

# 2009 North Carolina A&T State University Extension and North Carolina State University Research and Extension Combined Annual Report of Accomplishments and Results

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## I. Report Overview

### 1. 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 2009 research and extension programs in North Carolina.

#### **NORTH CAROLINA AGRICULTURAL RESEARCH SERVICE (NCARS)**

North Carolina State University is North Carolina's 1862 land grant university and the only Research 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. The following North Carolina State University colleges collaborate on NCARS research projects.

- Agriculture and Life Sciences
- Natural 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, the Agricultural Research Service coordinates research in 18 departments and works in partnership with the North Carolina Cooperative Extension Service and the college's Academic Programs office.

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;
- Improve the health, well being and quality of life of North Carolina citizens; and
- Provide the science base for research and extension programs.

In FY 2009 Research Service personnel included tenured and tenure-track research faculty accounting for approximately 375 research faculty, most on shared appointments with Academic Programs or Cooperative Extension. Working with these faculty members are more than 490 research professors, researchers, research assistants, professional support staff and graduate students; 230 laboratory or field technicians and other technical support; and 80 clerical/other staff. These faculty members and support personnel conduct basic and applied research involving 500 projects, of which 23 are multistate. These projects 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 partners with communities to deliver education and technology that enrich the lives, land and economy of North Carolinians. 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 nine major goals that focus on concerns statewide. Each goal has several objectives that are designed to operate interdependently among the nine goals, allowing Extension to provide multi-faceted responses to meet complex needs. To achieve the plan's objectives, specialists at the state's two land grant universities work hand-in-hand with field faculty serving all 100 North Carolina counties and the

Eastern Band of the Cherokee Indians. Programs at N.C. A&T State University are targeted largely at limited-resource audiences. Parameters are included for every objective that may be used to measure the success of Extension programs with both limited- and nonlimited-resource audiences.

The work of Cooperative Extension professionals is coordinated with the efforts of the North Carolina Agricultural Research Service. Indeed, about 75 of the 355 Extension faculty within the 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. To ensure that underserved and underrepresented audiences are among those included in program development and implementation, Cooperative Extension established a 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; however, 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 nine 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**

The Research and Extension AREERA plans encompass nine broad planned program areas and five NIFA priority areas. These include:

- 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 of each of the nine program area accomplishments follow.

## **PLANT PRODUCTION SYSTEMS AND HEALTH**

North Carolina has a strong agricultural economy that has become more diverse to meet the demands of a changing population and market opportunities. However, to remain competitive in the national and global agricultural economy and take advantage of local marketing opportunities, growers must adopt more efficient production practices and continue to diversify. Growers are now producing specialty crops, including medicinal herbs, specialty melons, heirloom fruits and vegetables, truffles, hops, caneberries, oriental pears, various crops for the state's growing ethnic populations and grapes for wine and nutraceutical properties. In addition, the green industry continues to increase yearly, and consumer concern over food safety, 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 from 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 the production, protection (from pests and pathogens), harvest, storage and marketing of these commodities. 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.

NCARS scientists are investigating new ways to more efficiently use water, fertilizer and other inputs and to improve yield and quality. Others are using molecular tools to develop new varieties with improved yield, quality and ability to withstand stresses such as drought, freeze injury and pests. To assist growers in taking advantage of the opportunities and challenges that 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 about alternative income sources, including commercialization of native species and the production of various ornamentals, fruit crops and vegetables, organic production methods, and agri-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 production practices, pest management, alternative marketing channels, creating grower associations, promoting the use of local farmers markets, starting pick- or cut-your-own operations and combining agri-tourism and direct marketing

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, glyphosate-resistant weeds are becoming widespread in North Carolina. NCARS scientists are working closely with county agents and producers in developing strategies to manage this and other problems.

Research and Extension activities by faculty in the NCARS and NCCES are creating new opportunities to increase profitability of existing crops and to take advantage local, national and international markets. Following are examples of these activities within each knowledge area.

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

Seven genes that account for over half of the winter hardiness in oats have been identified. Four freeze-tolerant oat lines have been identified that are significantly hardier than both parents. The freezing tolerance of two of these lines has tentatively been confirmed in the field in international uniform nurseries. This germplasm will eventually allow successful culture of winter oats as far north as Pennsylvania and in regions of the world where oats have never been grown.

Areas of the soybean genome that are associated with higher protein content, increased levels of a specific mono-unsaturated fatty acid and with reduced levels of a specific polyunsaturated fatty acid have been identified.

The first genomic draft sequence of blueberry has been generated (18 billion base pairs of DNA sequence; ~ 60X coverage). The current assembly covers 320 million base pairs of unique sequence and represents a predicted 47,494 genes. The draft sequence has been used to identify potential genes associated with production of health-promoting compounds based on similarity to grape.

#### **Plant Genetic Resources**

The Small Grains Program at N.C. State has developed breeding lines with powdery mildew resistance genes transferred from both wild and cultivated relatives of soft red winter wheat. These lines have different levels of resistance, and genetic markers have successfully been associated with many of these genes. Microsatellite markers have been used select wheat lines containing more than one powdery mildew resistance gene. This strategy of gene pyramiding can extend the life of the resistance genes under field conditions because it takes the pathogen longer to overcome the resistance.

High-oleic peanuts are in demand by manufacturers and consumers because of their extended shelf life and health benefits. However, the high-oleic Virginia-type peanut cultivars are, in general, susceptible to one or more of the commonly occurring peanut diseases. The peanut genetics program at N.C. State has released 15 germplasm lines derived from *A. cardenasii*, a diploid wild species with high levels of resistance to leaf spots, CBR, TSWV, Sclerotinia blight, nematodes and several insect pests.

The NC Medicinal Germplasm Repository at the North Carolina Arboretum, begun in January 2008, is North America's first facility dedicated to the acquisition, maintenance, characterization, evaluation, enhancement and distribution of medicinal plant germplasm of known genetic origin and taxonomic identity. Accessions from these collections will be distributed to scientists for collaborative research and education purposes. Approximately 1,475 accessions of medicinal taxa have been identified and/or stored for long-term preservation and research purposes at the NC Arboretum.

Covington, a new table-stock sweetpotato variety released in 2005, was grown on approximately 80% of North Carolina sweetpotato acreage in 2009. Based on USDA NASS crop value estimates of \$159 million for the 2009 crop, the farm-gate value of Covington was approximately \$127 million. Covington is also being grown in other states and accounts for roughly 40% of the U.S. sweetpotato crop.

Research on selection and development of pest-resistant landscape perennials at N.C. State has essentially eliminated the need for pesticides to control apple scab, dogwood anthracnose, fire blight, powdery mildew, Japanese beetles and

eastern tent caterpillar on a variety of plants.

The genetic diversity in redbud was used to develop novel landscape types through recombination of weeping growth habit, variegated leaf, purple leaf, golden leaf, and compact growth habit. A purple leaf selection with upright growth habit and superior drought tolerance compared to existing cultivars was released in 2009 as *Cercis canadensis* Merlot.

### **Plant Product Quality and Utility**

Sustainable agriculture programs have identified opportunities for niche marketing such as direct marketing (green labels, farmers markets and community supported agriculture) and organic production (a 20 - 30% growth industry in North Carolina). The most obvious incentives for organic production are the prices.

A total of five southern highbush blueberry varieties adapted to mechanical harvest for the fresh market have been developed by the N.C. State blueberry breeding program. These varieties cover the majority of North Carolina's usual marketing season, mid- to late May through mid-June. The small to medium size of the berries of these varieties also puts them in a more desirable range with regard to the antioxidant content of the fruit on a per cup or pint basis. In addition, the reduced costs associated with managing and harvesting varieties adapted to mechanical harvest for the fresh market should help keep North Carolina growers in a favorable competitive situation as blueberry industries develop in similar climate zones and marketing seasons.

Identification of new fresh market apple varieties that are uniquely suited to production in the Southeast, together with the development of technologies for consistently regulating crop load, promoting return bloom, delaying fruit drop, enhancing fruit appearance at harvest and fruit quality after storage are strategies that will ensure continued viability and success of the apple industry in the region. NCARS scientists found that reductions in cosmetic defects (e.g., russeting) increased pack-out of 'Golden Delicious' by an average of 13%, resulting in additional revenue per acre of \$1,680. A long-term evaluation of technology for delaying fruit drop demonstrated an increase in average annual yield of Red Delicious apples of 100 bushels per acre, a 10% increase.

### **Plant Management Systems**

Research conducted from 2002 to 2009 indicated that by combining careful corn hybrid selection with narrow rows, growers could increase seeding rates by up to 5,000 seeds per acre with resulting increases in yield of 10 to 40 bushels per acre. The average yield increase reported by growers using this program was over 12 bushels per acre in 2009. It is estimated that approximately 80% of North Carolina growers use this program. Based on a price of \$3/bushel, the program resulted in an economic impact of \$1,960,000 in 2009.

Studies on the use of nitrogen and potassium fertilizers on sweetpotatoes found no yield benefit with potash when the recommended rate of 160 pounds/acre was used to grow Covington and Evangeline varieties. Similarly, with Hatteras sweetpotato, yield was not enhanced with low rates of nitrogen fertilizer. Based on these initial studies, potash and nitrogen rates could be reduced substantially in North Carolina fields with limited effect on yield, thereby increasing growers' bottom line.

### **Basic Plant Biology**

Genes from the plant pathogenic fungus *Cercospora nicotianae* that provide resistance to a toxin required for successful infection of crop plants have been isolated. These genes are being tested to determine if they have utility in engineering disease-resistant plants.

Scientists at N.C. State and the University of California Riverside have identified small molecules that inhibit the delivery of membrane proteins to the vacuole. Mutants with altered sensitivity to one of these drugs are being characterized in order to understand its mode of action and to identify novel regulators of this trafficking pathway. Understanding the mechanisms of delivery of membrane proteins to the vacuole is important to the development of improved plants with high nutritional value and improved tolerance to environmental stress.

When the rice blast fungus attacks rice, several novel virulence associated genes and suites of enzymes involved in destroying host tissue are activated. A new class of small RNA molecules that appear to map to and potentially regulate gene expression have been identified. These molecules have unique features that specifically target the initiation and termination points of genes, potentially aiding in promoting gene expression. These small RNA molecules are unique and have not been previously observed in living cells. Moreover, they target specific genes and particular locations in genes, which suggests they play an important role in regulating gene expression and thus the ability of the rice blast fungus to cause disease.

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

Field studies revealed that insecticides commonly used in sweetpotato are not effective against the threat of a newly

discovered white grub when applied in a conventional manner. These results have saved growers the expense of employing ineffective chemical control tactics. A Section 18 exemption was obtained for clothianidin, which appears to be effective against the grub. If clothianidin proves to be effective over the long term, it will save growers hundreds of thousands of dollars annually.

Food-based vermicompost concentrations as low as 5-10% were found to cause plants to become resistant to caterpillar pests. Studies found that the mechanism of resistance mediated by vermicomposts is due to antibiosis plant effects leading to either delayed insect development and/or higher mortality. Insect mortality was increased by as much as 20% when insects fed on plants grown in vermicompost-amended soil.

A Granulate Ambrosia Beetle Monitoring and Alert Program based on trapping and targeted insecticide applications is being evaluated in woody plant nurseries. The average grower makes two insecticide applications before beetles emerge. The applications have no impact on the beetles and are thus wasted. A modest sized nursery with 10 acres and 10,000 trees can save \$1,400 per year by monitoring for beetles and waiting until they emerge to spray. Also, it was found that applying insecticides by hand as opposed to using an airblast sprayer improves coverage, although labor costs are higher. However, if improved coverage reduces damaged trees from 1% to 0.5%, growers would save five trees/acre, with a minimum value of \$200/acre. This, in addition to using 20 times less insecticide, will compensate for increased labor costs

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

A southern corn rootworm advisory system for peanuts developed at N.C. State provides sound decision-making principles and has reduced insecticide use by approximately 50%. The documentation of higher organic matter soils interfering with chlorpyrifos activity has caused some changes in rotation patterns and more emphasis on the use of the rootworm advisory for field selection.

A tomato spotted wilt virus risk index has reduced the incidence of tomato spotted wilt virus on peanuts by 75%. Educational programs, conducted each year to remind farmers to use the index even if virus was not present the previous year, have been successful in keeping disease pressure low.

### **Pathogens and Nematodes Affecting Plants**

New knowledge of the biology, ecology and management of soilborne pathogens associated with strawberry roots is being used to develop management programs to replace methyl bromide. Biological and chemical alternatives to methyl bromide were evaluated in multiple replicated and observational strawberry and vegetable trials. Issues unique to each alternative need to be resolved through additional research, but N.C. State research provides a solid scientific basis for strawberry and vegetable growers who desire to implement alternatives in site- and problem-specific ways. Programs are being developed to mitigate the possible direct loss of \$14 million per year to Southeastern U.S. growers (GA, NC, TN, VA) if methyl bromide is phased out.

Cucurbit growers in North Carolina, Michigan and Georgia used information about cucurbit downy mildew posted to the N.C. State Cucurbit Downy Mildew Forecasting Web site to save two to three fungicide applications in 2009. With about 122,000 acres of cucurbits in the three states, that translates into more than \$6 million in savings to producers. These states alone account for about one-fourth of the U.S. cucurbit production. Reducing fungicide applications creates production efficiencies for producers and reduces unnecessary exposure of workers, consumers and the environment to pesticides targeted at fungi and fungus-like plant pathogens.

A Pierce's disease vector management program has been developed and could significantly reduce losses from Pierce's disease in regions of North Carolina where it is a problem. Based on a value of \$18,000 for a 3-year-old vineyard, reducing losses from Pierce's disease from 5% to 1% a year would reduce losses from the disease from \$900 to \$175/acre.

Based on N.C. State research, more than 50% of soybean and corn acreage is grown in a planned rotation that aids in prevention of disease losses. Most of the 600,000 acres of small grain in the state is double-cropped with soybean. This practice minimizes soybean yield loss due to soybean cyst nematode that infests over 60% of the soybean acreage.

### **Weeds Affecting Plants**

N.C. State research led to the labeling of a prepackaged mix of nicosulfuron plus metsulfuron (Pastora) 2010 for grass

weed control in pasture and spray fields. This herbicide will control problematic grassy weeds such as foxtails, sandbur and johnsongrass as well as numerous broadleaf weed species. Sandbur is a growing problem in southeastern North Carolina counties, and Pastora is a welcome addition for these producers.

In 2007, the EPA ruled that MSMA production would be phased out over an 18-month period. MSMA is the only selective herbicide that provides effective dallisgrass control in turfgrass. Research designed to identify an MSMA replacement showed that low rates (8 to 11 fl oz per acre) of glyphosate (Roundup ProMax) applied in November provided more than 90% dallisgrass control the following spring without harming common bermudagrass coming out of dormancy. Dallisgrass that was monitored for the 2009 growing season eventually sprouted in early summer, indicating that one Roundup ProMax application in the fall will not completely eradicate this difficult-to-control weed.

A risk assessment protocol was developed that facilitates the evaluation of potentially invasive species in North Carolina. This protocol uses largely objective measures to rank the potential invasiveness of plants sold in the NC nursery and landscape trade. The results of this assessment will be utilized by the NC Nursery and Landscape Association to advise their membership on voluntary actions to limit the spread of invasive plants in NC public lands.

Rye allelopathy and benzoxazinone content were found to be quantitatively inherited traits, so breeding for these traits should be feasible. Development of new rye varieties and a better understanding of how to manage rye allelopathy will assist farmers in managing weeds while lowering chemical input costs. This information will be of particular benefit to organic producers, who cite weed control as the number one challenge in organic crop production. Additionally, the use of cover crops will have long-term benefits to farmers by increasing soil retention, adding organic matter to soil and decreasing herbicide residues.

### **Integrated Pest Management Systems**

Methods have been developed for large-scale development of field border habitat using both organic and conventional approaches. Ongoing studies are examining the value of these habitats for promotion of insect pest and weed suppression and farmland wildlife and as pollinator enhancement.

An existing CRP program (CP33) has been modified to allow either organic or conventional growers the option of incorporating field border habitats on their farms to enhance beneficial insects as well as farmland wildlife.

A chemigation strategy was compared to conventional spraying of insecticides in commercial fields of tomatoes, peppers and cucumbers in 2009. Compared to plots receiving conventional sprays of insecticides, the use of chemigation resulted in equivalent or improved levels of insect control, a 61% reduction in insecticide use (0.61 vs. 1.57 lbs active ingredient per acre), and a 26% savings in pesticide costs (\$109 vs. \$150 per acre). Considering that most commercial vegetable crops are now grown using drip irrigation, growers are in a position to implement this new technology immediately. It represents both an economic incentive to growers and improved safety to farm workers and the environment.

Results of North Carolina studies along with historical weather data of warming trends during May suggest that North Carolina cotton producers may be able to reduce both expensive at-planting inputs and foliar sprays for thrips and lower potential damage from this insect complex by planting from approximately May 18 to May 28. In a series of preliminary tests, insecticide inputs, thrips damage and yield losses were lower in cotton planted just after May 20 than in cotton planted during the last week in April through the first week in May. This approach may also increase yields. A planting date-based approach to the selection of insecticide choice for managing thrips has the potential to increase grower profits by lowering the cost of expensive inputs.

In collaboration with the information technology company ZedX Inc, a system for pest prediction (weather-based mapping) using national and international weather and climate databases has been developed. This system, NAPPFAST, has been used for exotic pest risk mapping for APHIS and the National Plant Disease Recovery System. In particular, NAPPFAST was used to develop risk maps for the APHIS Cooperative Agricultural Pest Survey's top 150 pest targets.

## **ECONOMIC SYSTEMS**

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 responses 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 in creating added value are important. Following are some of the initiatives undertaken and their

results.

Tax preparers gained needed knowledge for accurate tax return preparation by participating in Extension workshops held throughout the state gave 1,350 tax preparers need knowledge for accurate tax return preparation.

Research on the likely impact of the 2008 Farm Bill's ACRE program indicates that it is not the best way to obtain additional revenue protection for North Carolina farmers who participate in USDA commodity programs. Extension efforts informed by this research discouraged participation in the ACRE program, a good decision for North Carolina farmers because the costs of the program outweighed the benefits in our state in 2009.

With a \$200,000 USDA grant, business development assistance was provided to 11 fresh water prawn producers, and a feasibility study allowed a producer cooperative to expand the market for fresh water prawns, adding jobs and dollars to the economy of Eastern North Carolina.

Extension programs based on analysis of the 2008 Farm Bill's Supplemental Revenue Assistance Payments (SURE) Program enabled county agents to help their clientele make sound crop insurance choices and develop risk management plans to help protect and enhance the agricultural economy of North Carolina and the United States. With the potential to provide up to \$100,000 (per farm) in disaster protection through the SURE program, the information extended could have a multi-million dollar impact in the event of unforeseen disaster.

Research on the non-linear relationship between temperatures and corn, soybean and cotton yields indicated that it will be very costly to adapt these crops to warmer climates, and strongly suggests that cropping patterns in North America will shift markedly if the climate warms as projected by the Intergovernmental Panel on Climate Change. This research has received widespread media attention, both locally and nationally.

Extension efforts have provided local governments with information on what types of ordinances may be enforced over farm and forestland uses and how they may be used to protect trees and working open space within planning jurisdictions. Various mechanisms for transmitting this information, including Web sites, workshops and a notebook, have provided local officials with improved knowledge about land use regulation of forestland and farmland. In 2009, more than 70 local government officials and natural resource professionals were trained at workshops, and a forestry ordinances Web site received more than 3,600 visits.

An econometric model was developed to provide local public transit managers in the Research Triangle area with forecasts of regional public revenues available for mass transit projects from three sources: retail sales, vehicle registrations and vehicle rentals. This work has been incorporated into the Triangle Transit Authority's long range planning process.

Systematic evaluation of USDA programs aimed at making broadband available to rural residents and businesses revealed that positive impacts of those programs were confined overwhelmingly to communities located near urban centers. This work strongly suggests that these programs have not had the positive catalytic effect on local economic activity in remote rural areas claimed by the programs' proponents.

## **NATURAL RESOURCES AND ENVIRONMENT**

North Carolina's outstanding natural resources include a wide variety of streams, lakes, rivers, wetlands, estuaries, forests and aquifers, with unique habitats in the mountains, foothills, and coastal regions of the state. These resources are critical elements supporting agriculture, economic development, recreation and quality of life for the state's citizens and visitors. Ongoing development and population increases throughout the state are resulting in conflicts over water, land, air and wildlife management. Significant research and Extension efforts continue to promote environmental protection and sustainable resource management. Water quality and availability, air quality, species diversity, wetland and stream preservation and restoration, and habitat enhancement are all topics of great interest and activity.

A guidebook on low impact development (LID) and its role in minimizing storm water runoff impacts on water resources was developed to meet the educational needs of local government officials and developers. The project has provided a much requested resource to meet a growing need for guidance in planning for and implementing LID to protect water resources throughout North Carolina and other southeastern states. One hundred copies were printed for distribution to participants of LID workshops, while over 175 CDs containing the guidebook were mailed to a waiting list of people from North Carolina and 12 other states.

Extension efforts were focused on teaching adults and youth to manage natural resources effectively while maintaining local environmental quality. Educational outcome highlights include the following.

5,606 professionals gained increased knowledge about natural resource conservation.

16,052 youth and adults gained increased knowledge of environmental issues.

5,146 pesticide applicators were certified or re-certified.

2,245 professionals were certified in an environmental topic.

542 farmers were certified to implement best management practices for environmental protection.

3,237 professionals applied best practices for natural resource management.

2,599 participants implemented community-based action projects for environmental protection.

3,892 participants implemented agriculture and forestry best management practices on 149,036 acres.

623 farmers and landowners implemented nutrient management plans on 97,359 acres.

800 eighth-grade students from Surry County participated in a hands-on educational experience to learn about water quality and water conservation, with 75% reporting that because of this program they are taking better care of their environment.

2,277 volunteers worked 13,317 hours on natural resource protection projects with a value of \$269,669.

Research efforts were focused on developing and evaluating innovative technological and management approaches for protecting and restoring quality natural resources. Research outcome highlights include:

Stormwater management research provided practical knowledge for engineers, surveyors, planners and landscape architects on innovative best management practices such as bioretention systems, constructed wetlands and permeable pavement systems for treating urban runoff and protecting water quality.

The Center for Applied Aquatic Ecology continued its long-term emphasis on harmful algal blooms, contributing a significant database for practical use by policy-makers in evaluating impacts of human and animal wastes on surface waters.

Erosion and sediment control research provided practical knowledge for construction site managers and regulators working to prevent downstream sedimentation by applying innovative technologies such as alternative check dams and polyacrylamides

Nutrient management research provided practical knowledge for farmers and crop consultants related to starter fertilizer use on soils testing high for phosphorus.

Toxicology research provided improved understanding of the impacts of contaminants on aquatic ecosystems and potential applications of resident macroinvertebrate communities to diagnose the causes of ecological impairment in streams.

## **ANIMALS AND THEIR SYSTEMS, PRODUCTION AND HEALTH**

North Carolina has long had a strong agricultural economy with an emphasis on and diversity in plant production. In recent years, animal production has increased, with North Carolina currently ranked second nationally in swine production and boasting impressive numbers of poultry, chickens as well as turkeys, beef and dairy cattle, meat goats and aquaculture. North Carolina Agricultural Research Service scientists continue to focus their research in the areas of reproduction, nutrition, genetic improvement, growth and development and disease and parasite prevention and control. Disciplines further include bacteriology, virology, mycology, entomology and microbiology. In addition, many animal management systems are being developed and explored in the areas of waste management, forage management, hatchery management, feed and water systems, litter and bedding and breeding stock selection.

A growing emphasis on the green industry has increased the study of nutrient management, with more studies focusing on composting and alternative methods of waste management. Nutrient regulations are changing the way waste is handled and incorporated into the environment. In a state where hogs and poultry are raised in confined systems with limited land mass for the disposal of waste, new systems are needed.



Current work in reproductive physiology is focused on the prepubertal environment and its effects on reproduction in swine. Results suggest that negative influences at an early age can result in a reduced reproductive life span with additional limitations to reproductive efficiency. Other studies are focused on quality characteristics of boar semen and their impact on fertility. Like some studies in beef cattle, the presence of specific seminal plasma proteins has been shown to enhance fertility in boars. The ability to identify the presence of these proteins will help producers identify boars with higher fertility at an earlier age, allowing producers to make selection decisions sooner. In collaboration with industry representatives, researchers continue to study new controlled reproductive techniques designed to enhance reproductive efficiency. Researchers are also studying the means of evaluating stress in swine and its effects on reproductive efficiency as well as growth and development.

The dairy industry is currently faced with economic and regulatory challenges that are making the profession difficult for many established producers. Researchers are exploring alternative protocols for the synchronization of dairy cows in an effort to enhance reproductive efficiency and make management of the breeding herd easier. Due to increased interest in pasture-based dairies, researchers are exploring means of optimizing milk production in this type of management system. Collaborations between geneticists, nutritionists and reproductive physiologists are leading to the development of lines of cattle that are more efficient in a forage based system. Nutritionists are further identifying nutritional supplements that enhance feed efficiency and production in this area. Forage-based dairies are more sustainable, with reduced levels of production inputs.

N.C. State researchers are collaborating with peers at the University of Arkansas to study insect control on dairy farms. A new vacuum system helps eliminate horn flies from dairy cattle. This system is a practical approach to an ongoing problem and minimizes the use of chemicals in ridding the animals of this pest. Researchers are further exploring organic means of treating diseases like mastitis in dairy cows. An intra-mammary infusion of phytomass, an organic product, is proving effective in treating mastitis.

A beef cattle efficiency group is exploring a number of approaches to increasing feed efficiency in growing cattle. In addition to studying nutritional and genetic influences on feed efficiency, other work is considering the impact thyroid hormones and insulin growth factors may have on growth and development. A multi-disciplinary approach to this issue is providing greater insight into the complexity of nutrient utilization.

All species of livestock are threatened by the potential immunity of parasites to anthelmintic products. Immunity to a class or classes of anthelcides may reduce feed efficiency, productivity and threaten the health of livestock. With limited alternatives, researchers are exploring new management approaches that it is hoped will minimize both the use of anthelcide products as well as the number of parasites that are immune to them.

The animal research programs at N.C. State and NC A&T State universities are enhanced by an extensive outreach component that disseminates the most recent research-based information to producers throughout North Carolina. Field and campus-based faculty conduct trainings, workshops, demonstrations, field days, conferences and one-on-one consultation for producers and consumers. Information is further distributed through distance education, hard-copy and electronic newsletters, radio and television programs, press releases, trade journals, scientific journals and popular press articles. NC A&T State University is further dedicated to the continuation of pasture-based production systems, aquaculture and the use of alternative breeds of livestock.

## **AGRICULTURAL, NATURAL RESOURCE AND BIOLOGICAL ENGINEERING**

In 2009, the planned program of Agricultural, Natural Resource and Biological Engineering continued developing and expanding new focus areas to meet the state's needs. Over 13,000 and 17,000 direct and more than 30,000 indirect contacts were made in this planned program area through extension activities including workshops, conferences, trainings and field days. Many research projects have direct outreach components, increasing the overall effectiveness of these projects. Areas of focus include agricultural air quality, agricultural energy conservation, alternative energy sources and engineered waste management systems.

Research continues on measuring and modeling air quality in egg production facilities and in broiler houses. In 2009, the project team mainly focused on monitoring particulate matter (PM) concentrations and PM sample collection to capture diurnal and seasonal variations of PM characteristics at an egg production farm and its surrounding areas. Building on a preliminary statistical model and a mechanistic emission model developed at a laboratory scale to estimate ammonia emission fluxes from broiler litter, work focused on model validation in the presence of measurement and model parameter uncertainties.

Energy research comprises work in energy conservation and in development of alternative fuels. A pair of innovative tobacco curing barns were built and tested on the N.C. State campus in 2007. During 2008, these barns were further tested, and in 2009 a fully automatic wood chip-fueled system was installed and extensively tested. Research has shown that a full-size barn may be successfully cured on about three tons of chips. At \$20 per ton of chips delivered, this represents a reduction in fuel costs or more than 85%.

Research focused on reducing energy costs for North Carolina's economically important swine industry. Tests performed on commercially available variable frequency controllers used with our large electric fan motors show promise of substantially reducing (> 40%) the use and cost of electrical power. In addition, a transpired solar wall (TSW), the most efficient solar collector for converting solar energy into heat, is being evaluated for energy savings and pig performance in a pig nursery. A continuing 18-month project begun in November 2008 is collecting energy use, environmental parameters, and pig performance data from the retrofitted house as well as an adjacent, identical nursery with a TSW.

Several new and continuing projects deal with the development of traditional or alternative fuels and chemicals from a variety of sources and feedstocks and through various processes. One project conducted with engineering faculty from the college of engineering has developed a process for the conversion of animal fats and vegetable oils into fuels, including jet fuel (JP-8), cold flow additive for biodiesel, and also gasoline. A variety of agricultural residues feed stocks are being included in research focused on fuel and chemical production. Biological processes and products that improve system efficiency and economic impact are being designed and developed to investigate the biotechnological potential of North Carolina commodities (e.g. sweet sorghum, industrial sweetpotatoes, grape processing residues, wood). The combined process of gasification and fermentation, conversion of sugar, starch and lignocellulosic resources as well as solid substrate cultivation technology is being explored for potential impact in this area. The effect of various microbial, chemical and oxidative delignification treatments on subsequent sugar generation through enzymatic hydrolysis of switchgrass and miscanthus is being studied by employing techniques like ensiling and rumen microbes, hydrogen peroxide and ozonation. An environment friendly sustainable approach that utilizes immobilized lipase-producing fungal cells for conversion of oil to biodiesel is currently being studied as an alternative to conventional biodiesel production processes that require hazardous chemical mixtures of acids-bases and organic solvents. Sugarbeets are also being studied for their potential as substrates for production of biodegradable plastics via fermentation. Other research looked at ways to reduce the production cost of biodiesel by using low-cost feed stocks such as waste vegetable oil (WVO), animal fat and non-edible vegetable oils. Research is currently underway for converting WVO into biodiesel using oyster shell-based catalysts.

Several projects focus on engineered production and waste management systems. Pressure on our existing water supplies, as well as a need to manage animal wastes properly, has stressed the importance of recirculating aquaculture systems for producing valuable sources of good quality protein. The College of Agriculture and Life Sciences has completed the development of a six-acre research site that is located at the headwaters of a saltwater creek in Marshallberg, NC. The college built a 4,200 square foot research laboratory and experimental marine water treatment facility on the site to develop technologies to allow marine aquaculture to be conducted away from high cost coastal areas using less than ideal (silty) saltwater. Research on alternative treatment of swine waste continues as exemplified by a project resulting in a patent on a continuous-flow struvite crystallizer for removing phosphorus from wastewater and concentrating it in a product (struvite). Struvite contains ammonia, phosphate and magnesium and has value as a feed ingredient for animals or as a slow-release fertilizer, especially for horticultural or golf course turf applications. The initial application was with anaerobic lagoon liquid and showed 50 to 80% removal of total phosphorus.

Engineered stormwater and irrigation systems are being implemented and evaluated through applied research conducted at N.C. State. Bioretention cells, level spreaders, stormwater treatment wetlands, permeable pavement, green roofs and water harvesting systems continue to be installed and evaluated for pollutant removal effectiveness. Several smart irrigation system controllers have been evaluated the past 3 years for water use efficiency and their relative ability to reduce water use over standard irrigation controllers and practices.

## **FOOD PRODUCTION SYSTEMS: DEVELOPMENT, PROCESSING, QUALITY AND SAFETY**

Food production systems link farmers and other agricultural producers with consumers. The link is provided by processing raw fruits, vegetables, grains, meats and dairy products into finished goods ready for the grocer or wholesaler to sell to households, restaurants or institutional food services. Work is performed by production employees, who account for 54% of all manufacturing jobs in the food industry; most of which require little formal education or training. Food manufacturing workers perform varied tasks; therefore, quality control and quality assurance programs are vital to this industry.

The U.S. Department of Agriculture's Food Safety and Inspection Service branch oversees all aspects of food

manufacturing in red meats, poultry and eggs. The U.S. Food and Drug Administration oversees all aspects of food manufacturing in bakeries, fruit and vegetables, specialty foods, dairy products, sugar and confectionary products, grain and oilseed milling, seafood products and other packaged goods.

Recent food safety programs have been adopted as issues of chemical and bacterial contamination and new food borne pathogens remain a significant public health concern. For example, a food safety program called Hazard Analysis and Critical Control Point focuses on identifying hazards and preventing them from contaminating food in early stages of food production and processing by applying science-based controls to the testing of food products - from raw materials to the finished products. The program relies on individual processing plants developing and implementing safety measures along with a system to intercept potential contamination points, which are then subject to USDA or FDA inspection. Recent food recalls have created a sense of urgency in placing greater responsibility on food manufacturers.

As a result, some food manufacturing workers need specialized training and education. Inspectors and quality control workers, for example, are trained in food safety and usually need a certificate to be employed in a food manufacturing plant. Often, USDA-appointed plant inspectors have a bachelor's degree in agricultural or food science. Formal educational requirements for managers in food manufacturing plants range from two-year degrees to master's degrees. Those who hold research positions, such as food scientists, usually need a master's or doctoral degree; research chefs typically have years of professional cooking experience.

Fierce competition has led food manufacturing plants to invest in technologically advanced machinery to become more productive. The new machines have been applied to tasks as varied as packaging, inspection and inventory control. Food manufacturing firms will adopt automation to better meet the changing demands of a growing and increasingly diverse population. As convenience becomes more important, consumers increasingly demand highly processed foods such as pre-marinated pork loins, peeled and cut carrots, microwavable soups or ready-to-cook dinners. Such a shift in consumption will contribute to the demand for food manufacturing workers and will lead to the development of thousands of new processed foods.

Domestic producers also will market these goods abroad as the volume of international trade continues to grow. The increasing size and diversity of the American population has driven demand for a greater variety of foods, including more ethnic foods. The combination of expanding export markets and increasing domestic consumption will help employment among food processing occupations to rise over the next decade and will lead to significant changes throughout the food manufacturing industry.

## **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 10 leading causes of death in North Carolina and the United States. Programs that provide consumers with research-based information and strategies for behavioral 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. North Carolina children 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.

The nutrition and health program promoted optimum nutrition and health through diet and lifestyle in all North Carolinians regardless of gender, income, age or race/ethnicity. Education programs addressed diet, health and chronic disease prevention and were offered to North Carolinians of diverse income levels, age groups, genders, and cultural backgrounds across the state. Programs offered included Give Your Heart a Healthy Beat; Project Eat Right: Add to Life Program; Color Me Healthy; Eat Smart, Move More, Weigh Less; Dining with Diabetes; SyberShop; Women Living Healthy - Women Living Well; Workable Wellness and Families Eating Smart and Moving More; Cook Smart. Eat Smart; and Steps to Health. Programs were held in many different settings, including congregate nutrition sites, senior centers, schools, churches, government buildings, businesses, daycare centers, work sites and outdoors. Various methods were employed, including the Internet, computers, mailed materials, media, one-on-one contact and public meetings. Research projects continue to seek

scientific discoveries that will enhance the quality of living for the state's and nation's human population. 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.

Over 80,000 North Carolinians who participated in programs conducted by NC Cooperative Extension have made at least one positive dietary change. Changes include increased consumption of 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.

Over 2,000 child care providers who attended training increased their knowledge of nutrition and physical activity in children. These providers serve over 20,000 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 on healthy eating and physical activity designed for the preschool classroom. 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 2009, Color Me Healthy was selected by the Centers for Disease Control and Prevention as a practice-tested intervention for childhood overweight.

EFNEP (Expanded Food and Nutrition Education Program) enrolled 4,893 families, while 14,330 participants took part in 4-H EFNEP. The following data were compiled from pre and post evaluation surveys administered to participants by EFNEP program assistants across the state. Completing the series of lessons improved nutrition, food behavior and food safety practices. As a result of EFNEP participation 79% improved in one or more food safety practices, 71% used food labels more often to make food choices, 93% improved in one or more food resource management practices, 44% of participants increased their amount of physical activity, 97% improved their diet, 57% increased fruit consumption, 54% increased vegetable consumption and 52% increased consumption of calcium rich foods.

Eat Smart, Move More, Weigh Less (ESMMWL) is a weight-management program that uses research-based strategies for weight loss-weight maintenance. This 15-week program informs, empowers and motivates participants to live mindfully as they make choices about eating and physical activity. The program provides opportunities for participants to track their progress and keep a journal of healthy eating and physical activity behaviors. Preliminary analysis of pilot data from over 1,000 participants indicates an average weight loss of 7 pounds.

## **FAMILIES AND COMMUNITIES**

Perhaps more than ever before, families and communities are facing extraordinary challenges. Economic concerns, military deployments, substance abuse, family violence and job losses all place enormous stress on the family unit and in turn on community resources. As a basic unit of society, it is essential that families have access to information and education that assists them in addressing the real-life challenges that they face every day.

In response to the needs of families and communities, N.C. State-based faculty and county based field faculty working with NC Cooperative Extension are teaching the skills and helping to provide the tools that families need to endure the current economic and social climate. Educational outreach efforts addressing family resource management, budgeting and record keeping, debt reduction, retirement planning, foreclosure prevention and credit management address the economic crisis facing families. Program efforts yielded the following results.

3,992 individuals and families developed a household budget.

2,644 developed a household record-keeping system.

A significant number of individuals and families developed other financial management skills, including 4,165 who use cost comparison skills and 3,071 who follow a budget.

1,638 individuals paid their bills on time.

Individual Development Account (IDA) participants saved \$13,100 toward home purchases.

3,394 individuals budgeted their basic monthly expenses.

115 individuals and families used strategies to prevent home foreclosure.

For parents, outreach programs addressing quality time, parenting practices, child development, importance of fathers and discipline have been designed to help parents develop effective and positive parenting skills. Program efforts yielded the

following results.

1,191 parents adopted appropriate guidance/supervision practices.

323 fathers increased involvement with their children at home, in school and in the community.

1,242 parents adopted appropriate disciplinary practices

331 parents used positive parenting practices

34 incarcerated parents implemented strategies for staying involved in their children's lives

499 court-mandated and agency referred parents consistently used positive parenting strategies

In conducting parenting programs, there were 6,043 known client contacts by volunteers, with a dollar value of \$132,273.

## YOUTH DEVELOPMENT

Faculty and staff at N.C. State University are engaged in a wide array of Extension and research- related projects that promote 4-H positive youth development. These efforts are broad in scope, impact and clientele served. Major initiatives include health and well-being, K-12 (School to Work success), volunteerism and leadership development (Citizen Leaders). 4-H youth development programs provide youth a pathway to view learning as relevant to the world around them, to connect with their communities and to become intentionally concerned and contributing members of the global economy. In 2009, the planned program of 4-H Youth Development was active in Extension and research activities.

We live in a new economy powered by technology, fueled by information and driven by knowledge. Over 23,059 youth participated in Career-Employability programs, resulting in 1,428 youth establishing career goals. In 2009, 18,483 youth participated in service learning, internship and mentorship programs, where they learned first-hand the critical elements involved in particular career pathways.

The health and well being of North Carolina youth has changed significantly in the past decade. As a result of 4-H Youth Development programs, 11,546 youth increased their daily consumption of fruit and vegetables by at least one serving in 2009, while 58,944 youth took part in fitness and 4-H sports-related curriculum projects, with 8,679 youth increasing their daily physical activity. In addition, 2,654 youth reduced their amount of screen time.

In 2009, 32,079 youth increased their communication skills, and over 24,447 developed appropriate goal setting strategies. As a result of 4-H Youth Development programs more than 17,116 youth increased their study skills, and 16,049 youth increased the quality of their homework. 4-H programs helped 5,832 youth perform better on End of Grade (EOG) tests and 1,072 families become more engaged with their children's homework. The estimated value of the 4-H K-12 (School to Work) programs to North Carolina is over \$1.9 million (a return of over \$75 for every \$1 spent by Extension).

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	404.0	41.0	403.0	0.0
Actual	355.0	31.0	375.0	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

North Carolina Cooperative Extension conducted a rigorous and detailed review of its major programmatic thrusts in 2007-2008. The review process included departments at both universities (NC State

and NC A&T State Universities); the state's 100 counties including the Eastern Band of the Cherokee Indians; 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. This program input led to the establishment of twenty new objectives and related impact indicators to guide Extension's programs into 2008 and beyond.

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. PIs interact with appropriate representatives of stakeholder and scientific groups. Consultation with faculty and stakeholders during the informal review phase should include inquiries 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.

### **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 underserved 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 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 for the Eastern Band of the Cherokee Indians 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.

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 having a direct effect on research activities within NCARS. 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.

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.

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 meeting or event of the association a year.

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.

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.

**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 ingrained 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
- Survey of 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. 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 gives 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.

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 and extension 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 and extension activity in all aspects of agricultural production and agribusiness. Then in late winter, these committees meet again to select and approve research and extension projects for funding, which provides another opportunity for input on program priorities.

### **3. A statement of how the input will be 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 are 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. These 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 were related to the strong programs of Cooperative Extension. Agricultural preservation, sustainability and development and nutrition and health were identified as 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. 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 for research programs. NCARS receives support annually from college-based foundations, including the Agricultural 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.

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>
11169401	3390495	7021285	0

<b>2. Totaled 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>	11169401	2635000	7021285	0
<b>Actual Matching</b>	17193248	1070000	31525000	0
<b>Actual All Other</b>	25990000	215000	34720000	0
<b>Total Actual Expended</b>	54352649	3920000	73266285	0

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

## V. Planned Program Table of Content

<b>S. No.</b>	<b>PROGRAM NAME</b>
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
10	Global Food Security and Hunger
11	Sustainable Energy
12	Climate Change
13	Childhood Obesity
14	Food Safety

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

**Program # 1**

**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%	15%	
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%	10%	
216	Integrated Pest Management Systems	5%	5%	5%	
<b>Total</b>		100%	100%	100%	

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

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	104.0	7.5	173.0	0.0
Actual	85.0	5.5	160.0	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
1840000	1750000	3200000	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
3100000	175000	3500000	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
3200000	55000	17900000	0

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

1. Brief description of the Activity

Activities in this area included:

- Conducting discovery research on plants and plant systems using tools genomics, metabolomics, and proteomics;
- Developing improved crop varieties using traditional and genomic approaches;
- Introduction/discovery of new plants for food use and the green industry;
- Developing systems for production of plants for biofuels;
- Seeking new uses for plants and plant byproducts;
- Developing production systems for organic farmers;
- Developing diagnostic techniques for indigenous and introduced pathogens; Partnering with industry;
- Developing sustainable production systems for both large scale and limited resource farmers;
- Enhancing IPM programs through new techniques and strategies;
- Setting up applied research/demonstration plots;
- Writing papers for the scientific community;
- Preparing publications for grower and homeowner audiences;
- Developing Web sites to deliver information to grower and homeowner audiences; and
- Conducting workshops, meetings, and other focused educational programs for farmers, commodity groups, and industry.

## 2. Brief description of the target audience

Target audiences included 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, and other public agency staff.

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

#### 1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	352000	1200000	22700	23200
<b>Actual</b>	352000	1200000	22700	23200

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

##### Patent Applications Submitted

Year: 2009

Plan: 8

Actual: 18

#### Patents listed

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

##### Number of Peer Reviewed Publications

2009	Extension	Research	Total
<b>Plan</b>	110	337	
<b>Actual</b>	110	337	447

### V(F). State Defined Outputs

#### Output Target

### Output #1

#### 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>
2009	28	28

### Output #2

#### Output Measure

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

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	370000	375000

### Output #3

#### Output Measure

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

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	1500	1500

**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 specialty 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**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	1000000	1000000

### **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, low commodity prices, and the end of the federal tobacco and peanut programs. As a result, North Carolina consumers are benefiting from locally grown, fresh produce produced by both traditional and organic means.

#### **What has been done**

Studies on the production and marketing of specialty fruits and vegetables, caneberries and grapes for wine and nutraceutical properties have led to the development of guidelines for the production of these crops under North Carolina environmental conditions. Extension programs at the local, regional, and state level have provided growers and prospective growers information needed to successfully produce and market these crops. Additionally, various crops are being investigated as biomass producers for ethanol production.

#### **Results**

The interest in growing hops on a commercial scale started in late 2007, when there was an international shortage of hops. At the same time, the number of small craft breweries exploded, and following the example of the local food movement, many brewers began looking for locally grown hops. In response to this demand, hop yards have been planted in four North Carolina counties. Using today's open market price of \$11.00/lb for Cascade, a popular variety with craft breweries, a farmer could expect to earn approximately \$18,700 from one acre. With a total potential demand of 185,000 to 370,000 pounds per year, the entire North Carolina hop market could range from \$2 to \$4 million. To fill this demand, North Carolina will need from 100 to 200 acres in hops production. It is likely this demand will be filled by smaller 0.5 to 2 acre plantings on smaller farms, where hops may help farmers diversify and reduce risk.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
201	Plant Genome, Genetics, and Genetic Mechanisms
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

- 211 Insects, Mites, and Other Arthropods Affecting Plants
- 212 Pathogens and Nematodes Affecting Plants
- 213 Weeds Affecting Plants
- 216 Integrated Pest 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
2009	3100000	5600000

**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 estuarine systems in North Carolina.

**What has been done**

Studies have been conducted that focus on optimum fertilizer timing, nutrient management planning, and the use of decision support systems to determine the need for and to 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**

Applied research projects have been conducted that examined the use of different blends of starter fertilizer to improve yield and nutrient use efficiency. Starter fertilizer blends were found to increase corn yield by 14 bu/acre in the Coastal Plain and 5 to 8 bushels in the Piedmont. Based on these studies, it is estimated that over 65% of the corn growers, comprising 533,000 acres, used a starter fertilizer program in 2009. This translates in a yield gain of approximately 6.4 million bushels of corn in the Coastal Plain and Piedmont regions. At a current price of \$3.20 per bushel, this represents an economic gain of \$20.6 million. If only 25% of this gain was directly attributed to the information provided by this project, then the value of this research and extension program is estimated to be \$5.6 million.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
202	Plant Genetic Resources

205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants

### **Outcome #3**

#### **1. Outcome Measures**

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

#### **2. Associated Institution Types**

- 1862 Research

#### **3a. Outcome Type:**

Change in Condition Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	27	19

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

##### **Issue (Who cares and Why)**

In order to remain competitive, growers must plant high-quality varieties of crops with improved yield potential and pest resistance. Moreover, it is important to develop 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 in North Carolina. These efforts 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, sweetpotato, soybeans, and switchgrass.

##### **Results**

Peanut cultivars developed by the peanut breeding program at North Carolina State University were grown on over 74% of the acreage under production in North Carolina in 2009. Of these cultivars, Perry is the most commonly grown, comprising 30% of the certified acreage. A new public cultivar, Sugg, was released in 2009 but is presently only available to seed producers. Examples of other releases in 2009 include, three new flowering quince hybrids (*Chaenomeles speciosa* - Pink Storm, Orange Storm, and Scarlet Storm) that have large double flowers and are thornless and fruitless, a new compact and showy summersweet (*Clethra alnifolia* Crystalina), and a new hybrid pickling cucumber, 'NC-Danbury'. In addition to these cultivar releases, breeding lines have been developed for crops such as wheat, corn, soybean, and peanuts that have superior agronomic characteristics and pest resistance.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
201	Plant Genome, Genetics, and Genetic Mechanisms

202	Plant Genetic Resources
206	Basic Plant Biology
212	Pathogens and Nematodes Affecting Plants

#### **Outcome #4**

##### **1. Outcome Measures**

New techniques and products developed and released that can be commercialized

##### **2. Associated Institution Types**

- 1862 Research

##### **3a. Outcome Type:**

Change in Condition Outcome Measure

##### **3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	10	12

##### **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**

Procedures are being developed for genetic engineering of various crops. New techniques are being developed for utilizing vermicompost and various agricultural wastes.

###### **Results**

A rice gene promoter or gene switch, which directs strong gene expression in all the tissues, has been cloned. This gene switch has a commercial potential to be widely used in transformation of grass and cereal crops, and a patent application has been filed. Ongoing studies for developing new methods of improving existing methods for plant transformation have found that protamine protects DNA better than the conventional spermidine in bombardment transformation. Transient and stable transformation rates were increased by 4-5 fold. Other studies showed that vermicompost-grown cucumber flowers are more attractive and nutritionally superior to pollinators (bumblebees) compared to plants grown in unamended soil. Bacterial biofilms have been shown to be important for the survival and infection by many pathogenic bacteria, including plant pathogens. Novel chemical molecules have been developed that inhibit and disperse bacterial biofilms. Such a molecule has been evaluated in the field for the potential of bacterial spot control of peppers.

##### **4. Associated Knowledge Areas**

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

## **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**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	32000000	45000000

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

#### **Issue (Who cares and Why)**

With the increasing cost of fuel, fertilizers, pesticides, and other production costs, growers must adopt new production practices to increase yield and optimize 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.

#### **Results**

Studies conducted from 2002 through 2009 demonstrated that soybean yields could be maintained at populations as low as 50,000 plants per acre with May planting dates and as low as 100,000 plants per acre with June and July planting dates. A survey indicated that growers used these studies to reduce soybean planting rates by 16.5 lb of seed per acre from 2001 to 2006. Based on this planting rate reduction, North Carolina's 2009 soybean crop was worth \$27,174,400 more than would have been the case with the 2001 planting rate. At the same time, seed costs were \$18,586,500 less than would have been the case were growers still using the 2001 planting rate.

### **4. Associated Knowledge Areas**

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

## **Outcome #6**

### **1. Outcome Measures**

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

Not Reporting on this Outcome Measure

## **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

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	37500	42000

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

#### **Issue (Who cares and Why)**

It is important to keep growers abreast of 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**

North Carolina blueberry growers apply broad-spectrum insecticides weekly for blueberry maggot and other insect control during the growing season. Various educational programs have familiarized blueberry growers with reduced-risk alternatives. In cooperation with the North Carolina Department of Agriculture and Consumer Services, blueberry growers have been educated on blueberry maggot quarantine requirements for Canadian export and ways growers may reduce costs and pesticide inputs associated with this program. In a separate effort, the Center for Environmental Farming Systems (CEFS) offered a wide variety of activities to people from different backgrounds (including producers, Extension agents, educators, students, consumers, and youth) by conducting educational programs such as a workshop series, an annual sustainable agriculture lecture, author series, spring farm festival and 8-week summer research internship. Through these CEFS-sponsored events producers, Extension agents, and gardeners have been educated on how to grow crops and care for livestock.

### **4. Associated Knowledge Areas**

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

## **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**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	12	12

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

#### **Issue (Who cares and Why)**

Integrated Pest Management (IPM) programs have been developed for many commodities over the past 30 years; however, it is important to incorporate new technologies and products in these programs to manage pests more effectively 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**

IPM programs developed for peanuts have improved control and reduced pesticide use. A southern corn rootworm advisory system, developed at North Carolina State University, provides sound decision-making principles and has reduced insecticide use by approximately 50%. Documentation of higher organic matter soils interfering with chlorpyrifos activity has caused some changes in rotation patterns and more emphasis on the use of the rootworm advisory for field selection.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants

## **Outcome #9**

### **1. Outcome Measures**

Increased acreage of organic crops and specialty crops.

### **2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	2000	1500

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

#### **Issue (Who cares and Why)**

Consumer demand for both fresh and processed organic foods is increasing.

#### **What has been done**

Studies have been conducted to identify suitable varieties and develop practices for the production of organic fruits, vegetables, and row 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 Web sites have been developed that provide information on organic production of small grains and vegetables.

#### **Results**

### **4. Associated Knowledge Areas**

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



## **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 Research

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	26	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 the traits.

#### **What has been done**

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

#### **Results**

A specific set of genes induced in *Aspergillus flavus* and in the plant during infection of developing corn seeds have been identified. One of these genes has been shown to be required for pathogenicity in other fungi. These genes represent potential targets in the fungus that can be used to block infection or aflatoxin production. The specifically induced plant genes represent candidate resistance genes that may have utility in the development of resistant genotypes. Specific regions in the corn seed that are initially colonized by the fungus have also been identified. Identification of genes specifically expressed in corn seeds in this area may provide insight into new resistance mechanisms that can be enhanced by plant breeding.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
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**

External factors which affected outcomes  
Natural disasters (drought, weather extremes, etc.)  
Economy  
Appropriation changes  
Public policy changes  
Government regulations  
Competing public priorities  
Competing programmatic challenges

#### **Brief explanation**

Weather was not as important in affecting research and extension programs in 2009 as previous years. Temperatures were moderate, and rainfall was generally adequate across the state. Above average rainfall late in the season did impact the harvest of late-season crops such as peanuts, cotton, and soybeans. The greatest factor that affected the outcomes was the decline in support from the state, which resulted in a reduction in both research and extension faculty and county extension agents. Also, increased competition for federal funds continues to make it more difficult to maintain programs and initiate new ones.

## **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**

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

**Program # 2**

**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	Economics of Agricultural Production 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 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: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	14.0	9.0	15.0	0.0
Actual	12.0	7.0	5.0	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
3400000	250000	290000	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
840000	260000	3000000	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
110000	130000	990000	0

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

**1. Brief description of the Activity**

We plan to conduct educational programs and utilize applied research projects to enhance the knowledge base of targeted citizens in North Carolina and other designated areas. This effort will include farm management schools and meetings on topics such as risk management, net profit calculations and tax preparation. We will also conduct feasibility studies that examine the economics of alternative and traditional enterprises. Research projects and extension programs will also focus on topics such as

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**

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

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

**1. Standard output measures**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	3900	9000	1600	3800
<b>Actual</b>	4100	10000	1300	2900

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

**Patent Applications Submitted**

Year: 2009  
 Plan: 0  
 Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

2009	Extension	Research	Total
<b>Plan</b>	30	50	
<b>Actual</b>	30	50	80

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

**Output Target**

**Output #1**

**Output Measure**

- Number of Non-degree credit activities conducted focusing on markets, farm and business management

Year	Target	Actual
2009	80	80

**Output #2**

**Output Measure**

- Number of county and area tax preparer schools

Year	Target	Actual
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2009	25	23
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**Output #3**

**Output Measure**

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

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	270	560

**Output #4**

**Output Measure**

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

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	20	43

**Output #5**

**Output Measure**

- Integrated Research Projects Conducted

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	8	8

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

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

O. No.	OUTCOME NAME
1	Tax preparers gain needed knowledge for return preparation by attending workshops conducted throughout North Carolina.
2	New organic, farmers, 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

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	1200	1500

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

#### **Issue (Who cares and Why)**

North Carolina taxpayers and professional tax preparers need information on tax law changes. 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 interested in learning about tax law and how changes in the law may affect their businesses are also invited to participate.

#### **Results**

With these opportunities for continuing education, professional tax preparers, CPAs, enrolled extension agents, accountants, and others receive up-to-date information for current year tax filing. Tax schools have reached over 1,200 tax preparers, who in turn prepare over 500,000 income tax returns. Consumers of these services can have an increased measure of confidence that documents are prepared correctly and with accuracy because of a better understanding of tax law and regulations.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
607	Consumer Economics

## **Outcome #2**

### **1. Outcome Measures**

New organic, farmers, and agritourism markets established by individual entrepreneurs

### **2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	22	15

### **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. North Carolina is a leader in organic egg and chicken markets. Also, sales of locally raised pork (and other meats and livestock products such as cheese and eggs) at farmers markets have increased dramatically. One market reports a tripling of vendors selling meat products (from 5 to 16) in the past two years. North Carolina A&T State University and North Carolina State University are working with farmers market managers, the North Carolina Department of Agriculture and Consumer Services 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 across the state. This need is being met at the Center for Environmental Farming Systems (CEFS) in Eastern North Carolina, with the leadership of North Carolina State University in partnership with North Carolina A&T State University. The N.C. A&T State University outdoor hog program has worked with N.C. State, local extension, and through the collaborative project NC Choices. The outdoor hog program 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 a 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 the Center for Environmental Farming Systems in Eastern North Carolina with the leadership of North Carolina State University in partnership with producers and North Carolina A&T State University. 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 N.C. A&T State University outdoor hog program has worked with N.C. State University, 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
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
607	Consumer Economics

#### Outcome #3

##### 1. Outcome Measures

Growers Adopting Improved Business 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
2009	3100	3500

##### 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 North Carolina A&T State University and North Carolina State University have conducted numerous business management workshops and other farmer education programs to assure that our audiences are adequately educated on efficient management practices, record keeping, marketing, and tax management.

###### Results

Success examples from extension business management programs across the state are reflected in success stories reported from across the state such as follows: REWRITE FOLLOWS, Following is a description of one of many successful extension business management programs conducted across the state. The demand for locally produced foods is encouraging new growers to try sustainable or organic vegetable production. To help train new farmers, Cooperative Extension and Orange County developed a program called PLANT @ Breeze. This eight-week program trained 43 growers in sustainable vegetable production. At the end of the program, evaluation results were positive, with participants saying they had learned skills in production, marketing, and farm and business management. Over half of the participants plan to begin some type of commercial production in the future. ROGER, THE FOLLOWING SEEMS CONFUSING, NOT CLEAR WHETHER THE FOLLOWING IS PART

OF PLANT@BREEZE OR A DIFFERENT PROGRAM. The production manager for Eastern Carolina Organics and a diversified, organic vegetable grower gave an organic market presentation. The 40 people from three counties who attended obtained an overview of organics, growing practices, and certification needs.

#### 4. Associated Knowledge Areas

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

#### 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

The highly volatile commodities market, rising input costs, and the economic downturn have 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 reached levels almost previously unknown have resulted in the need for highly informed decision making regarding enterprise mix and allocation of resources. Of course, ever advancing technologies have 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 and the exercise of keen marketing skills. ROGER, I'M NOT SURE HOW MUCH REWRITING TO DO. I THINK THIS MAKES SENSE, BUT NOT WRITTEN WELL, IN MY OPINION.

#### 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
- 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**

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

**Program # 3**

**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: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	45.0	2.0	23.0	0.0
Actual	40.0	1.0	15.0	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
930000	55000	235000	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1300000	55000	3900000	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1400000	25000	1700000	0

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

**1. Brief description of the Activity**

Research activities will be focused on understanding the processes and situations that create pollution problems from agricultural production (including animal operations, field activities, and processing). 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**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	74000	160000	15000	20000
<b>Actual</b>	76000	150000	12000	18000

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

**Patent Applications Submitted**

Year: 2009  
 Plan: 0  
 Actual: 1

**Patents listed**

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

**Number of Peer Reviewed Publications**

2009	Extension	Research	Total
<b>Plan</b>	5	25	
<b>Actual</b>	5	25	28

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

**Output Target**

**Output #1**

**Output Measure**

- Waste Management Certification Programs

Year	Target	Actual
2009	40	48

**Output #2**

**Output Measure**

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

Year	Target	Actual
2009	5	5

**Output #3**

**Output Measure**

- Number of non-degree credit environmental activities conducted

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	750	900

**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

## **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 Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	30	691

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

#### **Issue (Who cares and Why)**

Producers and the general public benefit from the use of precision application technologies. Producers benefit because they generally use less fertilizer and pesticide, thus reducing production costs and environmental impacts. They also benefit from the fact that they place the materials where they are needed, thus maximizing production. The general public benefits from the fact that runoff and drift are minimized, thereby decreasing negative impacts off site.

#### **What has been done**

Training sessions, including workshops and field days, have been held to demonstrate precision application equipment and procedures. Research is being conducted concurrently to determine the most effective hardware, software, and operational strategies.

#### **Results**

North Carolina producers continue to adopt precision application technology as a best management practice. Improved productivity, decreased production costs, and reduced environmental impact have all been noted.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation



## **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**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	30	1149

### **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 swine 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 1980s and 1990s.

#### **Results**

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

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
141	Air Resource Protection and Management

### **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 Action Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	45	0

#### **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**

<b>KA Code</b>	<b>Knowledge Area</b>
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

## **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**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	4100	2731

### **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 issued each year.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
141	Air Resource Protection and Management

## **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 Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	90	729

### **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 crop 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**

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

## **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**

Warmer than usual temperatures combined with a severe drought in the first half of the year stressed both animal and crop production systems and also stressed aquatic and terrestrial wildlife habitat. Forest fires, wild fires, fish kills, and reservoir depletion all took their toll on North Carolina's natural resources and environment. The second half of the year, while normal environmentally, saw higher input costs, tighter credit issues, and reduced government funding, all of which 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**

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

**Program # 4**

**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>	100%	100%	100%	

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

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	58.0	3.0	99.0	0.0
Actual	52.0	2.0	90.0	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
1100000	175000	2100000	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1223248	175000	1500000	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1000000	0	8000000	0

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

1. Brief description of the Activity

Faculty will conduct research to enhance the efficiency of animal production.

Develop means of enhancing reproductive efficiency, nutrient utilization, growth and development, and genetic

influence.

Explore means of decreasing the incidence of animal disease and parasite infestation.

Establish applied research/demonstration plots.

Develop and enhance animal production systems.

Develop sustainable animal production programs.

Write papers for the scientific community.

Write fact sheets in support of animal husbandry and production.

Utilize new technologies in the dissemination of information to producers and the general public.

Transfer technology and knowledge to stakeholders.

Conduct workshops, conferences, demonstrations, and miscellaneous educational programs for commodity groups, and producers.

## 2. Brief description of the target audience

The scientific community

Livestock, poultry, aquaculture producers

Small-scale limited-resource producers

Beginning and under served growers

General public

Local, state, and federal politicians

Agribusiness personnel

State and federal agencies

Non-governmental agencies

Veterinarians and the medical community

Regulatory agencies

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

### 1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	160000	250000	47000	50000
<b>Actual</b>	150000	240000	45000	52000

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

#### Patent Applications Submitted

Year: 2009

Plan: 3

Actual: 9

#### Patents listed

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

#### Number of Peer Reviewed Publications

2009	Extension	Research	Total
<b>Plan</b>	56	145	
<b>Actual</b>	56	145	211

**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>
2009	700	420

**Output #2**

**Output Measure**

- Relevant and impacts focused research projects to be conducted

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	62	57

**Output #3**

**Output Measure**

- Youth Livestock Shows Producing Scholarship Income

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	30	30

**Output #4**

**Output Measure**

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

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	40	24

**Output #5**

**Output Measure**

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

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	14	13



**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**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	3700000	3500000

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

#### **Issue (Who cares and Why)**

Efficient utilization of nutrients can enhance growth, milk production, and mean the difference between a profit and loss for livestock producers. Cost per unit of nutrient can also make a difference between profit and loss. Positioning a farm to take advantage of volume discounts can greatly impact the farm's cost per unit of nutrient.

#### **What has been done**

Extension agents worked with livestock producers to create marketing alliances aligned to purchase feedstuffs in bulk, thereby allowing producers to take advantage of volume discounts on feedstuffs, supplements, and anthelmintics.

#### **Results**

By participating in a marketing alliance, producers were able to realize significant savings, decreasing production costs and providing balanced nutrition at a lower cost.

### **4. Associated Knowledge Areas**

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

## **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 Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	1700000	18500000

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

#### **Issue (Who cares and Why)**

Understanding basic genetic principles can help producers select and purchase more productive breeding stock. Increasing the weight of meat animals or pounds of milk produced through genetic selection can enhance profitability.

#### **What has been done**

Extension agents conducted training for beef producers in the selection of bulls. Upon completion of the training, agents assisted program participants in the selection of beef bulls.

#### **Results**

Beef cattle producers participating in the program realized an average increase in weight of 50 pounds for each feeder calf produced. In total, the participants realized \$15,000 in additional revenue from the sale of heavier calves. The producers realized the value of purchasing higher quality breeding stock.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems

### **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 Action Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	1700000	18000000

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

##### **Issue (Who cares and Why)**

Livestock production, may be compromised by parasite infestation, costing producers thousands of dollars in operating expenses and unrealized income. Learning how to control parasites, especially in sheep and goats, can help producers enhance profits.

##### **What has been done**

Extension agents, in collaboration with industry experts, conducted workshops, conferences, and certification trainings for producers seeking to further their knowledge and understanding of parasite control.

##### **Results**

Participants learned herd health management practices designed to optimize profitability, with 15 producers achieving certification in herd health management.

#### **4. Associated Knowledge Areas**

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

## **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**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	1650	1400

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

#### **Issue (Who cares and Why)**

Youth animal projects are designed to provide an understanding and appreciation of livestock production and to develop leadership skills in youth. Quality assurance trainings, livestock judging, skillathons, and livestock shows instill an understanding of the animal industries, develop critical thinking, speaking, and problem-solving skills necessary for future success.

#### **What has been done**

Cooperative Extension agents organized county and state youth events designed to enhance competency and confidence in young participants. The youth raised the animals they showed and participated in livestock judging, skillathon, and public speaking events.

#### **Results**

Youth gained a hands-on understanding of livestock production practices and challenges. In addition, they gained competence and confidence, enhancing life skills by participating in the judging, skillathon, and public speaking events.

### **4. Associated Knowledge Areas**

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

## **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**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	120000	100000

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

#### **Issue (Who cares and Why)**

Preparing livestock for youth livestock shows teaches young people responsible husbandry practices and an understanding of the importance of animal agriculture. For years, promoters of youth livestock shows have used the shows to generate scholarship money for youth who plan to further their educations following high school.

#### **What has been done**

The 2009 economy threatened a number of livestock shows in North Carolina. The Albemarle region in northeastern North Carolina has a long history of supporting youth livestock shows, and area residents decided that a poor economy was not going to prohibit the youth from having a successful show.

#### **Results**

More than 110 volunteers and local sponsors (both individuals and companies) contributed to the success of the show, with more than \$70,000 raised through the goat, lamb, hog, and steer show and sale. This show and sale has opened many doors for youth interested in the livestock industry and in continuing their education.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
303	Genetic Improvement of Animals
315	Animal Welfare/Well-Being and Protection

## **Outcome #6**

### **1. Outcome Measures**

Number of Producers Adopting Best Management Practices that Optimize Income

### **2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	12000	13500

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

#### **Issue (Who cares and Why)**

Beef production allows many landowners to keep their land in agricultural production while providing a secondary source of income for the landowner. Often, small scale producers are unfamiliar with best management practices that decrease operating costs and increase profitability.

#### **What has been done**

North Carolina Cooperative Extension agents worked with beef producers, helping design corral systems, pasture rotation systems, nutritional programs, and providing technical assistance in administering vaccines and parasite control products.

#### **Results**

Implementation of best management practices taught in the Extension trainings resulted in significant operating savings for participating producers.

### **4. Associated Knowledge Areas**

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

## **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

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	6100	6300

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

#### **Issue (Who cares and Why)**

Small scale livestock producers often fail to keep records that help them make informed production and marketing decisions. Setting goals and understanding basic business management principles can help optimize profit.

#### **What has been done**

County Extension agents developed a financial management class for beef cattle producers in six North Carolina counties. Producers participated in sessions on working with financial lenders, budgeting, marketing strategies, and other business topics. A tour of successful cattle farms was included in the training.

#### **Results**

Producers gained a better understanding of the financial resources available to them, including alternative lending opportunities, management software, and marketing programs.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
311	Animal Diseases
312	External Parasites and Pests of Animals
315	Animal Welfare/Well-Being and Protection



## **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
- Populations changes (immigration, new cultural groupings, etc.)

### **Brief Explanation**

The following factors affected North Carolina animal agriculture to some degree, even though the impact may be difficult to determine. Huge increases in commodity prices, drought, the declining economy, changes in program funding, public policy changes, new rules and regulations, public priorities, competing programs, and population increases, especially along the I-85 corridor, all affect 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**

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

**Program # 5**

**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 Products	5%	5%	5%	
<b>Total</b>		100%	100%	100%	

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

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	19.0	1.0	10.0	0.0
Actual	16.0	1.0	8.0	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
640000	30000	115000	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
680000	30000	1200000	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
8000000	0	400000	0

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

**1. Brief description of the Activity**

Research and Extension activities will focus 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) will be a part of research and extension activity. Technology transfer will be achieved through workshops, demonstrations and field days, and publications.

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

The target audience will be agricultural producers, manufacturers of agricultural machinery and food processing and storage equipment, state agencies, watershed stakeholders, and the general public.

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

**1. Standard output measures**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	13000	21500	2200	4600
<b>Actual</b>	15450	27650	1700	3050

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

**Patent Applications Submitted**

Year: 2009  
 Plan: 1  
 Actual: 3

**Patents listed**

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

**Number of Peer Reviewed Publications**

2009	Extension	Research	Total
<b>Plan</b>	11	30	
<b>Actual</b>	5	40	45

**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
2009	30	34

**Output #2**

**Output Measure**

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

Engineering

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	60	89

**Output #3**

**Output Measure**

- Non-degree credit group activities completed

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	30	30

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

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

O. No.	OUTCOME NAME
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
- 1890 Extension

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	20	839

### **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 continue to convert from sprinkler irrigation to drip irrigation and to high-efficiency center pivot irrigation. Much vegetable production, including the majority of tomato production, has moved to drip under plastic (plasticulture). Three drainage system demonstration sites and a series of field days have illustrated new drainage system components and drainage strategies, including storage and use of drainage water for subsequent irrigation of crops.

#### **Results**

Efficient drip irrigation systems have been installed in crops considered to be alternative crops in North Carolina, including a pear orchard and culinary herb fields. A new drainage system product that installs in drain tile and controls the water table and can enhance sub-irrigation has been installed in production fields.

### **4. Associated Knowledge Areas**

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

## **Outcome #2**

### **1. Outcome Measures**

Number of stream miles restored

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	6	6

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

#### **Issue (Who cares and Why)**

Stream impairment plays a major role in the degradation of 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 practices and some have traditionally farmed right up to the edge of the creek. Unprotected riparian areas can lead to stream bank instability and loss of land, increased transport of nutrients to streams and loss of wildlife habitat.

#### **What has been done**

Through educational and training programs, over 4,000 professionals have learned about stream assessment, design, construction, and monitoring. N.C. 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 60 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 increased their knowledge of stream restoration principles and applications. Nearly 200 people received training related to stream restoration in 2009. Funding for projects has increased as resource agencies determine that previous projects are successful in meeting water quality and habitat goals. Ecosystem mitigation policies have been adjusted based on outcomes of this program to meet restoration goals.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
133	Pollution Prevention and Mitigation
401	Structures, Facilities, and General Purpose Farm Supplies
402	Engineering Systems and Equipment
405	Drainage and Irrigation Systems and Facilities

### **Outcome #3**

#### **1. Outcome Measures**

Number of stormwater systems installing BMPs

#### **2. Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research

#### **3a. Outcome Type:**

Change in Action Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	30	30

#### **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. State and national water quality rules have 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 forces communities to implement stormwater education programs, in addition to requiring that new and innovative practices be used to treat stormwater runoff.

##### **What has been done**

Since 1997, nearly 100 demonstration sites have been established across the state. In 2009, 287 people attended the Second National Low-Impact Development Summit in Asheville, N.C. organized by faculty at N.C. State. Over 900 professionals received training related to stormwater management in 2009. Design standards for a wide array of stormwater BMPs have been or are being established by N.C. State University faculty.

##### **Results**

Extension agents have been trained to deliver effective stormwater education programs to the public. This has resulted in the installation of stormwater treatment or retention systems such as stormwater wetlands, rain gardens, and cisterns. New design standards have been developed and used throughout the state by the engineering and regulatory community. Landscapers have received training on stormwater BMP maintenance. A stormwater BMP Maintenance and Inspection training program developed by N.C. State has been adopted by 11 counties, and annual BMP inspection is now required by seven North Carolina cities. Ninety-five percent of those attending a rain garden certification workshop passed the post-workshop certification exam.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
133	Pollution Prevention and Mitigation
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse
404	Instrumentation and Control Systems



#### **Outcome #4**

##### **1. Outcome Measures**

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

##### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

##### **3a. Outcome Type:**

Change in Action Outcome Measure

##### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	8	5

##### **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**

Nearly 200 people received HAACP (Hazard Analysis and Critical Control Points) training in 2009. Forty of these participants were re-certified.

###### **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**

<b>KA Code</b>	<b>Knowledge Area</b>
404	Instrumentation and Control Systems
503	Quality Maintenance in Storing and Marketing Food Products
511	New and Improved Non-Food Products and Processes
512	Quality Maintenance in Storing and Marketing Non-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**

Training in the use of irrigation systems for frost protection seems to be an ongoing need, as weather vagaries require precision actions at exactly the proper times. A continuing drought and pending legislation dealing with water allocation also directed extension focus towards management strategies and technologies (and associated workshops/sessions) focusing on 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 on the electric grid at regulated (augmented) prices. Also, air quality related technology and research have 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)

## **Evaluation Results**

## **Key Items of Evaluation**

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

**Program # 6**

**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 Residues from Agricultural and Other Sources	10%	10%	10%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	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: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	54.0	0.0	51.0	0.0
Actual	50.0	0.0	48.0	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
1330091	0	571285	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1000000	0	475000	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1000000	0	3200000	0

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

1. Brief description of the Activity

Multiple 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;
- Assess 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;
- Assess novel antimicrobial strategies for use in reducing foodborne pathogens and biofilm formation on food processing contact surfaces;
- Employ the antimicrobial properties of eggshell membranes for reducing the heat resistance of foodborne pathogens;
- Develop Salmonella-specific inhibitory nanoparticles for preventing intestinal colonization;
- Develop alternative layer molting diets for reducing the risk of Salmonella contamination of shell eggs;
- Characterize 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;
- Develop 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;
- Develop a Vienna sausage product without casings via an in-tube focused microwave field heating technology;
- Improve the texture and yield of canned/pouched Albacore tuna by controlling precook proteolysis and injection of a tuna-derived protein isolate;
- Explore the application of continuous flow processing of foods and biomaterials using advanced focused microwave technology; and
- Develop and test 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 involve 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 will be evaluated at least annually for success, progress, and impact.

## 2. Brief description of the target audience

Primary food producers, food processors, food service operators, county extension agents, state and federal regulatory agencies, commodity associations, news media and consumers. The primary audience will be in North Carolina but will also extend 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

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	3100	6300	0	0
<b>Actual</b>	3100	6500	0	0

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

##### Patent Applications Submitted

Year: 2009

Plan: 4

Actual: 20

**Patents listed**

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

**Number of Peer Reviewed Publications**

<b>2009</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>	12	60	
<b>Actual</b>	12	60	72

**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>
2009	400	500

**Output #2**

**Output Measure**

- Relevant and impacts focused research projects to be conducted

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	50	65

**Output #3**

**Output Measure**

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

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	20	25

**Output #4**

**Output Measure**

- Number of firms adopting quality and safety strategies

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	250	325

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

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

O. No.	OUTCOME NAME
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
- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	1100	1200

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

#### **Issue (Who cares and Why)**

High profile food recalls due to contamination with pathogenic bacteria have created greater demand for education and training programs for industry and regulatory personnel. The food safety certification programs offered through North Carolina Cooperative Extension have continued to serve this identified need. The number of programs delivered and individuals receiving certificates of course completion continue to rise each year.

#### **What has been done**

Food safety certification courses offered through organizations ranging from the International HACCP Alliance to the National Seafood HACCP Alliance were conducted for food manufacturing firms, state and federal regulatory personnel.

#### **Results**

Knowledge of biological, chemical, and physical risks associated with agricultural products and processes employed in manufacturing and production systems has increased. Certification of course participants fulfills state and federal regulatory requirements in a number of food areas such as acidified food products, seafood, meat and poultry products. In addition, compliance of firms increased and safety of food improved through participation in courses.

### **4. Associated Knowledge Areas**

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

## **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

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	900	75

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

#### **Issue (Who cares and Why)**

FDA mandates that fish and seafood processors perform a food safety hazards assessment annually to determine if food-related hazards are reasonably likely to occur with the products or processes employed. The National Seafood HACCP Alliance basic HACCP workshop is recognized by the Association of Food and Drug Officials as the standard by which industry can demonstrate compliance with the law. This course is offered annually for industry and regulatory personnel in North Carolina and the region.

#### **What has been done**

One annual three-day course and four one-day Segment Two courses were conducted in North Carolina, and a second three-day course was offered in South Carolina. Participants were given training in the preventive approach in food safety and updates on FDA regulatory guidance. The number of participants (75) brings the total trained since 1997 to 864 individuals receiving their AFDO certificates of course completion.

#### **Results**

Results include increased knowledge of food safety hazards, improved quality of fish products, and achieved compliance with mandatory food safety law based on preventive methods under the HACCP program. The number of firms in compliance with state and federal regulations increased, and the quality of HACCP plans improved.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources



### **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**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	80	100

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

##### **Issue (Who cares and Why)**

Increased competition in the global economy has forced commodity oriented companies to expand into retail and niche markets in order to remain viable. The number of firms seeking new process and packaging technologies has increased accordingly. In addition, a large number of new businesses have sprouted based on new marketing and distribution channels. The demand for new technologies and technical services continues to increase.

##### **What has been done**

Education and technical services were provided during workshops and one-on-one consultations with firms and individuals seeking new methods for storing, processing, and preserving food products. A number of informational brochures and marketing Web sites were developed to assist firms seeking to expand into new market areas. The primary area of interest has been in extending the shelf life of refrigerated products in order to expand the marketing area and time for distribution of food products.

##### **Results**

Fifteen firms have adopted new technologies for delivery of extended shelf life refrigerated food products. The number of value-added products developed varies by the size of firm, ranging from three to four to over 50 new products per company. The outcome has been expansion of the market for value-added food products due to use of new processing techniques.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

## **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**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	460	450

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

#### **Issue (Who cares and Why)**

Entrepreneurial and small business assistance is necessary to assure the safety, quality, and regulatory compliance of food manufacturers. This program area works collaboratively with state and federal food regulatory agencies to ensure that food entrepreneurs are meeting food safety regulations in marketing their products.

#### **What has been done**

Full-time technical services are provided to individuals and small businesses in classifying foods by their risk category, verifying control of food safety by measurement of pH and water activities, meeting labeling requirements of packaged foods, assisting with FDA filing of scheduled processes for acidified foods and providing a letter of process authority required by FDA prior to the manufacture and sale of safe foods.

#### **Results**

An average of eight firms per week are provided technical services in safety, labeling, and regulatory compliance in new products prior to marketing each year; approximately 250 firms per year. Many of these firms successfully entered the market with their new products and have continued to utilize the technical services provided through the entrepreneurial assistance program. The outcome of such technical services is measurable in both economic development and reduction of food borne illnesses.

### **4. Associated Knowledge Areas**

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

## **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**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	30	30

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

#### **Issue (Who cares and Why)**

Technical services in start up of new business and compliance with food regulations are vital in food manufacturing. The number of new companies entering into food manufacturing has been steady at between two to three firms per month. Many of these firms would not be able to venture into the food business market without the technical services and guidance provided by North Carolina Cooperative Extension.

#### **What has been done**

Technical assistance and regulatory guidance were delivered to entrepreneurial and small businesses seeking to enter the food manufacturing industry. The technical services are delivered at the request of firms or individuals seeking to start new business or new operations at existing firms. Services include validation studies needed to establish the safety of food processing operations.

#### **Results**

Thirty new and expanding small food manufacturing businesses were provided technical service and regulatory guidance to ensure market success. These firms increased their knowledge of and regulatory compliance with food safety and quality regulations. The firms expanded the number of value-added products on the market and created new jobs in the state and industry.

### **4. Associated Knowledge Areas**

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

## **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
- Populations changes (immigration, new cultural groupings, etc.)

### **Brief Explanation**

Outbreaks of food borne illnesses have increased demand for non-degree credit workshops, meetings, and conferences planned in 2009. These educational and applied research efforts have targeted specific industries and operations affected by the illnesses associated with food and animal products. New and revised food policies and further need for process and product validation studies are expected. Many of these studies are likely to involve state research and extension personnel.

## **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**

Workshop surveys given to all participants on completion of HACCP workshops rated the program from very good to excellent. Recommendations received were incorporated into the program as appropriate. In addition, considerable time was spent on updating the seafood HACCP curriculum to reflect changes in the FDA guidance document. The new curriculum will be completed in 2010 and used in the new train-the-trainer courses to be offered starting in May of 2010.

### **Key Items of Evaluation**

A National Seafood HACCP Alliance established in 1995 has continued to serve as a model for other commodities seeking to implement food prevention methods based on the HACCP principles.

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

**Program # 7**

**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 Components	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>		100%	100%	100%	

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

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	35.0	2.5	13.0	0.0
Actual	30.0	1.0	10.0	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
850000	70000	130000	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
950000	70000	1850000	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
730000	5000	1130000	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. Educational programs addressing diet, health, 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 quality of life.

**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, day care 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. North Carolina children 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 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 with school-aged children work outside the home; 67% of women whose youngest child is under six years are 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**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	90000	90000	25000	42500
<b>Actual</b>	240036	528079	67702	0

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

**Patent Applications Submitted**

Year: 2009

Plan: 2

Actual: 2

**Patents listed**

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

**Number of Peer Reviewed Publications**

2009	Extension	Research	Total
<b>Plan</b>	12	4	
<b>Actual</b>	12	4	16

**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>
2009	2200	421

**Output #2**

**Output Measure**

- Targeted audiences participate in workshops on food and nutrition

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	19000	13097

**Output #3**

**Output Measure**

- Conduct research projects on vectors, their influences on human health and their control.

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	5	12

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

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

O. No.	OUTCOME NAME
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	Program participants decrease body weight.
5	Program participants decrease blood pressure.
6	Program participants increase physical activity.
7	Program participants increase their fruit and vegetable consumption by at least one serving.
8	Research projects produce findings that can and will have an impact on the knowledge of and control of vectors that impact human health and safety.



## **Outcome #1**

### **1. Outcome Measures**

Program participants increase knowledge that will promote a healthier diet

### **2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	20600	81262

### **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 10 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 environments.

#### **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 settings, including after school, faith community, work site, and others. Media were used to effectively disseminate a clear message about healthy eating to even more citizens.

#### **Results**

Over 80,000 North Carolinians who participated in programs conducted by NC Cooperative Extension increased knowledge of how to promote a healthy diet. While knowledge does not indicate behavior change, it is a step in moving toward lifestyle changes in diet that promote optimal health.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
702	Requirements and Function of Nutrients and Other Food Components
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
- 1890 Extension

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	20600	41197

### **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 10 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 environments.

#### **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 settings, including after school school, faith community, work site, and others. Media were used to effectively disseminate a clear message about healthy eating to even more citizens.

#### **Results**

Over 40,000 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, it is a step in moving toward lifestyle changes in diet that promote optimal health.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
702	Requirements and Function of Nutrients and Other Food Components
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
- 1890 Extension

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	16000	58348

### **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 10 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 environments.

#### **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 settings including after school school, faith community, work site, and others. Media were used to effectively disseminate a clear message about healthy eating to even more citizens.

#### **Results**

Over 50,000 North Carolinians who participated in programs conducted by NC Cooperative Extension made at least one positive dietary change. Changes include increased consumption of 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**

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

## **Outcome #4**

### **1. Outcome Measures**

Program participants decrease body weight.

### **2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

### **3a. Outcome Type:**

Change in Condition Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	1200	2430

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

#### **Issue (Who cares and Why)**

Overweight and obesity are issues of critical importance to the public's health. Overweight and obesity increases the risk of many chronic conditions, including sleep apnea, arthritis, type 2 diabetes, heart disease, and some forms of cancer. In addition, the economic toll of overweight and obesity in North Carolina is billions of dollars each year in health care costs and loss of productivity.

#### **What has been done**

NC Cooperative Extension, in partnership with NC Division of Public Health, offers the Eat Smart, Move More, Weigh Less program. Eat Smart, Move More, Weigh Less is a 15-week weight management program that offers dietary, physical activity, and lifestyle strategies that are consistent with a healthy weight. Participants plan, track and live mindfully in addition to eating healthy and being physically active.

#### **Results**

The Eat Smart, Move More, Weigh Less program is in its first full year of implementation and has reached over 2,500 participants across the state. Most participants set a healthy weight loss goal at the beginning of the program (some participants enroll to learn about healthy eating and physical activity and do not need to lose weight). Average weight loss is 7 pounds during the 15-week program.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
703	Nutrition Education and Behavior
724	Healthy Lifestyle

## **Outcome #5**

### **1. Outcome Measures**

Program participants decrease blood pressure.

### **2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

### **3a. Outcome Type:**

Change in Condition Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	1500	760

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

#### **Issue (Who cares and Why)**

High blood pressure increases risk for heart disease and stroke.

#### **What has been done**

Several programs conducted by NC Cooperative Extension promote eating and physical activity patterns that have been shown to decrease blood pressure.

#### **Results**

Over 700 participants decreased blood pressure as a result of participating in programs conducted by NC Cooperative Extension. Many other participants adopted physical activity or healthy eating behaviors that can positively affect blood pressure.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
703	Nutrition Education and Behavior
724	Healthy Lifestyle

## **Outcome #6**

### **1. Outcome Measures**

Program participants increase physical activity.

### **2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	2000	11640

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

**Issue (Who cares and Why)**

Many North Carolinians are not active on a regular basis. Few are active to the level recommended by the Dietary Guidelines for Americans. Physical activity is widely accepted as a positive behavior for optimal health and can decrease the risk of heart disease, stroke, and high blood pressure, and can help control weight.

**What has been done**

NC Cooperative Extension encourages both moderate and vigorous physical activity in several lifestyle management programs. Participants are educated about recommended levels of physical activity and develop skills that can help them become physically active for life.

**Results**

Over 11,000 participants increased their physical activity. While this is the first step, we need to encourage participants to meet or exceed the minimum of 30 minutes of activity on most days. To that end, 4,428 participants met the minimum recommended physical activity guidelines, while 2,053 participants adopted behaviors exceeding the minimum recommended physical activity guidelines.

**4. Associated Knowledge Areas**

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

**Outcome #7**

**1. Outcome Measures**

Program participants increase their fruit and vegetable consumption by at least one serving.

**2. Associated Institution Types**

- 1862 Extension
- 1890 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	2000	22916

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

**Issue (Who cares and Why)**

Fruit and vegetable consumption is a critical component of a healthy diet. Increased fruit and vegetable consumption alone has been shown to be effective in decreasing fat and calories while increasing fiber and critical nutrients. Fruit and vegetable consumption is associated with an increased intake of phytonutrients that have been shown to decrease the risk of heart disease and certain forms of cancer.

**What has been done**

Many programs and media campaigns across North Carolina focus on fruit and vegetable consumption. In addition to educational programs that include fruit and vegetable consumption as a healthy behavior that should be adopted, we also encourage community gardens, home gardening, and home food preservation.

**Results**

Over 22,000 participants across North Carolina increased their fruit and vegetable consumption by at least one serving.

**4. Associated Knowledge Areas**

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

**Outcome #8**

**1. Outcome Measures**

Research projects produce findings that can and will have an impact on the knowledge of and control of vectors that impact human health and safety.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	5	12

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

**Issue (Who cares and Why)**

## What has been done

### Results

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
721	Insects and Other Pests Affecting Humans

#### 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
- Populations changes (immigration, new cultural groupings, etc.)

##### Brief Explanation

Many factors affect individuals' decisions and abilities to practice positive behaviors with respect to healthy 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 access to reliable information. Lasting changes in healthy 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 multilevel 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

In 2009, 4,893 families enrolled in EFNEP, while 14,330 participated in 4-H EFNEP. The following data were compiled from pre- and post-evaluation surveys administered to participants by EFNEP program assistants across the state. Completing the series of lessons improved nutrition, food behavior, and food safety



practices. As a result of participation in EFNEP 79% improved in one or more food safety practices, 71% used food labels more often to make food choices, 93% improved in one or more food resource management practices, 44% of participants increased amount of physical activity, 97% of participants improved their diet, 57% increased fruit consumption, 54% increased vegetable consumption, and 52% increased consumption of calcium rich foods.

### **Key Items of Evaluation**

Eat Smart, Move More, Weigh Less (ESMMWL) is a weight-management program that uses research-based strategies for weight loss/weight maintenance. This 15-week program informs, empowers, and motivates participants to live mindfully as they make choices about eating and physical activity. The program provides opportunities for participants to track their progress and keep a journal of healthy eating and physical activity behaviors. Preliminary analysis of pilot data from over 1,000 participants indicate an average weight loss of 7 pounds.

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

**Program # 8**

**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, and Residential and Commercial Structures	33%	33%	33%	
<b>Total</b>		100%	100%	100%	

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

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	25.0	5.0	5.0	0.0
Actual	25.0	5.0	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
459310	130000	380000	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
7000000	130000	2600000	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
8750000	0	1400000	0

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

**1. Brief description of the Activity**

Family resource management and healthy housing and parenting trainings and workshops were developed and conducted. Educational workshops for consumers related to family resource management, debt reduction, developing budgets and savings plans were included in these trainings. Trainings were designed to include low to moderate income families and families headed by women. In addition, educational workshops for consumers related to reducing home hazards were provided, and research findings related to family resource management, housing, and parenting were made available. We also established and/or maintained 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 people, minorities, youth/students, homeowners, families with young children, limited resource parents, caregivers, court mandated or DSS referred parents, grandparents raising grandchildren, and women whose poor economic decisions, ability, and other socio-economic factors make them more at risk to experience negative consequences than other families.

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

#### 1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	40550	120300	3200	8400
<b>Actual</b>	46777	104767	3011	9780

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

##### Patent Applications Submitted

Year: 2009

Plan: 0

Actual: 0

#### Patents listed

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

##### Number of Peer Reviewed Publications

2009	Extension	Research	Total
<b>Plan</b>	13	0	
<b>Actual</b>	13	7	20

### V(F). State Defined Outputs

#### Output Target

##### Output #1

##### Output Measure

- Develop and conduct Family Resource Management training and workshops.

Year	Target	Actual
2009	20	36

##### Output #2

##### Output Measure

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

Year	Target	Actual
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2009 25 106

**Output #3**

**Output Measure**

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

Year	Target	Actual
2009	65	183

**Output #4**

**Output Measure**

- Conduct parenting education training for county agents

Year	Target	Actual
2009	5	8

**Output #5**

**Output Measure**

- Conduct educational workshops for consumers related to healthy homes

Year	Target	Actual
2009	25	27

**Output #6**

**Output Measure**

- Parents mandated by the court and referred by the Department of Social Services (or other agencies/organizations) for parenting training will adopt positive parenting practices.

Year	Target	Actual
2009	230	499

**Output #7**

**Output Measure**

- Conduct debt reduction training workshops

Year	Target	Actual
2009	5	5

**Output #8**

**Output Measure**

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

Year	Target	Actual
2009	30	4

**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
- 1890 Extension

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	2000	357

### **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. Quality time with parents is essential to building trusting relationships. The consequence of these circumstances is that youth may display anti-social behavior, including gang membership, disruptive behavior, school drop out, and substance abuse.

#### **What has been done**

Family and Consumer Science agents are assisting in building strong families by educating citizens on parenting and family life issues. Agents direct educational workshops, conferences, camping experiences, and other outreach efforts focused on positive parenting skills. These efforts address the importance of family time and identify real life concerns of parents.

#### **Results**

As a result of educational programs, 310 non-custodial fathers increased their knowledge of the importance of staying actively involved in their children's lives, and 34 incarcerated parents implemented strategies for staying involved in their children's lives. Parents (1,191) adopted appropriate guidance and supervision practices, and 499 court mandated and agency referred parents consistently used positive parenting strategies.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
802	Human Development and Family Well-Being

## **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
2009	1500	6636

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

The seriousness of today's economic climate has highlighted the importance of basic money management skills. Unfortunately, individuals and families often lack basic financial decision-making skills. Budgeting and record keeping are essential skills for individuals and families to master in order to begin forming a secure financial future. Programs focused on these areas help equip individuals and families with skills to better manage economic change that will occur throughout their lives.

#### What has been done

Family and Consumer Science Agents collaborated with county and state partners to conduct workshops, conferences, and other educational events addressing the importance of basic money management skills such as record keeping and budgeting. These outreach efforts are designed to equip individuals and families with the tools they need to better manage economic change throughout their lifespan.

#### Results

As a result of educational efforts, 3,992 individuals and families have developed a household budget, and 2,644 have developed a household record keeping system. In addition, individuals and families developed other financial management skills, including 4,165 program participants who now use cost comparison skills, and 3,071 program participants who now follow a budget.

### 4. Associated Knowledge Areas

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

### 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
2009	1100	1143

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

**Issue (Who cares and Why)**

Savings are an essential element in overall financial well-being. When individuals and families have savings, they are able to better weather difficult economic circumstances such as a reduction in income, loss of a job, or health crisis.

**What has been done**

Family and Consumer Science agents in North Carolina conducted workshops and trainings to assist limited resource and non-limited resource individuals in improving their financial management skills. Skills such as budgeting, debt reduction, and credit management have helped consumers develop the essential tools for improving their financial situation.

**Results**

Almost 1,150 individuals and families reported increasing their savings accounts, and 1,365 families and individuals reported achieving their financial goals.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being

**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
2009	500	172

### 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. In addition, in recent years, home foreclosures have seen alarming increases. A high level of indebtedness among households not only threatens the economic health of families but also the state's economy at large.

#### What has been done

Family and Consumer Science Agents along with partners in various agencies, organizations, and institutions developed and implemented educational programs related to debt reduction and foreclosure prevention.

#### Results

While debt reduction did not meet targeted goals, a number of other successful money management goals were met. For example, 1,638 individuals paid their bills on time; IDA participants saved \$13,100 toward home purchases; and 3,394 individuals budgeted their basic monthly expenses. In addition, 115 individuals and families used strategies to prevent home foreclosure.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being

### 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
2009	800	1326

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

#### Issue (Who cares and Why)

Recent economic circumstances have resulted in decreases in some individual's retirement savings. As a result, some individuals have elected to postpone retirement until the volatility of the financial markets subsides, and they have a more secure financial situation. Others have returned to work after experiencing a significant drop in their retirement income.

#### **What has been done**

Family and Consumer Science agents conducted workshops, conferences, and other educational programs focused on retirement planning, estate planning, financial management, and insurance plans in order to assist individuals in planning for their retirement future.

#### **Results**

Regardless of circumstances, thoughtful retirement planning is essential for security in later years. Over 1,300 individuals planned for their retirement; 2,143 gained knowledge about retirement planning; and 2,057 gained skills in retirement planning. In addition to those planning for retirement, 2,470 families and individuals reviewed insurance plans for adequate coverage, and 324 individuals and families implemented estate planning strategies.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

### **Outcome #6**

#### **1. Outcome Measures**

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

Not Reporting on this Outcome Measure

### **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 contributed to the adoption of practices as they relate to family resource management, parenting, and home safety. Overall, the economy of the state and nation plays a significant role. In 2009, the state faced historic job losses as the nation's recession affected the North Carolina economy. Tightened lending, declining job markets, and industry closings all influenced individual income. Foreclosures and bankruptcies have reached all-time highs. Normal stressors of maturity, communication, and family dynamics are often 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, and violence.

### **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 Family and Community programs is on-going. The methods and timing of evaluation depend on each individual program and each Family and Consumer Science agent's plan of work. Evaluation of programs reveal that 3,992 families and individuals developed a household budget; 1,143 families and individuals increased their savings, 1,365 families and individuals achieved their financial goals; 1,191 parents adopted appropriate guidance and supervision practices; 323 fathers increased involvement with their children; 1,449 parents increased their knowledge of effective techniques to deal with anger; and 1,182 family caregivers increased their knowledge of self-care strategies.

## Key Items of Evaluation

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

**Program # 9**

**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: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	50.0	7.0	0.0	0.0
Actual	45.0	4.5	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
620000	175000	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1100000	175000	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1800000	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- and field-based youth development educators. Each team continuously works to accomplish three related, overlapping focus area or objective-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 areas; 2) design and deliver programs responsive to existing and emerging needs; and 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, measures of progress, impact indicators, related research, programming resources, and target audiences. Youth development professionals and volunteers working with low-income and minority youth will be engaged in various phases of program design and development. They will also assist with pilot testing of developed educational products. Strategies to increase access to 4-H programs in local communities will be built by matching income and 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 of 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

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	50000	250000	250000	750000
<b>Actual</b>	22477	136535	240926	782422

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

##### Patent Applications Submitted

Year: 2009

Plan: 0

Actual: 0

#### Patents listed

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

##### Number of Peer Reviewed Publications

2009	Extension	Research	Total
<b>Plan</b>	8	0	
<b>Actual</b>	8	0	8

### V(F). State Defined Outputs

#### Output Target

##### Output #1

###### Output Measure

- Fostering Relevant and Challenging Learning Experiences

Year	Target	Actual
2009	20000	21052

##### Output #2

###### Output Measure

- Strengthening Civic Responsibility through Leadership and Volunteerism

Year	Target	Actual
2009	20000	31468

**Output #3**

**Output Measure**

- Preparing for an Employable Future

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	7000	23059

**Output #4**

**Output Measure**

- NurturingHealthyLifestyles

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	18000	28125

**Output #5**

**Output Measure**

- Food Safety & Preservation

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	33102

**Output #6**

**Output Measure**

- K-12

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	25039

**Output #7**

**Output Measure**

- Life Skills

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	56333

**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
5	Youth Involved: Life Skill development programs
6	Youth involved: K-12 Academic Achievement Programs.

## 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
2009	40000	36016

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

North Carolina's youth and families continue to discover the world through 4-H camp and child care education programs. 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. In addition, child care education centers continue to be a foundational layer of community development as more and more families move to a two parent working household model.

#### What has been done

Over 21,052 youth participated in 4-H day and residential camping in 2009. And over 14,964 youth participated in 4-H child care education programs in approximately 338 centers across North Carolina.

#### Results

Camp and child care education center participants gained significantly in both life skills and knowledge. Knowledge gains were seen in the following areas: safety, environment, personal responsibilities, making wise decisions, and healthy food/physical activity choices.

### 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
2009	21000	21213

**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 risks they face, become better communicators, and serve their communities. 4-H's hands-on, learn-by-doing approach reaches hundreds of thousands of North Carolina's youth in schools, in community clubs, camps, and other settings.

**What has been done**

A total of 240,926 youth participated in 4-H programs across the state, with over 162,694 involved in 4-H Clubs and School Enrichment (K-12) programs; 121,353 participated in Special Interest programs.

**Results**

Sixty four (64) counties emphasized the volunteerism program initiative. These 4-H professionals worked with youth and adult volunteers in a variety of program areas, including: citizenship, civic engagement, global education, and cultural education. The volunteer programs reported that 15,706 participants indicated an increase in knowledge of volunteerism; and that over 1,598 participants served in new roles on community boards or councils. Over 4,728 participants reported aspirations to serve as new volunteers in their community. In 2009, the volunteerism initiative had an estimated value to society of over \$22.8 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
2009	7000	23059

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

To successfully face rigorous higher education coursework, career challenges, and a globally competitive workforce, 4-H aligns its academic programs with real world environments by infusing 21st century skills.

#### What has been done

Youth in 46 counties benefited as a result of involvement in community based programs that focused on the Preparing for an Employable Future (School to Work) Initiative, which includes career pathways, entrepreneurship, K-12 programs and STEM. The career pathways program reported 4,932 youth increased their knowledge of viable career pathways, and 1,428 youth set career goals as a result of their involvement in 4-H programs.

#### Results

Some indicators of Progress included: 21,096 youth participating in public speaking/presentation and TV/radio programs; 7,479 youth participating in consumer education/financial literacy programs; 23,059 youth participating in career/employability programs; and 17,748 youth participating in entrepreneurship and economic/business programs.

Some Impacts included: 457 youth indicating an interest in starting their own business; 1,071 limited-resource youth reporting that they would seek post secondary education (these youth were previously not interested in post secondary education); and 18,484 youth participating in service learning/job shadowing/internship programs.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

### Outcome #4

#### 1. Outcome Measures

Youth Involved: 4-H Clubs, School Enrichment, Special 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
2009	18500	27841

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Health is a major concern for Americans. 4-H provides endless opportunities for youth to grow and develop self confidence, independence, and healthy habits. Staying active and eating right helps youth build strong minds and bodies. 4-H is a great place for youth to flex their muscles and learn about building healthy habits that will last a lifetime.

#### What has been done

Eighty seven counties emphasized the Healthy Eating, Physical Activity and Chronic Disease Risk Reduction Initiative. These 4-H professionals worked with a variety of programs areas, including fruit and vegetable consumption, ways to be physically active, managing stress, decreasing tobacco and alcohol use, fire safety, and outdoor activities.

#### Results

As snapshot of impacts include: 27,841 youth increased their knowledge of the importance of fruits and vegetable consumption; 16,252 youth increased their skills in selecting and preparing healthy meals and snacks at home; and 12,254 youth reported an increase in their knowledge of the importance of reducing risk factors for chronic disease.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

#### Outcome #5

##### 1. Outcome Measures

Youth Involved: Life Skill development programs

##### 2. Associated Institution Types

- 1862 Extension
- 1890 Extension

##### 3a. Outcome Type:

Change in Action Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	60000

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

#### Issue (Who cares and Why)

The true value of 4-H comes not from short-term results or even the effects over a few years. It comes from the program's influence on the lifelong pathway of development. Just as inoculations protect children from harmful diseases, 4-H programs have similar inoculation effects.

### What has been done

Youth in 94 counties benefited as a result of participation in community based programs that focused on developing life skills, which includes problem solving, communication, decision making, critical thinking, and goal setting. Problem solving programs reported 56,333 youth increased their problem solving skills, and 24,447 youth gained goal setting strategies.

### Results

Some indications of Progress included 35,519 youth gained communication skills; 19,725 youth gained conflict resolution skills; and 33,092 youth gained critical thinking skills

Some impacts included 32,079 youth learned to use appropriate communication techniques; 25,789 youth learned to use appropriate critical thinking strategies; and 24,712 youth took part in county, district and state level leadership building events/programs.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

### Outcome #6

#### 1. Outcome Measures

Youth involved: K-12 Academic Achievement Programs.

#### 2. Associated Institution Types

- 1862 Extension
- 1890 Extension

#### 3a. Outcome Type:

Change in Action Outcome Measure

#### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	18000

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

##### Issue (Who cares and Why)

Once upon a time, a person did not need a college education to fully participate in the economy. A high school diploma was good enough to get a decent job that could support a family and provide a decent pension. That is no longer the case. Today, high school is the pathway to higher education, career success, and a productive adulthood. Nationally, 70% of all students in public schools graduate yet, only 32% of graduates leave high school qualified to attend a four-year college.

##### What has been done

Youth in 39 counties benefited as a result of involvement in Extension K-12 academic achievement programs, which included information on homework completion, EOG/EOC test scores, study skills, and test taking. Homework completion programs reported 16,049 youth increased the quality of their homework, while 25,039

youth increased their classroom participation as a result of 4-H programs.

### Results

Some indications of Progress included 15,909 youth increasing their knowledge related to homework completion, while 17,116 youth increased their study skills.

Some Impacts included: 10,796 youth increasing their performance on pre and post tests; 2,444 teachers learning of extension as a resource for their school/students; and 5,823 youth performing better on EOG tests.

## 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
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

#### Brief Explanation

The national budget crisis and its trickle down impact on the state of North Carolina has affected some of our program outcomes. As the economy tightens, communities and families stay closer to home and are less inclined to participate in educational programs. Despite Extension's footing in communities, when parents struggle with holding down a job and making a living wage, their youth are certainly impacted. Despite some program areas decreases in numbers, the overall 4-H youth development program participation increased by 1,022 in 2009. Our K-12 (School to Work) program experienced a 17% increase in participants (132,914 youth involved), and our individual study program increased by 14% (5,089 youth participating).

### 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

Evaluations include retrospective (post program), pre and post program; formative (on-going), case study; and comparisons between program participants (individual, group, organization) and non-participants.

Programs are evaluated for impact by objective/goal in the context of the Long Range Focus Area Team Plans. These impacts are reported in the following separate, related systems: Extension Service Report 237; the NC Extension Reporting System; and knowledge, attitude, skill, and aspiration assessments for individual

program teams.

### **Key Items of Evaluation**

Programs are evaluated for impact by objective/goal in the context of our state long-range plan. The impacts are reported in the following three separate, related systems: ES-237; the NC Extension Reporting System; and the knowledge, attitude, skill, and aspiration assessments for individual programs.

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

**Program # 10**

**1. Name of the Planned Program**

Global Food Security and Hunger

**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	20%	20%	20%	
204	Plant Product Quality and Utility (Preharvest)	20%	20%	20%	
205	Plant Management Systems	20%	20%	20%	
212	Pathogens and Nematodes Affecting Plants	20%	20%	20%	
213	Weeds Affecting Plants	10%	10%	10%	
216	Integrated Pest Management Systems	10%	10%	10%	
	<b>Total</b>	100%	100%	100%	

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

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Actual	0.0	0.0	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
0	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

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

1. Brief description of the Activity

This area includes the following activities:

- Conduct discovery research on plants and plant systems using genomics, metabolomics, and proteomics tools;

- 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.

This plan of work includes broad and extensive research and extension programs. NC Agricultural Research Service scientists will conduct research projects to study methods to improve the efficiency of animal production. Research will focus on methods to improve reproductive performance, nutrient utilization, and genetic influence on growth and reproduction. Scientists will also work 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 plan of work are also very broad and include poultry such as turkeys, broiler chickens, and table-egg chickens. The plan of work also includes swine, fish such as flounder, and cattle such as beef and dairy, and numerous pests such as house flies. Research will include 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 that will be 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 plan of work is to transfer technology and knowledge to our stakeholders and clientele. Therefore, an extensive outreach effort through Cooperative Extension will be 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. Stakeholders and clientele will be 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 stakeholders and clientele will include 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 will 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

Target audiences are 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, and other public agency staff.

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

#### 1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
<b>Actual</b>	0	0	0	0

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

##### Patent Applications Submitted



Year: 2009

Plan:

Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

<b>2009</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>			
<b>Actual</b>	0	0	0

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

**Output Target**

**Output #1**

**Output Measure**

- {No Data Entered}

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

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

## **Outcome #1**

### **1. Outcome Measures**

{No Data Entered}

### **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
- Populations changes (immigration, new cultural groupings, etc.)

#### **Brief Explanation**

### **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**

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

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

**Program # 11**

**1. Name of the Planned Program**

Sustainable Energy

**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	25%	25%	25%	
402	Engineering Systems and Equipment	25%	25%	25%	
403	Waste Disposal, Recycling, and Reuse	25%	25%	25%	
404	Instrumentation and Control Systems	25%	25%	25%	
	<b>Total</b>	100%	100%	100%	

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

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Actual	0.0	0.0	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
0	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

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

**1. Brief description of the Activity**

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

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

**1. Standard output measures**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
<b>Actual</b>	0	0	0	0

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

**Patent Applications Submitted**

Year: 2009

Plan:

Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

2009	Extension	Research	Total
<b>Plan</b>			
<b>Actual</b>	0	0	0

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

**Output Target**

**Output #1**

**Output Measure**

- {No Data Entered}

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

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

## **Outcome #1**

### **1. Outcome Measures**

{No Data Entered}

### **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 Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

#### **Brief Explanation**

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

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

#### **Evaluation Results**

{No Data Entered}

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

{No Data Entered}

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

**Program # 12**

**1. Name of the Planned Program**

Climate Change

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

1. Program Knowledge Areas and Percentage

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

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890

Actual	0.0	0.0	0.0	0.0
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**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

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

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

**1. Brief description of the Activity**

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

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

**1. Standard output measures**



2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual	0	0	0	0

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

**Patent Applications Submitted**

Year: 2009

Plan:

Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

2009	Extension	Research	Total
Plan			
Actual	0	0	0

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

**Output Target**

**Output #1**

**Output Measure**

- {No Data Entered}

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

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

## **Outcome #1**

### **1. Outcome Measures**

{No Data Entered}

### **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
- Populations changes (immigration, new cultural groupings, etc.)

#### **Brief Explanation**

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

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

#### **Evaluation Results**

{No Data Entered}

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

{No Data Entered}

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

**Program # 13**

**1. Name of the Planned Program**

Childhood Obesity

**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 Components	15%	15%	15%	
703	Nutrition Education and Behavior	25%	25%	25%	
724	Healthy Lifestyle	60%	60%	60%	
	<b>Total</b>	100%	100%	100%	

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

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Actual	0.0	0.0	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
0	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	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. Educational programs addressing diet, health, 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 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 whose youngest child is 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**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
<b>Actual</b>	0	0	0	0

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

**Patent Applications Submitted**

Year: 2009

Plan:

Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

2009	Extension	Research	Total
<b>Plan</b>			
<b>Actual</b>	0	0	0

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

**Output Target**

**Output #1**

**Output Measure**

- {No Data Entered}

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

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

## **Outcome #1**

### **1. Outcome Measures**

{No Data Entered}

### **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
- Populations changes (immigration, new cultural groupings, etc.)

#### **Brief Explanation**

### **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**

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



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

**Program # 14**

**1. Name of the Planned Program**

Food Safety

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

1. Program Knowledge Areas and Percentage

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
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 Residues from Agricultural and Other Sources	10%	10%	10%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	40%	40%	40%	
<b>Total</b>		100%	100%	100%	

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

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

<b>Year: 2009</b>	<b>Extension</b>		<b>Research</b>	
	<b>1862</b>	<b>1890</b>	<b>1862</b>	<b>1890</b>
Actual	0.0	0.0	0.0	0.0

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

<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
0	0	0	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
0	0	0	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
0	0	0	0

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

1. Brief description of the Activity

Multiple 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;
- assess 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;
- assess novel antimicrobial strategies for use in reducing foodborne pathogens and biofilm formation on food processing contact surfaces;
- employ the antimicrobial properties of eggshell membranes for reducing the heat resistance of foodborne pathogens;
- develop Salmonella-specific inhibitory nanoparticles for preventing intestinal colonization;
- develop alternative layer molting diets for reducing the risk of Salmonella contamination of shell eggs;
- characterize 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;
- develop 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;
- develop a Vienna sausage product without casings via an in-tube focused microwave field heating technology;
- improve the texture and yield of canned/pouched Albacore tuna by controlling precook proteolysis and injection of a tuna-derived protein isolate;
- address the application of continuous flow processing of foods and biomaterials using advanced focused microwave technology; and
- develop and test 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 involve campus and field faculty located in local communities. Direct outreach efforts will include engaging stakeholders 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 will be evaluated at least annually for success, progress, and impact.

## 2. Brief description of the target audience

Target audiences include primary food producers, food processors, food service operators, county extension agents, state and federal regulatory agencies, commodity associations, news media and consumers. The primary audience will be in North Carolina but will also extend 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

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
<b>Actual</b>	0	0	0	0

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

##### Patent Applications Submitted

Year: 2009

Plan:

Actual: 0

**Patents listed**

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

**Number of Peer Reviewed Publications**

<b>2009</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>			
<b>Actual</b>	0	0	0

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

**Output Target**

**Output #1**

**Output Measure**

- {No Data Entered}

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

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

## **Outcome #1**

### **1. Outcome Measures**

{No Data Entered}

### **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
- Populations changes (immigration, new cultural groupings, etc.)

#### **Brief Explanation**

### **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**

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