughout North Carolina. This allowed 1615 food handlers to participate. Of those, 1310 passed the certification exam with a 75% correct rate and higher. These restaurant workers, school lunchroom personnel, public and institutional food sites workers and others who serve the public needs for a quality food availability and servings assures that fewer opportunities are created whereby improper food handling causes food poisoning or related illnesses.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Pa
503	Quality Maintenance in Storing and Marketing Food Products
501	New and Improved Food Processing Technologies
504	Home and Commercial Food Service

**Outcome #2**

**1. Outcome Measures**

Number of participants completing National Seafood HACCP Alliance Education and other food safety HACCP workshops

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	50	1109

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Hazard Analysis and Critical Control Points (HACCP) is a systematic preventive approach to food safety, pharmaceutical safety, etc. that addresses physical, chemical and biological hazards as a means of prevention rather than finished product inspection. HACCP is used in the food industry to identify potential food safety hazards, so that key actions, known as Critical Control Points (CCP's) can be taken to reduce or eliminate the risk of the hazards being realized. The system is used at all stages of food production and preparation processes including packaging, distribution, etc. (Wikipedia). Therefore, consumers and food handlers must be sufficiently educated whereby all facets of our food supply is safe and protected.

**What has been done**

Due to regulatory requirements, food handlers in the state's school cafeterias must participate in HACCP training programs. Training programs were conducted in counties throughout the state by Extension to provide the affected citizens opportunities to participate in this required HACCP training.

**Results**

Such training programs led to a much larger than planned participation level in HACCP training programs in North Carolina. Reports from the HACCP training participants indicate an increased knowledge and appreciation level for assuring that food is properly processed, handled, stored, prepared and served in to assure that hazards related to food safety are recognized and prevented on a continuous basis throughout the entire food handling process.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
712	Protect Food from Contamination by Pathogenic Microorganisms, Pa
711	Ensure Food Products Free of Harmful Chemicals, Including Residu
504	Home and Commercial Food Service
503	Quality Maintenance in Storing and Marketing Food Products

**Outcome #3**

**1. Outcome Measures**

Number of companies adopting new technologies

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	30	120

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Keeping abreast of new developments in processing technologies is vital to ensure competitiveness in today's markets. Businesses rely upon Extension Specialists to provide technical assistance and advise on new techniques and emerging issues affecting their businesses.

**What has been done**

Extending science-based knowledge through industry specific workshops, trade association meetings and conferences were conducted throughout North Carolina, the region and nation. These programs addressed the issues identified by industry through roundtable discussions with regulatory agencies.

**Results**

North Carolina businesses increased their knowledge in development of new technologies and have adopted many of these techniques to optimize their processing systems thereby increasing profits and creating new jobs.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites
504	Home and Commercial Food Service
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products

**Outcome #4**

**1. Outcome Measures**

Number of requests for technical assistance from small business and entrepreneurs for developing new or expanding food processes or systems.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	30	580

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Sourcing information, interpreting regulatory requirements and providing technical support to small businesses and entrepreneurs is vital service provided through the NC Cooperative Extension Service. Businesses look to Extension Specialists for unbiased information relative to the safety, quality and processing technologies in food systems.

**What has been done**

Public workshops, individual business assistance and individual entrepreneurial services were provided state wide to help answer questions related to safety, quality and value-added food products. Technical services and guidance in conjunction with state and federal agencies provide an invaluable tool for small businesses and entrepreneurs. Many of these needs would go unmet without help from Extension Specialists across the state.

**Results**

Sustainable small business and start up of new entrepreneurial businesses are the larger segment of the North Carolina food industry. Many of these businesses are the direct result of the technical services and information provided during workshops and followup contacts provided through the state Extension Service programs.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residu
504	Home and Commercial Food Service
503	Quality Maintenance in Storing and Marketing Food Products
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
712	Protect Food from Contamination by Pathogenic Microorganisms, Pa

**Outcome #5**

**1. Outcome Measures**

Number of new companies in food manufacturing

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	10	54

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Many small business and entrepreneurs who obtained technical information and services through contact with state Extension specialists start new companies based on the information provided. The need for technical support prior to and during startup of new business operations is vital to their success. Extension specialists are uniquely qualified to provide science-based and experience driven technical support services.

**What has been done**

Small business assistance resulting in startup of new companies have resulted from participation in workshops and through technical support and information services provided. Many of these startups have benefited from applied research projects that have been supported through the Extension service specialists with commodity responsibilities.

**Results**

New business startups and expansion of small to medium sized businesses have resulted from direct involvement with state Extension personnel. The startups have provided new job opportunities and increased business across the state. Many of the businesses continue to utilize the expertise of state Extension specialists during the critical startup phase in the food processing operations.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
502	New and Improved Food Products
501	New and Improved Food Processing Technologies
504	Home and Commercial Food Service

**V(H). Planned Program (External Factors)**

External factors which affected outcomes

- Natural Disasters (drought,weather extremes,etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programatic Challenges
- Populations changes (immigration,new cultural groupings,etc.)

#### **Brief Explanation**

Actually, regulatory requirements for school lunch personnel translated into a significantly increased provision of HACCP training, which resulted in over 1,000 additional persons securing the required training than our plan had anticipated.

#### **V(I). Planned Program (Evaluation Studies and Data Collection)**

##### **1. Evaluation Studies Planned**

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Comparisons between program participants (individuals,group,organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.

#### **Evaluation Results**

#### **Key Items of Evaluation**

**Program #7**

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Human Nutrition and Health

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
702	Requirements and Function of Nutrients and Other Food Cor	15%	15%	15%	
703	Nutrition Education and Behavior	25%	25%	25%	
721	Insects and Other Pests Affecting Humans	10%	10%	10%	
724	Healthy Lifestyle	50%	50%	50%	
<b>Total</b>		<b>100%</b>	<b>100%</b>	<b>100%</b>	

**V(C). Planned Program (Inputs)**

**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	34.0	2.5	16.0	0.0
<b>Actual</b>	35.0	2.5	13.0	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
850680	73328	453864	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1019879	73327	1554586	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
744451	10000	2114385	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

The Nutrition and Health program will promote optimum nutrition and health through diet and lifestyle in all North Carolinians regardless of gender, income, age, or race/ethnicity. Education programs addressing diet, healthy, and chronic disease prevention will be offered to North Carolinians of diverse income levels, age groups, genders, and/or cultural backgrounds across the state. Programs offered will include Give Your Heart A Healthy Beat, Project Eat Right: Add to Life Program, Color Me Healthy, Moving Towards a Healthier You, Dining with Diabetes, SyberShop, Women Living Healthy – Women Living Well, and Families Eating Smart and Moving More. Programs will be held in many different settings including congregate nutrition sites, senior centers, schools, churches, government buildings, businesses, daycare centers, work sites and outdoors. Various methods will be employed including using the Internet, computers, mailed materials, media, one-on-one contact, and public meeting. Research projects will continue or be undertaken to seek scientific discoveries that will enhance the quality of living for the states' and nation's human population.

**2. Brief description of the target audience**

Audiences reached included children, adults and the elderly, day care workers, hospital employees, housing authorities, Head Start, Red Cross, food banks, daycare home providers, food stamp and WIC recipients and community coalitions. No time is more important than childhood to promote healthy eating and health practices. Children in North Carolina do not consume enough fruits or vegetables and have diets that are low in fiber and higher in fat than recommended. Children in North Carolina need quality nutrition education to help positively influence their food choices. For nutrition education efforts to be effective they must also include parents and care givers. Helping families make informed decisions about their nutrition will help ensure that North Carolina's children grow to reach their full mental and physical potential. Overweight in children in North Carolina continues to rise. Treatment of overweight and obesity is difficult. Preventing overweight and obesity in children is essential to address this issue. Demographic changes in North Carolina's population continue to impact nutrition and health issues. The fastest growing age group in the state is the 65 years-and-over segment. The elderly run disproportionate risks of malnutrition and poverty as well as poor overall health status. In fact, over 85% of older adults suffer from chronic diseases and could benefit from dietary intervention. The general nutrition needs of the well elderly must be addressed; however, the needs of the elderly for prevention of malnutrition and chronic disease actually begin much earlier in life. Programs addressed to young adults and the middle-aged consumers will continue to impact the health of the population as it "ages." Women are employed in greater numbers, and many of them are among the ranks of the working poor. Over 80% of women who had school-aged children were working outside the home; 67% of women with youngest child under six years were in the labor force. For working parents with very limited resources, lack of after-school and summer programs for youth are a major concern.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

**Target for the number of persons (contacts) reached through direct and indirect contact methods**

	<b>Direct Contacts Adults</b>	<b>Indirect Contacts Adults</b>	<b>Direct Contacts Youth</b>	<b>Indirect Contacts Youth</b>
<b>Year</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>
<b>Plan</b>	18000	40000	2500	7500
2007	152250	300550	50750	100400

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

<b>Year</b>	<b>Target</b>
<b>Plan:</b>	5
2007 :	4

**Patents listed**

An Avirulent Strain of Salmonella for Use as a Live Vaccine  
 Novel Insecticide for the Control of Insects and Acari Using BioUD  
 High Through-put screen for anti-infectives against gram positive pathogens (HTGP)  
 Methods of Treating Influenza Viral Infections

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>			
2007	17	5	22

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Non-degree credit group activities conducted on Foods and Nutrition Education

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	2100	2343

**Output #2**

**Output Measure**

- Targeted audiences participate in workshops on food and nutrition

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	15000	22717

**Output #3**

**Output Measure**

- Child care providers attend training on food and nutrition

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	3000	2342

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

<b>O No.</b>	<b>Outcome Name</b>
1	Program participants increase knowledge that will promote a healthier diet
2	Program participants increase skills that will promote a healthier diet
3	Educational program participants make one or more positive dietary change
4	Child care providers increase knowledge about nutrition and physical activity in children
5	Child care providers adopt practices that improve nutrition and physical activity in the children they serve

**Outcome #1**

**1. Outcome Measures**

Program participants increase knowledge that will promote a healthier diet

**2. Associated Institution Types**

•1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	10000	28031

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The importance of promoting nutrition and wellness throughout life has been clearly established. Dietary factors are associated with five of the ten leading causes of death in North Carolina and the United States. Programs that provide consumers with research-based information on healthy eating are imperative to increase their knowledge of the importance of making changes in their dietary patterns to optimize health. Further, consumers need knowledge as to how to go about making these changes based on their lifestyle and environment.

**What has been done**

NC Cooperative Extension has used multiple delivery strategies to increase the knowledge of participants in healthy eating. Agents have conducted workshops and demonstrations in a variety of setting including after-school, school, faith community, work site and others. Media was used to effectively disseminate a clear message about healthy eating.

**Results**

Over 28,000 North Carolinians who participated in programs conducted by NC Cooperative Extension increased knowledge on how to promote a healthy diet. While knowledge does not indicate behavior change, certainly it is a step in moving toward lifestyle changes in diet that promote optimal health.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

**Outcome #2**

**1. Outcome Measures**

Program participants increase skills that will promote a healthier diet

**2. Associated Institution Types**

•1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	10000	27347

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The importance of promoting nutrition and wellness throughout life has been clearly established. Dietary factors are associated with five of the ten leading causes of death in North Carolina and the United States. Programs that provide consumers with research-based information on healthy eating are imperative to improve their skills to be better able to make changes in their dietary patterns to optimize health. Further, consumers need skills as to how to go about making these changes based on their lifestyle and environment.

**What has been done**

NC Cooperative Extension has used multiple delivery strategies to increase the skills of participants in healthy eating. Agents have conducted workshops and demonstrations in a variety of setting including after-school, school, faith community, work site and others. Media was used to effectively disseminate a clear message about healthy eating.

**Results**

Over 27,000 North Carolinians who participated in programs conducted by NC Cooperative Extension acquired skills as to how to have a healthy diet. While acquiring skills does not indicate behavior change, certainly it is a step in moving toward lifestyle changes in diet that promote optimal health.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

**Outcome #3**

**1. Outcome Measures**

Educational program participants make one or more positive dietary change

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	8000	24098

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The importance of promoting nutrition and wellness throughout life has been clearly established. Dietary factors are associated with five of the ten leading causes of death in North Carolina and the United States. Programs that provide consumers with research-based information on healthy eating are imperative to assist them in making positive behavior change in dietary patterns to optimize health.

**What has been done**

NC Cooperative Extension has used multiple delivery strategies to increase change of participants in healthy eating. Agents have conducted workshops and demonstrations in a variety of setting including after-school, school, faith community, work site and others. Media was used to effectively disseminate a clear message about healthy eating.

**Results**

Over 24,000 North Carolinians who participated in programs conducted by NC Cooperative Extension have made at least one positive dietary change. Changes include increased consumption in fruits and vegetables, increased breakfast consumption, decreased fat consumption, increased dairy consumption and change in portion sizes to better match recommendations per mypyramid.gov. All of these behaviors reduce the risk of chronic diseases including heart disease, stroke and some forms of cancer. Also, these dietary behaviors are related to an increased likelihood of achieving and maintaining a healthy weight.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
702	Requirements and Function of Nutrients and Other Food Components

**Outcome #4**

**1. Outcome Measures**

Child care providers increase knowledge about nutrition and physical activity in children

**2. Associated Institution Types**

•1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	3000	2225

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Childhood obesity rates continue to rise in North Carolina. The epidemic of childhood overweight is a complex problem, poor eating patterns is one widely recognized contributor to this issue. Very few children however have eating habits that would be conducive to decreasing their risk of overweight. Everyday many children spend most of their waking hours in child care, this provides opportunities to reinforce habits that support good health. Involving caregivers in educating and inspiring children about healthy eating is essential in developing positive eating patterns.

**What has been done**

NC Cooperative Extension continues to be a leader in the state in providing research-based nutrition training for child care providers. Participants receive nutrition education as well as creative ways to engage young children in healthy eating. Participants learn ways to encourage children to try new foods and enjoy a variety of foods including fruits and vegetables. Participants also learn strategies to engage parents with similar messages about healthy eating that their children are hearing in the preschool classroom.

**Results**

Over 2,000 child care providers who attended training increased their knowledge about nutrition and physical activity in children. These providers serve over 20,000 preschool children across the state. As we increase the knowledge of child care providers in the importance of nutrition and physical activity in children we take the first step to providing a positive preschool environment that is supportive of healthy eating and physical activity.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
724	Healthy Lifestyle
703	Nutrition Education and Behavior

**Outcome #5**

**1. Outcome Measures**

Child care providers adopt practices that improve nutrition and physical activity in the children they serve

**2. Associated Institution Types**

•1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	1800	1874

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Childhood obesity rates continue to rise in North Carolina. The epidemic of childhood overweight is a complex problem, poor eating patterns is one widely recognized contributor to this issue. Very few children however have eating habits that would be conducive to decreasing their risk of overweight. Everyday many children spend most of their waking hours in child care, this provides opportunities to reinforce habits that support good health. Involving caregivers in educating and inspiring children about healthy eating is essential in developing positive eating patterns.

**What has been done**

NC Cooperative Extension continues to be a leader in the state in providing research-based nutrition training for child care providers. Participants receive nutrition education as well as creative ways to engage young children in healthy eating. Participants learn ways to encourage children to try new foods and enjoy a variety of foods including fruits and vegetables. Participants also learn strategies to engage parents with similar messages about healthy eating that their children are hearing in the preschool classroom.

**Results**

Over 1,800 child care providers who attended training increased their knowledge about nutrition and physical activity in children. These providers serve over 18,000 preschool children across the state. By changing practices at the child care center level, we create an environment that is supportive of healthy eating and physical activity behaviors. Child-care providers participating in training increased the level of nutrition education taught in the preschool classroom as well as the amount of physical activity for the children. One way this was achieved was by using the Color Me Healthy curriculum, a program designed for the preschool classroom on healthy eating and physical activity. This curriculum has been shown to be an effective tool at increasing nutrition knowledge, fruit and vegetable recognition and willingness to try new foods in the children.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
702	Requirements and Function of Nutrients and Other Food Components

**V(H). Planned Program (External Factors)**

**External factors which affected outcomes**

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programatic Challenges
- Populations changes (immigration,new cultural groupings,etc.)

**Brief Explanation**

Many factors affect individuals' decisions and abilities to practice positive behaviors with respect to health eating and physical activity. These factors include the physical and social environment of families, communities and organizations; the policies, practices and norms within the social and work settings; and their access to reliable information. Lasting changes in health behaviors require physical environments and social systems that support positive lifestyle habits. In order for individuals (adults and children) to make positive lifestyle changes with respect to healthy eating and physical activity, changes need to be made in the surrounding organizational, community, social and physical environment. Without these changes, successful health behavior change is difficult to achieve and sustain. Confidence in adopting and maintaining a behavior may be strengthened when the physical and social environment supports the new behavior. Policy and environmental interventions can improve the health of all people, not just small groups of motivated or high-risk individuals. NC Cooperative Extension continues to work using the multi-level model or socioecological model for behavior change. It is within that context that we provide education to participants while working at the county and state level to make systems, policy and environmental changes. These changes are systemic and societal thus do not happen quickly. Slow changes in policy and environments that support healthy eating and physical activity continue to challenge our ability to make improvements in eating and physical activity patterns.

## V(I). Planned Program (Evaluation Studies and Data Collection)

### 1. Evaluation Studies Planned

- After Only (post program)
- Before-After (before and after program)
- During (during program)
- Comparisons between program participants (individuals, group, organizations) and non-participants

### Evaluation Results

There are many evaluation ongoing evaluation efforts in the area of healthy eating and physical activity across North Carolina. The following will highlight evaluation from the Expanded Food and Nutrition Education Program. EFNEP helps families and youth with limited resources—those most at risk to suffer from hunger, food insecurity and the ability to connect with available support systems. EFNEP offers practical nutrition information, food preparation, food resource management and food safety education in settings convenient for the participants. EFNEP graduates reflect significant, lasting improvement in eating behaviors and healthy food habits. North Carolina EFNEP Reaches Diverse Audiences In 2007, • 4,632 families enrolled in EFNEP • 9,849 participated in 4-H EFNEP • 68% of EFNEP participants were also WIC participants • 72% of EFNEP participants enrolled in one or more food assistance programs. The following data were compiled from pre and post evaluation surveys administered to participants by EFNEP program assistants across the state. EFNEP Makes a Real Difference for Limited Resource Adults Participants completing the series of lessons improved nutrition, food behavior and food safety practices. As a result of participation in EFNEP: • 82% improved in one or more food safety practices • 77% used food labels more often to make food choices • 94% improved in one or more food resource management practices • 41% of participants increased the amount of physical activity • 98% of participants improved their diet • 62% increased fruit consumption • 54% increased vegetable consumption • 54% increased consumption of calcium-rich foods Recent research shows the positive effects of families eating together. In North Carolina, we track meals eaten together as an indicator of participant families' well being. In 2007 clients were asked "How often do you eat meals or snacks with one or more family members?" After EFNEP participation, 62% of families more often ate together. EFNEP makes a difference in families! EFNEP Makes a Real Difference for Limited Resource Youth Through a series of classes, 4-H EFNEP participants learn basic nutrition, the importance of daily physical activity, how to make healthy food choices, and food safety in preparation and storage. Evaluation data shows the following: • 55% of the youth reported eating a variety of foods; • 54% increased their knowledge of human nutrition; • 54% increased their ability to select low-cost, nutritious foods; and • 44% improved practices in food preparation and safety. EFNEP Makes a Real Difference for Limited Resource Pregnant Teens EFNEP encourages pregnant teens to make healthy food choices, seek professional prenatal care, and achieve their educational goals. Pregnant teenagers that take part in our hands-on program use the knowledge they gain to make positive choices in their diet, which results in reduced risk of low-birthweight infants. Society at large benefits from reduced infant mortality, lowered health care cost and the increased economic stability of families. As a result of participation in EFNEP: • 75% of pregnant teens improved food safety practices • 100% used food labels to make food choices • 77% improved their diet • 73% increased fruit consumption • 62% increased vegetable consumption • 54% increased consumption of calcium-rich foods

### Key Items of Evaluation

North Carolina EFNEP Reaches Diverse Audiences In 2007, • 4,632 families enrolled in EFNEP • 9,849 participated in 4-H EFNEP • 68% of EFNEP participants were also WIC participants • 72% of EFNEP participants enrolled in one or more food assistance programs. The following data were compiled from pre and post evaluation surveys administered to participants by EFNEP program assistants across the state.

**EFNEP Makes a Real Difference for Limited Resource Adults** Participants completing the series of lessons improved nutrition, food behavior and food safety practices. As a result of participation in EFNEP: • 82% improved in one or more food safety practices • 77% used food labels more often to make food choices • 94% improved in one or more food resource management practices • 41% of participants increased the amount of physical activity • 98% of participants improved their diet • 62% increased fruit consumption • 54% increased vegetable consumption • 54% increased consumption of calcium-rich foods

Recent research shows the positive effects of families eating together. In North Carolina, we track meals eaten together as an indicator of participant families' well being. In 2007 clients were asked "How often do you eat meals or snacks with one or more family members?" After EFNEP participation, 62% of families more often ate together. EFNEP makes a difference in families!

**EFNEP Makes a Real Difference for Limited Resource Youth** Through a series of classes, 4-H EFNEP participants learn basic nutrition, the importance of daily physical activity, how to make healthy food choices, and food safety in preparation and storage. Evaluation data shows the following: • 55% of the youth reported eating a variety of foods; • 54% increased their knowledge of human nutrition; • 54% increased their ability to select low-cost, nutritious foods; and • 44% improved practices in food preparation and safety.

**Program #8**

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Families and Communities

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
801	Individual and Family Resource Management	34%	34%	34%	
802	Human Development and Family Well-Being	33%	33%	33%	
804	Human Environmental Issues Concerning Apparel, Textiles, ;	33%	33%	33%	
	<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	

**V(C). Planned Program (Inputs)**

**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	25.0	5.0	0.0	0.0
<b>Actual</b>	26.0	5.0	11.0	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
367880	146655	372463	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
736579	146655	1157597	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
957127	0	1014597	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

- Develop and Conduct Family Resource Management, Healthy Housing and Parenting Trainings and Workshops. - Educational workshops for consumers related to family resource management, debt reduction, developing budgets and savings plans will be included in these trainings. Trainings will also be designed to include low to moderate income families and families headed by women. Educational workshops for consumers related to reducing home hazards. - Dissemination of research findings related to family resource management, housing and parenting. - Establish and/or maintain collaborative partnerships with agencies/organizations serving limited resource families.

**2. Brief description of the target audience**

The target audience for programs includes individual/family consumers, working poor, low to moderate income, minorities, women whose poor economic decisions, ability, and other socio-economic factors make them more at risk of experiencing negative consequences than other families, youth/students, homeowners, families with young children, limited resource parents, caregivers, court madated or DSS referred parents, grandparents raising grandchildren in North Carolina.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

**Target for the number of persons (contacts) reached through direct and indirect contact methods**

	<b>Direct Contacts Adults</b>	<b>Indirect Contacts Adults</b>	<b>Direct Contacts Youth</b>	<b>Indirect Contacts Youth</b>
<b>Year</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>
<b>Plan</b>	40550	120300	2200	8400
2007	43101	503161	6861	17650

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

<b>Year</b>	<b>Target</b>
<b>Plan:</b>	0
2007 :	0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>			
2007	17	0	17

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Develop and conduct Family Resource Management training and workshops.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	20	25

**Output #2**

**Output Measure**

- Educational workshops for consumers related to family resource management, debt reduction, developing budgets and savings

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	40	87

**Output #3**

**Output Measure**

- Conduct educational workshops for consumers related to parenting and family life.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	35	92

**Output #4**

**Output Measure**

- Develop and conduct healthy housing training and workshops for county agents

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	6	3

**Output #5**

**Output Measure**

- Conduct parenting education training for county agents

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	5	5

**Output #6**

**Output Measure**

- Conduct educational workshops for consumers related to healthy homes

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	25	26

**Output #7**

**Output Measure**

- Parents mandated by the court and referred by the Department of Social Services (or other agencies/organizations) for parent

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	30	383

**Output #8**

**Output Measure**

- Conduct debt reduction training workshops

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	5	6

**Output #9**

**Output Measure**

- Develop and conduct financial education workshops for community based financial educators.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	10	45

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

<b>O No.</b>	<b>Outcome Name</b>
1	Parents will report increased time and interaction with their children
2	Individuals and families will use basic money management skills (budgeting/recording keeping)
3	Individuals will improve financial status
4	Individuals/families will reduce debt
5	Individuals/families will develop and implement savings plan to increase financial security in later years
6	Individuals will use one or more strategies to prevent or control safety hazards in the home

**Outcome #1**

**1. Outcome Measures**

Parents will report increased time and interaction with their children

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	1000	2370

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Basic skills and socialization and educational motivation are first taught in the home. Many youth, however, are growing up in environments that lack parental supervision and support, and lack of quality time to build trusting relationships. The consequence of these circumstances is youth may suffer from anti-social behavior such as gangs, crime, disruptive school behavior, school drop-out, and drug and alcohol addiction.

**What has been done**

North Carolina Family and Consumer Science agents are assisting in the development of building strong families by educating citizens on parenting and family life issues. Agents conduct camps, workshops, trainings, and conferences that help address the very real and important needs of parents. These educational efforts emphasize the importance of quality family time and encourage skill development for parents.

**Results**

As a result of participating in educational programs, 3,928 parents attended parenting education classes, including 3,039 limited-resource persons and 920 court-mandated or DSS-referred parents. As a result of these classes, 1,810 reported adopting effective parenting practices, 2,449 adopting practices in motivating and guiding children, and 2,095 parents said they adopted practices in nurturing their children.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
802	Human Development and Family Well-Being
804	Human Environmental Issues Concerning Apparel, Textiles, and Res
801	Individual and Family Resource Management

**Outcome #2**

**1. Outcome Measures**

Individuals and families will use basic money management skills (budgeting/recording keeping)

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	1500	1686

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Individuals and families often lack basic skills in financial decision making, planning and stretching financial resources. As a result, families in financially stressful situations are making decisions that cause long term serious financial consequences.

**What has been done**

Family and Consumer Science Agents conducted educational programs that focused on equipping individuals and families with skills to help them better manage economic change that will occur throughout their lives. Agents addressed basic financial budgeting and planning, credit use, and record keeping.

**Results**

As a result of participating in educational programs, 1686 individuals reported ongoing use of budgeting, record keeping (basic money management) skills, 6884 individuals, including limited resource individuals, gained basic money management skills such as goal setting, budgeting and record keeping.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
801	Individual and Family Resource Management

**Outcome #3**

**1. Outcome Measures**

Individuals will improve financial status

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	1500	1106

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The current and future financial status of North Carolinians is at risk. Rising indebtedness, foreclosures, bankruptcies, predatory lending, and a lack of planning for economic changes create an uncertain future for families.

**What has been done**

Family and Consumer Science agents in North Carolina have conducted workshops and trainings to assist limited resource and non-limited resource individuals in improving their financial management skills. Budgeting, debt reduction and credit management offerings have helped citizens develop the necessary financial management skills to improve their financial situation. In addition, individuals have learned to plan for expected and unexpected economic changes and events in their lives.

**Results**

As a result of participating in educational programs, 1106 individuals reported making lifestyle changes that improved financial status, 849 individuals reported achieving financial goals, 763 reported reducing their debt load

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
801	Individual and Family Resource Management

**Outcome #4**

**1. Outcome Measures**

Individuals/families will reduce debt

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	500	763

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

A symptom of increased indebtedness of working class and middle class families is the rise in the number of personal bankruptcies. A high level of indebtedness among households could lead to increased household delinquencies and bankruptcies which then threaten the health of the state's economy at large.

**What has been done**

Family and Consumer Science agents, along with their program partners, developed and implemented educational programs related to debt reduction.

**Results**

As a result of program efforts, 763 participants, including limited resource individuals, reduced their debt load, participants estimated they debt load reduction a total of \$130,450.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
801	Individual and Family Resource Management

**Outcome #5**

**1. Outcome Measures**

Individuals/families will develop and implement savings plan to increase financial security in later years

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	500	857

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Financial security in later life, and ultimately quality of life, is affected by financial management practices and experiences in the marketplace. Many individuals have failed to plan for retirement and do not know or understand what resources will be needed for retirement.

**What has been done**

Family and Consumer Science agents, along with various partners, developed and implemented educational programs related to financial security in later years. These programs included preparing for retirement and estate planning.

**Results**

As a result of participation in educational programming, 857 individuals reported developing and implementing plans to increase financial security in later years.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
801	Individual and Family Resource Management

**Outcome #6**

**1. Outcome Measures**

Individuals will use one or more strategies to prevent or control safety hazards in the home

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	1500	1173

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Most accidents and injuries occur in the home. Accidents and injuries include burns, falls, drownings, and poisoning. Many of these accidents can be prevented by eliminating or controlling various hazards in the home.

**What has been done**

NC Cooperative Extension has used multiple delivery strategies to increase the knowledge and skills of participants in creating safe living and playing environments. Agents conducted workshops, trainings and demonstrations related to controlling home safety hazards.

## Results

As a result of participation in programs, 626 non-limited resource and 883 limited resource participants increased their knowledge about home safety strategies by participating in workshops and discussion groups on home safety. In addition, 1173 (limited and non-limited resource) individuals reported using one or more strategies to prevent or control safety hazards in the home.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
804	Human Environmental Issues Concerning Apparel, Textiles, and Res

## V(H). Planned Program (External Factors)

### External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

### Brief Explanation

A number of factors contribute to the adoption of practices as they relate to family resource management, parenting, and home safety. The overall economy of the state and nation plays a significant role. Increases in interest rates, a tightening and/or declining job market, industry closings, affect individual income levels. In 2007, saw increases in foreclosures and bankruptcies. Normal stressors of maturity, communication and family dynamics often are compounded by external forces including the economy. In addition to economic forces, families must cope with concerns such as deployment of one or both parents, substance abuse, incarceration, violence and disaster.

## V(I). Planned Program (Evaluation Studies and Data Collection)

### 1. Evaluation Studies Planned

- After Only (post program)
- Before-After (before and after program)
- During (during program)
- Case Study
- Other (Data provided by collaborators)

### Evaluation Results

Evaluation of education programs in family and communities is an on-going process. Evaluation methods and timing is dependent upon the Family and Consumer Science agent's plan of work. Evaluation of family resource management programs include: Limited resource families saved a total of \$45,630. IDA participants saved a total of \$66,900. County tax base increased by \$450,000. 1,461 limited resource individuals incorporated basic money management skills into everyday lives. 849 individuals set financial goals and achieved them. 1,731 developed and implemented a savings plan. 857 developed and implemented a saving splan for financial security. Evaluation of parenting programs include: 3,928 parents attended parenting education classes. 1,810 parents adopted effective parenting practices. 2,449 parents adopted practices in motivating and guiding children. 2,095 parents adopted practices in nurturing children. Evaluation of healthy and safe homes revealed: 1,509 participants increased their knowledge about home safety strategies. 1,173 participants used one or more strategies to prevent or control safety hazards in the home.

### Key Items of Evaluation

**Program #9**

**V(A). Planned Program (Summary)**

**1. Name of the Planned Program**

Youth Development

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
806	Youth Development	100%	100%	100%	
<b>Total</b>		100%	100%	100%	

**V(C). Planned Program (Inputs)**

**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2007	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	40.0	6.0	0.0	0.0
<b>Actual</b>	54.0	6.0	0.0	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
473992	175986	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1529819	175986	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1918803	0	0	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

Objectives listed under the four Long Range Focus Areas are accomplished by teams of campus/field based youth development educators. Each team continuously works to accomplish three related, over lapping focus area/objectives specific processes. Each team works to build youth development professional practices and expand the impact of evaluations as they: 1) Scan the environment for emerging focus area specific and deliver programs responsive for those existing and emerging needs. 2) Design and deliver programs responsive to those existing and emerging needs. 3) Design evaluation tools to facilitate program impacts for reporting into the Extension Reporting System. Each team will produce, share and implement the following program-wide set of elements: Focus/Objectives Teaching Points Situation Statement Evaluation strategies a) Measures of Progress b) Impact Indicators Related Research Programming Resources Target Audiences. Youth development professionals and volunteers working with low income and minority youth will be engaged in various phases of the program design and development. They will also assist with pilot testing developed educational products. Strategies to increase access to 4-H programs in local communities will be built by matching income youth. This strategy will promote the building of a strong network of individuals equipped to address the unique needs of the targeted audience.

**2. Brief description of the target audience**

The Development Responsible Youth Initiative is designed to drive collaboration with and among all agencies, programs and organizations dedicated to the well being of young people in our state. Our initiative activity engages youth, volunteers, stakeholders and youth development professionals “to create helping relationships, to enable youths to become responsible, productive citizens.”

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

**Target for the number of persons (contacts) reached through direct and indirect contact methods**

	<b>Direct Contacts Adults</b>	<b>Indirect Contacts Adults</b>	<b>Direct Contacts Youth</b>	<b>Indirect Contacts Youth</b>
<b>Year</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>	<b>Target</b>
<b>Plan</b>	40000	150000	150000	450000
2007	19700	59100	204410	537526

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

<b>Year</b>	<b>Target</b>
<b>Plan:</b>	0
2007 :	0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>			
2007	8	0	8

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Fostering Relevant & Challenging Learning Experiences

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	20000	24895

**Output #2**

**Output Measure**

- Strengthening Civic Responsibility through Leadership and Volunteerism

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	20000	22001

**Output #3**

**Output Measure**

- Preparing for an Employable Future

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	20000	21267

**Output #4**

**Output Measure**

- Nurturing Healthy Lifestyles

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2007	20000	19591

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O No.	Outcome Name
1	Youth Involved: 4-H Clubs, School Enrichment, Special Interest and Resident/Day Camps Fostering Relevant and Challenging Learning Experiences
2	Youth Involved: 4-H Clubs, School Enrichment, Special Interest, and Resident/Day Camps Strengthening Civic Responsibility Through Leadership and Volunteerism
3	Youth Involved: 4-H Clubs, School Enrichment, Special Interest and Resident/Day Camps Preparing for an Employable Future
4	Youth Involved: 4-H Clubs, School Enrichment, Special Interest and Resident/Day Camps Nurturing Healthy Life Styles

**Outcome #1**

**1. Outcome Measures**

Youth Involved: 4-H Clubs, School Enrichment, Special Interest and Resident/Day Camps Fostering Relevant and Challenging Learning Experiences

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	20000	19641

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

North Carolinas youth and families continue to Discover the World Through 4-H Camps. Camps and educational conference center operations continue to grow in celebration of being exemplary units in the certification system managed by the American Camping Association.

**What has been done**

Over 19,641 youth participated in 4-H day and residential camping in 2007. 5,872 youth discovered the world during 16-units weeks of junior camping and 12 weeks of specialty camps including: Marine Science and Sailing, Cloverbud Camping (ages 6-8), Fur, Fish & Game Camp, Horsemanship, Shooting Sport, Adventure Camp, and Challenge Camp.

**Results**

Camp participants gained significant life skills both socially and knowledge gains in safety, the environment, personal responsibilities, and gaining a sense of making responsible decisions, plus gaining skills in functioning via the use of healthy life skills.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
806	Youth Development

**Outcome #2**

**1. Outcome Measures**

Youth Involved: 4-H Clubs, School Enrichment, Special Interest, and Resident/Day Camps Strengthening Civic Responsibility Through Leadership and Volunteerism

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	20000	21814

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Through active 4-H participation youth learn to manage relationships, make decisions, become resilient enough to overcome the risks they face, become better communicators, and serve their communities. 4-Hs hands-on, learn-by-doing approach reaches hundreds of thousands of North Carolinas youth each year in schools, in community clubs, camps, and in other settings.

**What has been done**

A total of 204,419 youth participated in 4-H programs across the state with over 138,021 involved in 4-H Clubs and School Enrichment; 79,522 involved in Short-term/Special Interest activities

**Results**

Fifty-seven (57) counties emphasized the new Strengthening Civic Responsibility through Leadership and Volunteerism program initiative. These 4-H professionals worked with youth and adult volunteers in a variety of program areas including: civic engagement and volunteerism. The Civic Engagement programs reported 4,823 youth indicated an increase in knowledge regarding political/election processes; and that over 1,200 youth sat on advisory boards or councils. The Social Problems programs reported that over 11,000 youth indicated an increased knowledge regarding volunteerism while over 10,600 youth increased their knowledge of effective leadership practices. In 2007, the Strengthening Civic Responsibility through Leadership and Volunteerism initiative had an estimated value to society of over \$22 million dollars.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
806	Youth Development

**Outcome #3**

**1. Outcome Measures**

Youth Involved: 4-H Clubs, School Enrichment, Special Interest and Resident/Day Camps Preparing for an Employable Future

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	20000	7115

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Through active 4-H participation youth learn to manage relationships, make decisions, become resilient enough to overcome the risks they face, become better communicators, and serve their communities. 4-Hs hands-on, learn-by-doing approach reaches hundreds of thousands of North Carolinas youth each year in schools, in community clubs, camps, and in other settings.

**What has been done**

Youth in seventy-one (71) counties benefited as a result of involvement in community-based programs that focused on the new Preparing for an Employable Future Initiative which includes: career pathways, entrepreneurship, life skills and STEM. Career Pathway programs reported 5,526 youth established career goals as a result of their involvement in 4-H programs

**Results**

Some indications of Progress included:

Number of youth gaining knowledge regarding career pathways. 7,115;

Number of youth increasing their awareness of potential career pathways through job shadowing/internship/service learning programs-3,995;

Number of youth identifying their career aspirations-6,372

Some Impacts included:

3,785 youth obtained employment and/or participated in Job Shadowing/Internship/Service Learning programs due to 4-H programming;

5,526 youth established career goals due t 4-H programming;

5,999 at-risk youth remained in school due to 4-H programming.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
806	Youth Development

**Outcome #4**

**1. Outcome Measures**

Youth Involved: 4-H Clubs, School Enrichment, Speical Interest and Resident/Day Camps Nurturing Healthy Life Styles

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2007	20000	18927

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Through active 4-H participation youth learn to manage relationships, make decisions, become resilient enough to overcome the risks they face, become better communicators, and serve their communities. 4-Hs hands-on, learn-by-doing approach reaches hundreds of thousands of North Carolinas youth each year in schools, in community clubs, camps, and in other settings.

**What has been done**

Thirty-four (34) counties emphasized the new Nurturing Healthy Lifestyles program initiative. These 4-H professionals worked with youth in a variety of program areas including: fruit and vegetable consumption, ways to be physically active, managing stress, decreasing tobacco and alcohol use, fire safety, and outdoor adventures.

## Results

A snapshot of impacts include: 15,218 youth increased their knowledge of different ways to be physically active; 7,686, youth increased physical activity evidenced through activity log or pedometer; 6,364 youth reported improved decision-making skills; and 3,709 youth increased knowledge and skills in fire safety.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

## V(H). Planned Program (External Factors)

### External factors which affected outcomes

- Natural Disasters (drought,weather extremes,etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programatic Challenges
- Populations changes (immigration,new cultural groupings,etc.)

### Brief Explanation

One of the most pressing social issues we face in North Carolina is how to provide our youth with a solid foundation for life. The evidence that the foundation is fragile appears year after year in newspaper articles and scientific studies that call attention to the challenge and problems facing too many youth: persistently high rates of alcohol and other drug use, teenage pregnancy, violence, school failure, and many more. Simultaneously, new concerns are being voiced about whether we are building the kinds of skills and competencies needed to ensure a competent work force and an engaged citizenry.

## V(I). Planned Program (Evaluation Studies and Data Collection)

### 1. Evaluation Studies Planned

- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants

### Evaluation Results

Programs are evaluated for impact by objective/goal in the context of the Long Range Focus Area Team plan. These impacts are reported in three separate, related systems: Extension Service 237, the North Carolina Extension Reporting System, and the knowledge, attitude, skill, and aspiration assessments for individual programs by teams.

### Key Items of Evaluation