2008 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

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2008 CSREES Research and Extension AREERA Annual Report

Executive Summary

North Carolinians are the beneficiaries of an array of research and extension efforts designed to better their lives and to make their state a better place in which to live. These efforts are administered by two entities: the North Carolina Agricultural Research Service and North Carolina Cooperative Extension. This report documents 2008 research and extension programs in North Carolina.

North Carolina Agricultural Research Service

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

- Agriculture and Life Sciences
- 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 at N.C. State University, the Agricultural Research Service coordinates research in 18 departments and works in partnership with the North Carolina Cooperative Extension Service and 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 2008 Research Service personnel include 397 tenured and tenure track research faculty accounting for approximately 188 full time scientist equivalents, most on shared appointments with academics or Extension. Working with these faculty members are more than 521 research professors, researchers, research assistants, professional support staff and graduate students; 284 laboratory or field technicians and other technical support; and 102 clerical/other staff. These faculty members and support personnel conduct basic and applied research involving 566 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 landgrant 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 everchanging needs, the organization operates under a dynamic longrange 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 landgrant universities work hand -in-hand with field faculty serving in all 100 North Carolina counties and on the state’s Cherokee Reservation. 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 100 of the 350 Extension faculty within the N.C. State University College of Agriculture and Life Sciences have joint appointments with the Agricultural Research Service.

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

To ensure that underserved and underrepresented audiences are among those included in program development and implementation, Cooperative Extension established a 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 9 million citizens address critical challenges facing them today and in the future.

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

Planned Program Overview Summaries

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

- 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 follows:

>Plant Production Systems and Health

North Carolina has a strong agricultural economy which is becoming more diverse every year to meet the demands of a changing population and market opportunities. However to remain competitive in a changing national and global agricultural economy and take advantage of local marketing they must adopt more efficient production practices and continue to diversify. Growers are now producing specialty crops including medicinal herbs, specialty melons, heirloom fruits and vegetables, truffles, various crops for the state’s growing ethnic populations, and grapes for wine and nutraceutical properties. The green industry continues to increase yearly. Additionally 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 through increased diversity of fresh, locally grown, produce in the marketplace. While this diversification has been good for North Carolina growers, it has placed demands on the NCARS to develop and deliver information on sustainable programs for producing, protecting from pests and pathogens, harvesting, storing, and marketing these commodities. 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.

Scientists in the NCARS are investigating new techniques to more efficiently produce various crops 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. 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 on alternative income sources, including commercialization of native species and the production of various ornamentals, fruit crops and vegetables, organic production methods, and agro-tourism. These activities draw audiences of all types and levels of experience, including new producers and existing producers, and large scale, limited resource and part-time producers. Topics addressed include cultural practices and alternative marketing channels, strategies and management of production, creating grower associations, promoting the use of local farmers markets, starting pick or cut your own operations, and combining agro-tourism and direct marketing

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. Among those activities within each knowledge area are some key outcomes:

Plant Genome, Genetics, and Genetics Mechanisms

Following the decoding of the genomes of both rice and the rice blast pathogen it was discovered that the rice blast

pathogen produces a large and diverse set of secreted proteins, including those defined by unusual carbohydrate binding domains, several novel virulence-associated genes, and large suites of enzymes involved in secondary metabolism. Data obtained from the project provide the foundation to begin to address the evolution of fungal pathogenicity and host resistance. These results may be used to predict future disease outbreaks on presently resistant cultivars and aid in the development of new cultivars.

A signaling pathway that is activated when plants are placed on their side was identified and biochemical changes that occur during the gravitropic response were described. Transgenic *Arabidopsis* plants with alterations in one of the key signaling pathways exhibited a reduced gravitropic response, altered sensitivity to other environmental stresses including drought, and also induction of defense responses to pathogens. Dampening basal signaling may lead to the development of more stress resistant crop plants.

Plant Genetic Resources

Molecular markers for wheat rust resistance genes were developed and may be useful in marker assisted transfer of rust resistance genes to commercially acceptable cultivars which will reduce the cost and expedite the wheat cultivar development.

A transgene originating from corn has been inserted into peanut and lines are being hybridized with elite cultivars to select favorable genotypes with aflatoxin resistance. A second transgene has been inserted which gives immunity to tomato spotted wilt virus, a severe disease problem throughout all peanut production areas. Lines with the TSWV transgene have been hybridized with elite cultivars to incorporate the gene into materials that have potential for cultivar improvement. Lines with transgenes suppressing toxin production in peanut will have great health benefit for all individuals consuming peanut, especially in the developing areas of the world.

Plant Product Quality and Utility

Commercialization of soybean varieties with low seed phytic acid depends on the stability of the trait when grown in soils with a wide range of phosphorus availabilities. The stability of the low phytic acid in a line with this trait to high levels of P supply supports continued development of varieties with low seed phytic acid and high yields. Use of meal from such varieties in animal rations will reduce excretion of phosphorus in animal manure and thus lower the environmental impact when applied to crop land.

Studies demonstrated that heirloom tomatoes can be grown organically in western NC, even under the high disease pressure in the region. Using the average yields obtained in 2008, 9.2 pounds of fruit per plant, with 6290 plants per acre, and a conservative price of $4.00 per pound, estimated gross returns would be over $200,000 per acre.

Research with ReTain and NAA demonstrated that different combinations of these materials delayed drop of ‘Red Delicious’ fruit more effectively than either material alone and that rates of ReTain could be reduced by up to half when combined with NAA without a loss of drop control. Long-term evaluations of these compounds demonstrated that they increased ‘Red Delicious’ annual yields by an average of 100 bushels per acre, equivalent to a 10% increase in yield.

Plant Management Systems

Soybean yields over the past 15 years have steadily increased as a result of improved varieties and management techniques, especially those related to improved tactics for managing plant-parasitic nematodes and weeds.

Studies were conducted to test new methods of assessing N requirements, new fertilizer additives, plant populations, multiple trait hybrids and a range of other new production practices for corn. Despite the severe drought statewide in 2008 average corn yield was just under 80 bu/acre as a result of the use these practices. An informal survey found that growers increased net income by $15 an acre compared to 2007. Assuming half of this was the result of the use of better management practices the return from their use on 920,000 acres was $6,900,000 in 2008.

Two sweet sorghum cultivars were found particularly well suited to producing ethanol with low input requirements indicating that this crop could be a viable alternative to corn for producing biofuels.

Basic Plant Biology

Low levels of winter hardiness limit the area of commercial winter oat production in much of North America and Europe Specific genes controlling crown freezing tolerance were identified. Seven genes were identified that accounted for over half of

the winter hardiness trait using user friendly DNA markers As a result, breeders will now be able to screen for winter hardiness every year, rather than once every three to four years. Breeding efficiency will be greatly improved.

Following the decoding of the genomes of both rice and the rice blast pathogen it was discovered that the rice blast pathogen produces a large and diverse set of secreted proteins, including those defined by unusual carbohydrate binding domains, several novel virulence-associated genes, and large suites of enzymes involved in secondary metabolism. Data obtained from the project provide the foundation to begin to address the evolution of fungal pathogenicity and host resistance. These results may be used to predict future disease outbreaks on presently resistant cultivars and aid in the development of new cultivars.

Insects, Mites and Other Arthropods Affecting Plants

Entomologists at North Carolina State University partnered with entomologists at other Land Grant Universities in the eastern US to develop and implement reduced-risk pest management programs for apples Active ingredients of older insecticides which are subject to further EPA regulation were reduced by 88.2% in reduced-risk versus conventionally management orchards Surveys among growers and the chemical distribution industry estimated that >90% of NC apple growers had incorporated reduced-risk insecticides into their program by 2008, and the percentage of NC growers using mating disruption increased from <5% in 2007 to almost 40% in 2008

Studies on the biology and management of a recently discovered exotic white grub, *Plectris aliena*, causing extensive damage to sweet potatoes. have led to the development of an effective, management approach for this insect using reduced risk insecticides applied to the soil Because *Plectris aliena* has the potential to spread further north into the main sweet potato production areas of NC, having an effective management procedure will mitigate potentially devastating losses should such spread occur.

Pathogens and Nematodes Affecting Plants

Fairy rings have become a destructive pest of golf course putting greens in recent years.
Research has led to recommendations for prevention of fairy ring were developed based on 2 fungicide applications per season, with a total cost of $430 per acre. Previously, many golf course superintendents were using more expensive products and making 4 to 6 applications per season, with a total cost of $3,000 per acre. If all golf courses in North Carolina implemented these recommendations, this would create a potential savings of $3.8 million for the state's golf course industry. Approximately 50% of golf courses in North Carolina implemented this program in 2008.

U.S. consumers have come to expect high quality, blemish-free peaches that have good "eye appeal" with a bright red skin color among other characteristics. Many of these are also are highly susceptible to a bacterial disease, bacterial spot, that can render the fruit unacceptable. Research has defined the critical fruit infection period as occurring early in the growing season near time of bloom rather than continually until fruit have ripened, thus potentially reducing the number of sprays while reducing fruit lost. The management strategy developed from this research done at NC State University now is the basis for chemical control of bacterial spot of peaches in the eastern U.S.

Plant parasitic nematodes reduce the yield of the world's forty major food staples and cash crops by an average of 12.3. A 10.4X draft sequence of the northern root knot nematode genome was assembled from multiple libraries. Genes identified will be potential targets for new therapies, including animal and human parasitic nematodes. In particular, these studies will result in the reduced dependence upon toxic chemicals for nematode management and sustainability for both plant and animal-producers during the coming years.

Weeds Affecting Plants

North Carolina growers have rapidly switched to herbicide-resistant cultivars in cotton , soybeans, and corn. This new technology is at least partially responsible for the tremendous increases in cotton acreage in the late 1990's and a continuing shift to conservation tillage. The overall value to North Carolina growers from switching to conservation-tillage cotton has been approximately $15 million.

Approximately 99, 95, and 70% of the cotton, soybean, and corn acreage in North Carolina is planted to an herbicide-resistant cultivar. Research has focused on determining the need for residual herbicides, best timing of herbicide applications, value of mixtures, solutions for problem weeds not adequately controlled in the new systems, and control programs for herbicide-resistant volunteers. Crop yields have increased, input costs have remained the same or been reduced, and quality problems have been reduced. The overall value of the program to North Carolina cotton and soybean producers is estimated at $50 million.

NCSU HADSS, Web HADSS and Pocket HERB, economics based computerized decision aids for making herbicide applications, have been released to help growers and consultants evaluate thousands of possible herbicide rate combinations and efficacies in a matter of seconds. Each presents the grower with a list of possible treatments ranked by net return.. When used in conjunction with good management practices these programs can help reduce the number and amount of herbicides applied to cropland while helping to increase crop yield.

Integrated Pest Management Systems

Bt cotton varieties resistant to caterpillar damage represented more than 97% of North Carolina's cotton acreage in 2008. As a result of reduced insecticide use there has been a significant increase in stink bug injury. Dynamic treatment thresholds were developed for applications of insecticides for managing sucking bugs on cotton. Under three stink bug pressure levels, economic returns were highest using the dynamic threshold, returning $33.78, $19.19, and $7.42/acre under high, medium, and low bug pressure, respectively.

A peanut disease advisory program has been developed with the North Carolina State Climate Office (SCO). Growers using peanut disease advisories would have saved from 1 to 3 sprays compared to a calendar-based application schedule. The approach used here also has the potential to greatly expand the utility of weather based disease forecasting in many other crops.

>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 response to incentives, programs, and the economic environment. Agricultural production remains an important source of farm income throughout North Carolina so programs designed to assist farmers create added value are important. Some of the initiatives undertaken and their results include:

- 1250 Tax preparers gaining needed knowledge for accurate tax return preparation by participating in Extension workshops throughout the state of North Carolina.
- Over 40 new organic and agritourism markets by individual entrepreneurs as a result of guidance from Extension.
- More than 3060 growers adopting improved business management practices in their operations.
- For both the dairy and poultry industries there is the need for the development of a sound research and outreach program in organic grain (both for feed and for direct human consumption) to meet the needs of the six or seven local organic milling operations that exist across the state. This has occurred at CEFS in eastern North Carolina with the leadership of NCSU in partnership with producers and NCA&TSU. Staggering increases in the price being offered for grain especially organic (prices have at least doubled over the past year from already high prices of $7.00- $10.00 bu. Outdoor hog production continues to be pushed by market interest . Several large scale buyers are looking for pork that is raised according to standards of treatment, nutrition, and d health. One buyer alone purchased $1,000,000 worth of pork raised in that way. The NCA&TSU outdoor hog program has worked with NCSU, local extension and through the collaborative project NCChoices in this area.
- Extension educational programs focused on ways to evaluate new enterprises, how to start a new business, and the cost and returns of new enterprises, Farm families were able to make informed decisions about the economic viability of new value – added and alternative agricultural enterprises for their farm. Families used the information to make informed decisions concerning the profitability of adoption of new enterprises. Losses from unprofitable enterprises were minimized. Profitable enterprises were added.
- Roundup Ready soybeans were significantly less risky to farm operators and their families and to the environment than the total herbicide use on conventional soybeans.

*With the severe recession in full force, economists provided critical information to state -level leaders on the feasibility and impact of accelerating the spending on several approved public capital projects in the state as a means of lessening the impact of the recession. This advice was an input into the decision by the Council of State to approve the early impact of these projects.

*Studies of broadband technologies availability in rural community's results suggest that rural broadband availability is trending toward universal access; that there remains some way to go; and that state and federal programs to stimulate broadband deployment appear to be effective tools for making high-speed data transmission available to the vast majority of rural dwellers.

*A study to investigate the changes in risk perceptions associated with adoption of precision cotton technology has shown

that cotton farmers tend to underestimate their within-field yield variability and more of them could benefit from adoption of a yield monitor than are actually adopting it. The new, triple- and eight -stacked traited crop biotechnologies are reducing farmers' yield risk by a significant amount.

>Natural Resources and Environment

North Carolina supports one of the nation's most diverse agricultural production systems. The state also possesses an abundance of natural resources. The coastal plain of Eastern North Carolina is home to most of the row crop agriculture in the state and much of the animal industry. The coastal plain is also home to the North Carolina sea coast and the state's remarkable sounds and estuaries. In Western North Carolina, agriculture, although less intense, is still a very large economic player, which must share space with much more rugged and mountainous terrain in that part of the state. Central North Carolina, which is characterized by Piedmont topography and soils, is also home to most of the population in the State. Agriculture is very evident in the Piedmont to this day, but it is not as extensive as in the eastern or western parts of the state. However, the contention for resources (water, land, etc.) is probably most evident in the middle part of the state, due to the rapid development going on in many areas.

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

- 1,640 individuals went through training for certification or recertification as animal waste land applicators. 71 people were trained as septic system installers and inspectors.

- More than 16,000 youth and adults increased their knowledge about best management practices and conservation.

- More than 4,200 landowners and producers adopted one or more agricultural or forestry best management practices.

- More than 25,000 individuals actively participated in environmental awareness programs (such as Project Learning Tree, Project WILD, Aquatic WILD, Catch Clinics, Wildlife Habitat Judging, Environmental Field Days, Hunter Safety, etc.).

- An economic analysis of the potential costs and returns of biofuel crop production at the Neuse River Waste Water Treatment Plant (Raleigh) has been completed.

- The North Creek Outdoor Field Laboratory has become a focus of the NC State University Centennial Campus, a growing research and advanced technology community of university, corporate, and government R&D facilities. The North Creek corridor is transforming from a stream overgrown with invasive vegetation such as kudzu, privet, Japanese honeysuckle, and microstegium, to a stream corridor with ecological diversity, including native giant cane (Arundinasia gigantean), warm season grasses, as well as numerous native shrubs and trees. One result is a decrease in the mosquito larvae in North Creek, as well as an increased diversity of birds.

Some 2008 findings for research in the natural resources and environment area were:

- Acidifier dosages have been studied for their impacts on ammonia concentrations and emissions from broiler houses. Results indicate that levels of acidifiers higher than currently used in the broiler industry may reduce ammonia concentrations without affecting broiler live performance.

- An economic analysis of the potential costs and returns of biofuel crop production at the Neuse River Waste Water Treatment Plant (Raleigh) has been completed.

- Drainage Water Management or Controlled Drainage has been installed on over 400,000 acres of cropland in North Carolina. Conservatively, these systems could reduce nitrate loads by over 4,000,000 pounds annually, if properly

managed. Currently, efforts are being made to develop and implement a pilot web-based advisory system that will assist producers in making important management decision concerning the use of these systems.

- Research to access the impact of antibiotic resistance bacteria and pathogens on animal and human health especially associated with CAFO's in agricultural areas has resulted in preliminary baselines for both animal and non-animal agriculture (row crop) communities.

- Long-term studies have been conducted over the last 20 years (1988-2008) on paired forested (pine) watersheds in Carteret County, North Carolina to determine effects of silvicultural and water management practices on hydrology and water quality. These studies have documented the effects of typical forest management practices such as thinning, fertilization and harvesting, and of drainage practices such as controlled drainage and the use of an orifice weir to reduce outflow rates.

- The nitrogen simulation model, DRAINMOD-N II, has been developed to simulate nitrogen dynamics and turnover in the soil-water-plant system under different management practices and soil and environmental conditions. The new version DRAINMOD 6.0, which incorporates the nitrogen model DRAINMOD-N II, has been released and is available on the web. The model has been tested using two data sets from agricultural drained sites in the US Midwest.

>Animals and Their Systems. Production and Health

Faculty and staff at North Carolina State University have been engaged in a wide array of research and related projects to increase the competitiveness of North Carolina animal agriculture and improve its global economic position. These efforts are very broad in scope, impact, and clientele served. Major concerns include improving animal health, production efficiency, and profitability while at the same time improving overall environmental conditions and ensuring the sustainability of our rural communities. These concerns receive intense effort for integrated animal agriculture as well as for diversified, alternative, and small independent producers. Projects were conducted within university campus resources and across the state working cooperatively with North Carolina producers, citizens, and other stakeholders. Some of the success experienced this past year include: improving dairy herd performance by improved record keeping; improved energy utilization in broiler houses through increased house insulation and maintenance while maintaining or improving broiler performance and welfare; use of molecular biology and genomics including DNA markers to identify poultry performance traits; and conducting introductory Hazard Analysis and Critical Control Points (HACCP) workshops in poultry processing plants to improve product safety.

Knowledge gained about the eighteen genes thought to play a role in swine Osteoarthritis (OA) development will provide insights into the progression of early degenerative changes in cartilage tissue. If we can gain a better understanding of the early degenerative changes that precede full blown OA we will be better able to treat the disease and prevent the debilitating changes that occur. Controlling the early degenerative changes holds the most promise for preventing or mitigating the disease process.

Researchers in the Department of Animal Science worked with InterVet, Inc., the North Carolina Pork Council, and the National Pork Board to develop management strategies for synchronization of estrus in swine. Estrus synchronization programs on farms significantly reduced mistakes in detection of estrus which increased reproductive performance, sow longevity, and farm profitability.

Change in dairy calf feeding practices resulted in a large savings in feed costs while maintaining growth and health of the calves.

Using piglets as a model**,** polydextrose has been ascertained as safe and efficacious as a prebiotic oligosaccharide supplement in human infant formulas.

Rhodopsin transgenic pigs have been produced using standard techniques in reproductive physiology and experimental embryology and are currently being used in studies of retinitis pigmentosa, an inherited form of blindness in humans.

Excretion of zinc and copper in swine waste was reduced by 30 to 50% as a result of reducing trace mineral supplementation to normal versus excess levels. This will lead to a savings of over one million dollars in feed cost in North Carolina per year and improve the sustainability of swine production by reducing concentrations of zinc and copper in swine waste.

Crude glycerol can be successfully used at low levels in swine diets to replace corn while improving the efficiency of pelleting of feed by 50% and improving pig performance.

Ration formulation using alternate feeds and based on feed analysis has increased annual dairy farm profits by over $100 per cow.

Extension personnel assisted potential new aquaculture producers in North Carolina and improved their opportunity for success. New aquaculture businesses are being started and existing businesses are diversifying their operations. These new businesses result in a broadening of the tax base and strengthening of the North Carolina economy as well as providing consumers sources of high quality protein.

A new poultry ovarian cancer model will enhance the ability of medical researchers to identify potential markers to help verify and determine the efficacy of cancer chemopreventive drug regimens. This model may support the development of acceptable preventive programs and provide for an early detection mechanism for ovarian cancer.

The NC Layer Performance and Management Test reports are used producers in North Carolina and industry representatives throughout the US and 22 different countries to compare and evaluate the impact of strain, environment, and management on chicken layer egg production and performance as well as the egg product information and safety.

Broiler breeder chicken flocks subjected to altered early feeding strategies have exhibited improved livability as well as better egg production and hatchability. This could improve USA performance and reduce costs by $5 million annually.

Direct fed microbials or probiotics have direct stimulatory effects on the systemic immune system of broilers. During antigenic challenges, the immune system responds with remarkable aggressiveness. Conversely, during in a non-challenged or resting state, the immune system uses much less energy. This may explain the growth and feed efficiency enhancing properties of direct-fed microbials.

Selenium (Se) is a naturally occurring micronutrient that is essential for several known major metabolic pathways, including; thyroid hormone metabolism and antioxidant defense systems in both mammals and birds. Organic Se has been demonstrated to improve the health of broiler chickens by acting on many physiological systems.

The efficiency of dietary nutrient utilization and enteric development of young poultry was improved through the use of inovo feeding which is the application of nutrients to the avian embryo while it is still in the egg.

Dietary supplementation of organic complexes of zinc, manganese, copper, and selenium was found to improve the welfare and growth efficiency of rapidly growing poultry by reducing the incidence of crippling skeletal abnormalities.

Dietary sodium bi-sulfite improved feed conversion, but not body weight, in broiler chickens reared to 42 days of age.

Feeding a low protein diet to broiler chickens over the first few days post-hatch stimulates satellite cell activity, which theoretically may leads to an increase meat yield. However, it was discovered that even though satellite cells were stimulated, there was no increase in ultimate meat yield. It is possible to feed a lower protein diet over the first week post-hatch without adversely impacting meat yield.

The use of acidifiers at higher levels than currently used in the broiler industry may reduce ammonia concentrations within broiler houses without affecting broiler live performance.

A strong immune system should translate to strong resistance to stress and antigenic challenges and thus a healthy organism. Immune enhancement was achieved by simply controlling the photoperiod appropriately and/or supplementing the diet with melatonin or its precursor, tryptophan.

Chicken carcasses were tested for numbers and types of bacteria present on different areas of the carcass, including leg quarters vs. breast quarters, and backs vs. fronts. A difference was found which showed considerably more bacteria present on the backs of carcasses. Potentially, the spray nozzles dispensing water and chemicals could be rearranged to concentrate on the back of the carcasses while reducing overall water and chemical usage without compromising safety of the product.

People associated with swine farms were more likely to harbor antibiotic resistant enteric bacteria than those living near or working on row crop farms. However, the bacteria found in these people could not be linked to the bacteria found in the nearby environmental waters nor the animal wastes.

Maturation of poultry embryonic organ systems that impact performance can be altered by manipulation of incubation parameters. Changes in incubation profiles improved hatching performance. Educational programs are disseminating this information to the poultry industry.

The establishment of southern flounder in North Carolina as a new, high-value aquaculture species represents the first introduction of a fish with a worldwide market appeal and the capability of being cultured over a large geographic area.

The effluents from North Carolina Hybrid Striped Bass ponds have been reduced by more than 50% which corresponds to an almost 25% savings in pumping costs through simple changes in management practices. This will bring the hybrid striped bass industry into an environmentally sustainable means of ensuring the long term survival of this vital industry.

>Agricultural, Natural Resource and Biological Engineering

In 2008, the planned program of Agricultural, Natural Resource and Biological Engineering was very active through Research and Extension activities. Over 13,000 and17,000 direct and indirect contacts respectively were made in this planned program area through extension activities including workshops, conferences, trainings and field days. The impact of these educational programs was far-reaching. . A new extension program in alternative fuels was established at NC State in 2007 and is continuing . Through this program, 40 farms have adopted the use of biofuels. In general, this program seeks to assist with technology transfer from the laboratory bench top to the field. The transfer is focused on demonstrating how processing techniques and cropping systems specifically selected for the region can be implemented to improve farm profitability and increase energy independence. These projects include ethanol production from cotton stalks, ethanol production from sweet sorghum, torification of wood chips, and identifying new sources of seed oil. Research activities in Agricultural, Natural Resource and Biological Engineering include:

- Several air quality studies including the initiation a of study to measure particulant emission from egg production facilities. The study is characterizing the spatial and temporal variation in particulant matter mass and chemical composition. Other studies are looking at the effect of additives or treatments on in-house ammonia emissions and/or pathogens. The development of an ammonia emissions model for prediction emissions from broiler litter has been focusing on estimating ammonia emission fluxes from litter properties (the TKN content, pH, moisture content, and total carbon content), the mass transfer coefficient Km and ventilation rate Q. Several sets of experiments were conducted. Based upon experimental results from a dynamic flow-through chamber system, a preliminary statistical modeling approach was established for ammonia emission flux estimation.

- Several energy related projects have been initiated or continued. 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. The patent application on the process was submitted 12/2007. Beginning November 2008, an 8-month study is being conducted to quantify the cost benefits of using transpired solar wall technology (TSW) in a pig nursery. A TSW (440 ft2) has been installed on the south face of a pig nursery near Clinton, NC. Energy use, environmental parameters, and pig performance are being collected in that house as well as an adjacent, identical nursery with a TSW. Analysis of the data from the two houses will help quantify the cost-benefits of using TSW in pig nurseries in NC. Recently, an integrated approach has been used to convert swine waste into bioenergy at Barham Farm, a swine operation. Swine manure is first converted through anaerobic digestion to biogas which is utilized for electricity and heat production. The produced heat can be utilized in the swine houses and in vegetable-producing greenhouses. Carbon dioxide from the combustion of the biogas can also be utilized to enhance the productivity of the vegetables in the greenhouses. Effluent from the anaerobic digester is used to grow high-starch duckweed which can be an efficient alternative to corn for fuel ethanol production. This integrated approach makes the conversion of swine waste to bioenergy much more efficient. Collaborative research across several departments and with industrial partner, Novozyme North America, Inc. in bioethanol production from lignocellulosic materials such as switchgrass and coastal Bermuda grass. Genetic techniques have been developed to lower the lignin and increase the cellulose contents in transgenic switchgrass. Various pretreatment technologies (acid, alkaline, microwave, and pyrolysis pretreatments) have been tested to improve the digestibility of both switchgrass and coastal Bermuda grass and efficiency of fermentable sugar generation from the grasses.

- Harvest and Post-Harvest Engineered systems have been developed. As field-based sensor system has been deployed to measure plant response and determine nitrogen requirements in real-time. An algorithm to evaluate plant response and determine nitrogen requirements is being tested. Real time assessment of nitrogen requirements can significantly reduce over application of fertilizer. Ultimately, reduced fertilizer cost and reduced environmental impact are possible. A pair of innovative tobacco curing barns were built and tested on the campus of North Carolina State University during 2007. These barns and their wood heating system were upgraded in 2008 to allow for the automatic stoking of wood chips. 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 tremendous savings in fuel costs. These state-of-the-art barns have biomass fueled heating system and employ a computer controlled fan

system with the potential to reduce total electrical consumption by over 50%. The combination of wood fuel and advanced electrical control, the total energy consumption of curing tobacco may be reduced as much as 60% which includes the amortized cost of the new equipment.

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

While it is well-documented that the United States has a safe food system from field to fork, the number and severity of food borne illnesses continue to make food safety a public health priority. Ten years ago, a team of scientists at the U.S. Centers for Disease Control and Prevention (CDC) put together a best estimate of how many Americans get food poisoning each year; 76 million illnesses, which resulted in 325,000 hospitalizations and 5,000 deaths. While the number of food poisonings has held steady in recent years, it is now estimated that close to 87 million cases, 371,000 hospitalizations and 5,700 deaths occur annually based the CDC formula and current population figures. Moreover, food safety is a moving target since pathogens continue to evolve and adapt, with changes in the way that food is produced, processed, delivered, and consumed, and as new hazards may be introduced. Given several recent outbreaks of microbial food borne disease, the safety of the nation's food is a critically important issue for both the agricultural production and processing sectors, as well as for the consumer. There has been considerable scientific progress in understanding, identifying, and mitigating hazards in the food chain, especially during the past decade. Much of this progress is due to the rapid application of emerging science, both within regulatory agencies as well as the food industry, from pre-harvest to the consumer. In order to reduce the incidence of food borne illness even further and to ensure continued safety in the food chain, a broad food safety research and outreach agenda is needed.

The associated knowledge areas in this planned program area are protecting food from contamination with pathogenic organisms and harmful chemicals including residues, quality maintenance in storing and marketing of food products, new and improved food products, food processing technologies and home and commercial food service.

Some recent extension program achievements are:

The number of individuals completing non-degree certificates courses in a variety of food safety education and training programs through a number of granting agencies continues to grow; in 2008 over 400 individuals received non-degree certificates in Hazard Analysis and Critical Control Point (HACCP) approach with over 25,000 individuals being certified nationwide since 1997.

The value-added meat processing industry is a very important segment of North Carolina's economy. In 2004, the USDA reported that North Carolina muscle foods industry products contributed over $4 billion to the state economy. In 2008, 48 different value added meat products was developed in a state of the art muscle foods processing laboratory on campus. Of these, 10 products were introduced into the retail market. The annual profits generated from these new products are estimated to be over $12 million.

Some selected research programs led to the following results:

Foodborne disease outbreaks associated with fresh produce (lettuce, tomatoes, etc.) have increased in the past decade. A semi-quantitative risk ranking tool was created to identify priority pathogen-produce commodity combinations based on explicit data-driven risk criteria. The model is flexible, can easily be updated with new data, and may be adaptable to additional pathogen-commodity pairs (including produce and non-produce products, and toxigenic agents) in the future.

Bacteria survive to their pathogenic potential by adapting to changing conditions and protect themselves against hostile climates, both natural and those apportioned on them in the forms of anti-infectives. A combination of genetic, biochemical, thermodynamic methods and high-resolution NMR spectroscopy are being used to elucidate mechanistic and molecular recognition features of proteins involved in bacterial regulatory and protection processes. The impact of our work is to provide targets to inhibit infectious disease. For example, biofilms are protective communities of bacteria that are resistant to antibiotics. Classes of non-toxic, potent chemicals from a marine sponge that eradicate biofilms have been discovered. These molecules are being refined for use in therapeutic and industrial applications.

Probiotics, meaning "in favor of life", are microbial cultures that are suspected to provide a variety of health benefits, including stimulation of the immune system, limiting antibiotic associated diarrhea, cancer retardation, antagonism to enteric pathogens, and reduction of intolerance symptoms to lactose. The predominant group of microorganisms considered to elicit these probiotic properties are members of the lactic acid bacteria, most notably species of *Lactobacillus* and *Bifidobacterium*. These two organisms are most commonly provided to consumers via cultured dairy products, notably yogurt. This effort has identified a series of genes that are predicted to be vital for the survival and activity of probiotic cultures in both yogurt and the gastrointestinal tract. Genetic regions have been discovered that direct acid tolerance, bile tolerance, promote attachment to intestinal epithelial cells and signal communication with immunomodulatory cells of the intestinal mucosa that help direct pro- or anti-inflammatory responses.

Edible meat from trimmings and deboned carcasses of meat, poultry and fishes continue to be wasted. A new method of recovering and refining such meats, which removes fat, connective tissues (including skin) and bone, was developed. A second method of solubilizing and injecting this meat protein into intact fillets and cuts of meats, poultry and seafoods was also developed. Value can be added to both the recovered meat and the treated meat cuts as a result that will provide tremendous

returns to the industry while keeping the cost of muscle foods lower for consumers, world-wide.

The first ever continuous flow microwave sterilization based plant is now operational in Snow Hill, North Carolina. This novel process recently received a letter of no objection from the FDA (allowing commercial production). Aseptic, advanced processing technologies are leading the way to food preparation areas where only warming of sterile products and/or ingredients is needed. Impacts include maximizing nutritional and health benefits to all possible consumers of prepared meals. The development is creating new market opportunities for the sweet potato industry, boosting its production for farmers, and eventually offering employment in rural areas. A substantial market could be developed for this functional ingredient, and there would be considerable upside potential for the sweet potato industry. Farmers have a market for their off-grade produce (30% of their crop) and more value-added products with high levels of beneficial phytochemicals would be available for the consumers.

Human Nutrition and Health

The importance of promoting nutrition and wellness throughout life has been clearly established. Dietary factors are associated with five of the ten leading causes of death in North Carolina and the United States. Programs that provide consumers with research-based information and

trategies for behavior change on healthy eating and physical activity are imperative. Participants must be informed and empowered to make positive lifestyle changes to optimize health. No time is more important than childhood to promote healthy eating and health practices. Children in North Carolina do not consume enough fruits or vegetables and have diets that are low in fiber and higher in fat than recommended. Children in North Carolina need quality nutrition education to help positively influence their food choices. For nutrition education efforts to be effective they must also include parents and care givers. Helping families make informed decisions about their nutrition will help ensure that North Carolina's children grow to reach their full mental and physical potential. Overweight in children in North Carolina continues

to rise. Treatment of overweight and obesity is difficult. Preventing overweight and obesity in children is essential to address this issue Demographic changes in North Carolina's population continue to impact nutrition and health issues. The fastest growing age group in the state is the 65 years-and-over segment. The elderly run disproportionate 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.

To that end, 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, healthy, and chronic disease prevention and were offered to North Carolinians of diverse income levels, age groups, genders, and/or 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. 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 using the Internet, computers, mailed materials, media, one-on-one contact, and public meeting. Research projects continue to seek scientific discoveries that will enhance the quality of living for the states' 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 24,000 North Carolinians who participated in programs conducted by NC Cooperative Extension have made at least one positive dietary change. Changes include increased consumption in fruits and vegetables, increased breakfast consumption, decreased fat consumption, increased dairy consumption and change in portion sizes to better match recommendations per mypyramid.gov. All of these behaviors reduce the risk of chronic diseases including heart disease, stroke and some forms of cancer. Also, these dietary behaviors are related to an increased likelihood of achieving and maintaining a healthy weight.

Over 2,000 child care providers who attended training increased their knowledge about nutrition and physical activity in children. These providers serve over 20,000 preschool children across the state. 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 he amount of physical activity for the children. One way this was achieved was by using the Color Me Healthy curriculum, a program designed for the preschool classroom on healthy eating and physical activity. This curriculum has been shown to be an effective tool at increasing nutrition knowledge, fruit and vegetable recognition and willingness to try new foods in the children.

4,928 families enrolled in EFNEP 10,339 participated in 4H 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, 72% used food labels more often to make food choices, 93% improved in one or more food resource management practices, 45% of participants increased the amount of physical activity, 98% of participants improved their diet, 63% increased fruit consumption, 53% increased vegetable consumption, 59% 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 heating 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 indicate that participants have lost an average of 8.5 pounds by the end of the program (n=440).

Research projects focusing on insect and disease vectors has resulted inmajor impacts. One project has enabled the apple industry to successfully transition away from the use of OP insecticides in favor programs that represent far greater safety to humans and the environment. When results from the program are projected over the entire eastern US apple industry of ~180,000 acres, the amount of insecticide applied annually will be reduced by 470 tons per year. In North Carolina, this represents an annual reduction of almost 17 tons of insecticide.

A study of ticks as a disease vector for Rocky Mountain Spotted Fever indicate that the most abundant tick species in the landscape and the species that people would most likely be exposed to is the lone star tick. Concern is focused on the disease agents that are transmitted by this ticks species; namely, *Ehrlichiachaffeensis* and *Borrelialonestari*. Because of its high prevalence in lone star ticks, residents in Chatham County should also be concerned about *R. amblyommii* as it could be an emerging human pathogen.

>Families and Communities

Families and individuals in North Carolina face a number of significant challenges. Rapid changes in society and in the economy create multiple family challenges and stressors. In terms of the economy, individuals and families often lack basic skills in financial decision making, planning and stretching financial resources. Families in financially stressful situations are making decisions that cause long term serious financial consequences. Societal stressors include normal factors such as maturity, communication and family dynamics as well as others external stressors such as disaster, war, and economic loss. Parents need skills to help them cope with stressors and develop positive, quality and nurturing relationships with their children.

In response, Extension has delivered educational programs that address the needs of citizens related to financial management and parenting. In North Carolina, 1956 participants followed a budget, 485 opened a savings account for the first time, 224 used home foreclosure prevention strategies, 788 reduced their debt, and almost 1500 began using money management skills. As a result of participating in focused parenting educational experiences, 1822 parents report using positive parenting practices; 1643 parents adopted appropriate guidance and supervision practices, and 1357 parents adopted appropriate disciplinary practices.

>Youth Development

Faculty and staff at North Carolina State University have been engaged in a wide array of extension and research related projects that promote 4-H positive youth development. These efforts are very broad in scope, impact, and clientele served. Major concerns include: health and well-being, workforce development, K-12 academic excellence, volunteerism and leadership, and 21st century life skill development. 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 2008, the planned program of the 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 15,041 youth participated in Career / Employability programs resulting in 1,120 youth establishing career goals. 10,500 youth participated in Service Learning Programs where they learned first-hand the critical elements involved in particular career pathways. And, 345 youth obtained certifications to improve their employability status.

- The health and well-being of youth in NC has changed significantly in the past decade. 13,772 youth increased their daily consumption of fruit and vegetables by at least one serving. 11,498 youth increased their daily physical activity; and 14,376 youth increased their skills in selecting and preparing healthy meals and snacks at home.

- Across NC, 4-H youth are solving some of the most pressing issues in their communities, and their track record is impressive. 22,980 youth and adult 4-H volunteers participated in a variety of Extension programs across our state. 4,422 participants reported serving in new volunteer roles in their community. Over 90,000 participants increased their knowledge of

leadership and 73,521 developed skills in problem-solving.

- 47,421 youth gained problem solving skills and 35,522 gained critical thinking skills. In addition, 30,961 youth increased their knowledge of diversity (family types, culture, etc.).

- 12,051 youth increased their homework completion skills while 10,469 youth increased the quality of their homework. 7,073 youth performed better on End-of-Grade (EOG) tests due to 4-H programs and 550 families became more engaged with their youth's homework.

- The estimated value of the 4-H Academic Achievement Programs to the state of NC is over $9.4 million (a return of over $65 for every $1 dollar spent by Extension).

Total Actual Amount of professional FTEs/SYs for this State

Year:2008	Extension		Research	
	1862	1890	1862	1890
Plan	394.0	37.0	413.0	0.0
Actual	411.0	36.0	423.0	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 Cherokee Indian Reservation; the state's Advisory Leadership System members; and local Advisory Leadership Councils for each of local administrative units. The Long Range Plan has been under review by state program leaders and advisory systems throughout the state as greater efforts are focused on assuring program relevance and programs that result in impacts the public is willing to support. Practicing Extension professionals who actually implement the various programs implemented the needs assessment process that involved 22,438 of the state's citizens. The state program leaders and the assistant administrator for state programs have also intensified their leadership roles as key merit reviewers. The other merit review group is the AREERA program area chairs. Collectively, all of these individuals provide a significant internal merit review of programs taking into consideration the needs and expectations expressed in the stakeholder input process. 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. PI's interact with appropriate representatives of stakeholder and scientific groups. Consultation with faculty and stakeholders during the informal review phase should includes inquires regarding both the scientific soundness of the proposed research and the relevance to the appropriate stakeholder groups' needs. In this formative stage, comments and suggestions from other faculty and stakeholders may be more productive and useful than those received later through the formal review process. All input should be considered and appropriate adjustments made as the research project outlines are developed.

III. Stakeholder Input

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

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

Brief Explanation

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

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

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

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

To ensure appropriate, inclusive, and adequate stakeholder input, the organization implements an environmental scan in each county and on the Cherokee Reservation every other year. These scans are conducted by a diverse group of extension employees, volunteers, clientele, commodity groups, and county residents.The scans provide a wide base of needs, issues, trends, and emerging issues that are representative of diverse groups throughout the county.

In 2007, a needs assessment was completed in each of the 101 Cooperative Extension's county administrative units.Each administrative unit conducted independent assessments using primarily: surveys, personal interviews and group meetings.Each unit prioritized the top seven needs/issues that stakeholders had identified.

There were 3,736 groups involved in the county assessments.Data were obtained from 22,438 individuals altogether.

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

might involve any state or federal legislation.

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

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

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

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

1. Method to identify individuals and groups

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

Brief Explanation

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

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

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

1. Methods for collecting Stakeholder Input

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

Brief Explanation

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

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

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

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

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NCARS receives support annually from college□based foundations, including the Agricultural Foundation, CALS Research Foundation, Tobacco Foundation and the Dairy Foundation. These foundations fund research projects and graduate students on a competitive basis across a wide range of areas. NCARS administration meets with the

Research and Extension Committees each fall to hear discussion of priority areas for research activity in all aspects of agricultural production and agribusiness. Then in late winter, these committees meet again to select and approve research projects for funding, which provides another opportunity for input on research priorities.

3. A statement of how the input was considered

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

Brief Explanation

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

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

Brief Explanation of what you learned from your Stakeholders

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

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

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, 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

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
10628693	3062467	6642824	0

2. Totaled Actual dollars from Planned Programs Inputs

	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	6470478	1146010	6673678	0
Actual Matching	12967918	1146010	72805494	0
Actual All Other	13558580	268707	66144740	0
Total Actual Expended	32996976	2560727	145623912	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous years

Carryover	0	0	0	0

V. Planned Program Table of Content

Program #1

V(A). Planned Program (Summary)

1. Name of the Planned Program

Plant Production Systems and Health

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

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

V(C). Planned Program (Inputs)

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

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	105.0	7.5	171.0	0.0
Actual	104.0	7.5	171.0	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
1105195	182145	2884413	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
3178769	182145	38036409	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
3710304	62787	18808743	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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

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

2. Brief description of the target audience

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

V(E). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	470000	960000	12500	23100
2008	260100	865490	22300	14370

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

Patent Applications Submitted

Year	Target
Plan:	10
2008 :	14

Patents listed

Buddleia sp. (butterfly bush) NC 2003-22 'Miss Ruby'
Buddleia sp. (butterfly bush) NC 2004-9 'Blue Chip'
Inhibition of Biofilms in Living Plants by Use of Imidazole Derivatives
A Method to Inhibit Ethylene Responses in Plants
Methods and Compositions for Expressing Proteins in Plants
Inhibition of Biofilms in Living Plants by Use of Imidazole Derivatives
Compounds Inactivating the Ethylene Receptor by Application in a Volatile or Non-volatile Form
Compounds Inactivating the Ethylene Receptor by Application in a Volatile or Non-volatile Form
Method of Inhibiting Ethylene Responses in Plants Using Dicyclopropene Derivatives
Method for Preventing Ethylene Response in Plants Using Dicyclopropene Derivatives
Regulation of Quinolate Phosphoribosyl Transferase Expression formerly Altering Nicotine Content in Tobacco by Way of Genetic Engineering
Cyst Nematode Resistant Transgenic Plants
Expression of a Calcium-Binding Peptide in Tomato Plants Increases Carotenoid Content in Fruits and Delays Senescence

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	77	433	
2008	134	418	552

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Peer reviewed publications produced

Year	Target	Actual
2008	510	552

Output #2

Output Measure

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

Year	Target	Actual
2008	27	21

Output #3

Output Measure

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

Year	Target	Actual
2008	305000	880860

Output #4

Output Measure

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

Year	Target	Actual
2008	960	1856

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	500000	5400000

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 realizing the benefit of locally grown, fresh produce produced by both traditional an organic means.

What has been done

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

Results

Large-scale commercial blackberry acreage has more than doubled in North Carolina in the past 2 years. In 2007-8, an estimated 300 new acres of blackberries were planted. Collectively, this new acreage of blackberries should net well over $2,452,000 /year for NC growers. The muscadine grape industry also continues to expand with approximately 1,400 acres planted. Average muscadine grape yields are 5-8 tons per acre and prices paid for muscadines by wineries in North Carolina range from $550 to $1000 per ton. Fresh muscadines bring an even higher price, as much as $1600 per ton. Two sweet sorghum cultivars have been indentified that are particularly suitable for ethanol production.

4. Associated Knowledge Areas

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

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
2008	205000	5050400

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Studies on nutrient management in turf involving evaluations of slowly available fertilizers include determining the effectiveness of nitrogen combination sources on Bermuda grass performance; evaluation of methlylene urea and coated urea products for turf performance; and characterizing nitrogen fate under golf course fairway conditions. These projects have provided information on the use of nitrogen fertilizers that potentially have less environmental impact from a surface water and groundwater perspective. Additionally studies on the use of use on turfgrass systems is providing the first scientifically based guidelines for the appropriate timing and application amounts for effluent on turfgrasses

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
211	Insects, Mites, and Other Arthropods Affecting Plants
213	Weeds Affecting Plants
205	Plant Management Systems
212	Pathogens and Nematodes 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 Extension
•1890 Extension
•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	25	125

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 plant varieties that are adapted to the often severe environmental conditions in North Carolina.

What has been done

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

Results

New varieties of horticultural crops released for NC growers include ÃƒÂƒÃ‚Â”HatterasÃƒÂƒÃ‚Â” an orange-fleshed table stock sweetpotato and ÃƒÂƒÃ‚Â“NC-74ÃƒÂƒÃ‚Â” and Danbury hybrid cucumbers. Additionally several selections of redbud (Cercis Canadensis) are near release. Among the row crops, ÃƒÂƒÃ‚Â“BaileyÃƒÂƒÃ‚Â”, a peanut with good yield potential and disease resistance was released.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
206	Basic Plant Biology
201	Plant Genome, Genetics, and Genetic Mechanisms
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 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	10	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

New techniques are being developed for utilizing agricultural wastes. Procedures are also being developed for genetic engineering various crops

Results

Studies have demonstrated that the pomace resulting from the processing of muscadine grapes into juice wine can be used to produce ÃƒÂ‚Ã‚Â“value-added productsÃƒÂ‚Ã‚Â” including extracts, and that these extracts are rich in antioxidant nutrients that are effective in inducing apoptosis in cell culture model systems. Three yeast strains which can produce ethanol from the sugars present in the agricultural waste products have been identified. They produce ethanol at levels comparable to currently used yeasts and they are more resistant to inhibitors present in the agricultural waste than these yeasts and are promising for use in these ethanol fermentations. Generic E. coli were found in the surface water used for irrigation at two locations. In all cases, following the use of the chlorination using calcium hypochlorite (tablets) these generic E. coli levels were brought to levels at or below the detection limits of the test being used. This system offers an affordable and straightforward way to address an immediate need by the vegetable production industry.

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)
212	Pathogens and Nematodes Affecting Plants
206	Basic Plant Biology

Outcome #5

1. Outcome Measures

Increased profit through the adoption of new production practices

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	31000000	14681000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

An online irrigation management decision aid to help the homeowner apply irrigation to their turf as efficiently as possible has been developed and implemented. This tool is free and available to all North Carolinians. Under normal water use conditions, this program will result in water savings of at least 25%, Adoption of modern production practices by corn growers reduced the impact of the summer drought in 2008 resulting in a return of $6,900,000.

4. Associated Knowledge Areas

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

204	Plant Product Quality and Utility (Preharvest)

Outcome #6

1. Outcome Measures

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

Not reporting on this Outcome for this Annual Report

Outcome #7

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	36000	76100

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

A workshop was held on starting a bunch grape vineyard in North Carolina and on-farm visits with potential growers and the county agent(s) were conducted in various sites across the state.
Caneberries. Numerous workshops and presentation have been conducted on both grafting and high tunnels and a number of growers have implemented grafting and high tunnels. Workshops were held at two locations across the state on the production of bread wheat and organic grains. Forty workshops and field days were held for turf managers which attracted over 3,000 participants.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	10	8

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

A peanut IPM decision aid has been developed that seeks to aid users in determining their risk of developing pest problems. The computerized decision aid is free to the public, and focuses on disease and insect control in peanuts. Research has studied the risk factors that exist for single pests in peanuts; however a compilation of the interactions between the pests (and the sometimes conflicting management tactics) has not been compiled into a decision aid for North Carolina peanut growers

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

Increased acreage of organic crops and speciality crops.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	37000	1019

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

Studies have been conducted to identify suitable varieties and develop practices for the production of organic 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 websites have been set up for organic production of small grains and vegetables

Results

There is an increasing demand for organic muscadine grapes and 60 acres grapes will be planted in 2009 to meet this demand. The acreage of organic grains continues to increase as demand exceeds the supply in NC. Based on research conducted in western NC, organic heirloom tomatoes were estimated to gross over $200,000/acre. In 2008 over 1000 acres were transitioned into organic grain production and at least 10 farmers started to grow and market organic grains from their farms. Studies are also underway to develop systems for reducing tillage in organic crops.

4. Associated Knowledge Areas

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

Outcome #10

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	22	14

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

Genes that control over one-half of the winter hardiness abilities of oat plants using user friendly DNA markers have been identified. As a result, breeders will now be able to screen for winterhardiness every year, rather than once every three to four years. Genome regions controlling photoperiod responses and flowering time in corn have been mapped A complete genome sequence has been obtained for the root-knot nematode Meloidogyne hapla, permitting a full accounting of the genetic arsenal of this parasite. Similarly, a complete proteome has been predicted, and initial experimental confirmation undertaken. Collectively, this has revealed genes and proteins with functions that are likely to be crucial for parasite viability. Genes from a plant pathogenic fungus that provide resistance to toxic forms of oxygen have been isolated. These genes are being studied to determine how they function to protect cells of living organisms

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

In 2008, research and extension activites in theh Plant Production Systems Health Program were primarily affected by dry weather and the availability of funds.Although irrigation was available on most of the research stations, on-farm research and demonstration plots were negatively affected by dry weather in June.Flat or declining budgets at the Federal and State level and increased competition for competatiave funds made it more difficult to maintain current programs and initiate ones.Budget reductions in the 2008-2009 fiscal year will have a negative impact on research and extension programs in 2009.

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

1. Evaluation Studies Planned

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

Evaluation Results

Key Items of Evaluation

Program #2

V(A). Planned Program (Summary)

1. Name of the Planned Program

Economic Systems

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
601	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%	
	Total	100%	100%	100%	

V(C). Planned Program (Inputs)

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

Year: 2008	**Extension**		**Research**	
	1862	**1890**	**1862**	**1890**
Plan	14.0	9.0	7.0	0.0
Actual	13.0	9.0	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**
389579	273218	307921	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
984672	273218	3122382	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
139569	145365	1083849	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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

2. Brief description of the target audience

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

V(E). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	3000	4000	400	800
2008	3690	6530	620	775

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

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	1	1	
2008	25	91	116

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Non-degree credit activities

Year	Target	Actual
2008	80	50

Output #2

Output Measure

- Number of county and area tax preparer schools

Year	Target	Actual
2008	24	26

Output #3

Output Measure

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

Year	Target	Actual
2008	300	1345

Output #4

Output Measure

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

Year	Target	Actual
2008	15	27

Output #5

Output Measure

- Integrated Research Projects Conducted

Year	Target	Actual
2008	6	7

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 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

Year	Quantitative Target	Actual
2008	700	1250

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

With these opportunities for continuing education professional tax preparers (CPAs, Enrolled Agents, Accountants and others) receive up to date information for current year tax filing. These Schools have reached over 1,200 tax preparers, who in turn prepare over 500,000 income tax returns: individual, partnership, corporation, LLC and other types. Consumers of these services can have an increased measure of confidence that documents are prepared correctly and with accuracy because of better understanding of tax law and regulations.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

New organic and agritourism markets established by individual entrepreneurs

2. Associated Institution Types

•1862 Extension
•1890 Extension
•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	11	40

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

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

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Growers Adopting Improved Business Management Practices

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	2000	3060

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

Extension agents and specialists at both NCA&T and NCSU extension have conducted numerous business management workshops and other farmer educational programs to assure that our audiences are adequately educated on efficient management practices, record keeping, 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: 'The demand for locally produced foods and agritourism is encouraging new growers to get into sustainable or organic vegetable production. To help train new farmers, Cooperative Extension and Orange County developed a program called PLANT @ Breeze. This program included an eight week series that trained forty-three growers on sustainable vegetable production. At the end of the program, evaluation results were very positive, with growers learning skills in production, marketing, farm management, and business management. Over half of the participants plan to begin some type of commercial production in the future.' and 'Farmers statewide are struggling to make a decent living and to keep their farms. They need access to sustainable and profitable markets. Support from the Tobacco Trust fund has enabled Cooperative Extension to hire an additional agent to focus specifically on helping farmers in the eleven county Fort Bragg region. The agent recognized that significant margins and improved agricultural and business practices are benefits of growing for the wholesale organic market. The Production Manager for Eastern Carolina Organics and a diversified, organic vegetable grower gave an organic market presentation. The forty people from three counties who attended obtained an overview of organics, growing practices and certification needed. Three farmers from Moore County, one of whom is a former tobacco farmer, are planning on growing organically this year.'

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

An extreme drought throughout 2007 that continued into 2008 with a huge adverseimpact on row, hay, and nursery crops coupled with the highly volatile commodities market, inputs costs, and economic downturn has required that every businessmanagement 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 has resulted in the need for highly informed decisions regarding enterprise mix and allocation of resources.Of course, ever advancing technologies has led to the need for increased computer competencies, as well as other technological innovations such as precision farming, and the resultant need for accurate decision making regarding the use of such technologies, and the exercise of keen marketing skills.

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
- Other (economic impact of drought on agricultural income)

Evaluation Results

Based on survey information provided by county agents, the unadjusted total economic loss of drought on North Carolina agriculture was $500 million (last 6 months of 2007 and first 6 months of 2008). Long-term economic impacts were noted for the nursery industry, beef cattle, and dairy industries. Crop insurance premiums paid by growers was $43 million (plus $65 million in federal government insurance subsidies) resulted in a net economic loss due to drought of $436 million. Using the standard economic income multiplier value of 1.5, then the economic loss from the drought was in excess of $650 million over the period. Longer term, reduce water restrictions imposed by cities and towns will reduce demand for outside shrubs and woody ornamental plants so producers remain impacted by longer-term drought policies enacted by policymakers. Economic impact information about the drought was presented to members of the North Carolina General Assembly Drought Committee in 2008.

Key Items of Evaluation

Note the long term effects of the NC drought that occurred in NC in 2007 and in some areas of the state in 2008 based on the above study.

Program #3

V(A). Planned Program (Summary)

1. Name of the Planned Program

Natural Resources and Environment

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

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

V(C). Planned Program (Inputs)

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

Year: 2008	**Extension**		**Research**	
	1862	**1890**	**1862**	**1890**
Plan	45.0	2.0	18.0	0.0
Actual	45.0	2.0	18.0	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**
946078	60715	241231	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1569856	60715	4010352	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1509340	26400	1801506	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) and other, primarily non-urban, situations. With that information in hand, improved management and technological solutions will be proposed and evaluated. Technology transfer will be accomplished through demonstrations, workshops, and publications by Cooperative Extension in concert with the researchers involved.

2. Brief description of the target audience

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

V(E). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	8000	17000	220	550
2008	16470	27730	2560	1250

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

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	5	25	
2008	14	38	52

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Waste Management Certification Programs

Year	Target	Actual
2008	40	65

Output #2

Output Measure

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

Year	Target	Actual
2008	5	39

Output #3

Output Measure

- Number of non-degree credit environmental activities conducted

Year	Target	Actual
2008	710	510

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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

Outcome #1

1. Outcome Measures

Number farms first utilizing precision application technologies

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	25	636

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

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

Outcome #2

1. Outcome Measures

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

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
2008	25	1577

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., pfisteria).

What has been done

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

Results

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

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
102	Soil, Plant, Water, Nutrient Relationships
141	Air Resource Protection and Management
133	Pollution Prevention and Mitigation
112	Watershed 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
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	40	3186

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

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

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Number of Waste Management Certifications Gained or Maintained

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	4050	1080

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

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

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Number of farms implementing improved nutrient management

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	75	936

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

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

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Number of animal production facilities implementing improved air quality management

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	75	75

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

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

4. Associated Knowledge Areas

KA Code	Knowledge Area
141	Air Resource Protection and Management
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

2008 was an "interesting" year for agriculture and the environment in North Carolina.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 habitat for wildlife.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 governmental 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

Program #4

V(A). Planned Program (Summary)

1. Name of the Planned Program

Animals and Their Systems, Production and Health

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

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

V(C). Planned Program (Inputs)

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

Year: 2008	**Extension**		**Research**	
	1862	**1890**	**1862**	**1890**
Plan	59.0	3.0	129.0	0.0
Actual	58.0	2.5	122.0	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**
999714	189734	2078486	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1383685	189734	16873459	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1327990	0	8202302	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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 stake-holders 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. Stake-holders 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 stake-holders 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

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

V(E). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	170000	270000	61000	101000
2008	179145	812262	52334	31707

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

Patent Applications Submitted

Year	Target
Plan:	5
2008 :	3

Patents listed

Mutant Versions of a Geminivirus Replication Protein for Interference with Geminivirus Infection^
Use of Terameprocol to Inhibit Poxvirus Infection
Methods For Treating Flaviviruses And Hepaciviruses With Termeprocol

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	25	75	
2008	18	245	263

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Target	Actual
2008	700	932

Output #2

Output Measure

- Relevant and impacts focused research projects to be conducted

Year	Target	Actual
2008	100	0

Output #3

Output Measure

- Youth Livestock Shows Producing Scholarship Income

Year	Target	Actual
2008	35	34

Output #4

Output Measure

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

Year	Target	Actual
2008	26	75

Output #5

Output Measure

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

Year	Target	Actual
2008	30	49

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

Outcome #1

1. Outcome Measures

Income Optimized by Livestock Producers Adopting Improved Nutrition Practices

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	3300000	2350000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

Livestock producers experienced improved animal production which was manifested in $2.35 million increased income.

4. Associated Knowledge Areas

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

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

Year	Quantitative Target	Actual
2008	2200000	2840000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

Farmers have experienced an increased income of $2.84 million due to improvements in animal genetics.

4. Associated Knowledge Areas

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

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

Year	Quantitative Target	Actual
2008	5200000	8409860

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

Farmers adopting improved animal management programs have experienced improvement in animal growth and performance resulting in increased farm income of over $8.4 million.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	1625	4745

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

In North Carolina, 4,745 youth have been successful in programs where they have enjoyed personal growth and learned about the importance of animal agriculture to their world, nation, and community.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Scholarship Money Gained From Youth Livestock Shows

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	101000	125000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

North Carolina youth have received $125,000 as scholarships.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	9200	3100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

Through agent activities, over 3,100 farmers have adopted new practices that will allow them to enjoy improved farming operations and increase their farm income.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	6300	3060

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

Agents have been successful in providing over 3,000 farmers successful adoption of improved planning and financial record keeping practices.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

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

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

1. Evaluation Studies Planned

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

Evaluation Results

Key Items of Evaluation

Program #5

V(A). Planned Program (Summary)

1. Name of the Planned Program

Agricultural, Natural Resource, and Biological Engineering

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

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

V(C). Planned Program (Inputs)

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

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	19.0	1.0	11.0	0.0
Actual	19.0	1.0	12.0	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
287573	30357	126774	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
719642	30357	1246155	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
838020	0	410996	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 the 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

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

Year	Direct Contacts Adults Target	Indirect Contacts Adults Target	Direct Contacts Youth Target	Indirect Contacts Youth Target
Plan	8500	14000	500	600
2008	12140	15075	1020	1930

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

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	11	30	
2008	12	57	69

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
2008	5	5

Output #2

Output Measure

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

Year	Target	Actual
2008	7	74

Output #3

Output Measure

- Non-degree credit group activities completed

Year	Target	Actual
2008	20	35

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
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	15	921

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

Growers have converted from sprinkler irrigation to drip irrigation. Much vegetable production, including the majority of tomato production has moved to drip under plastic (plasticulture). A set of extension bulletins on subsurface drip irrigation for North Carolina has been published and is available online Extension guidiance on controlled drainage to minimize nitrogen losses and improve crop yields is continuing with the development of a web-based advisory system.

Results

Growers used fertigation to correct nutrient deficiencies in fruit and vegetable crops. Several berry and grape growers decided to add irrigation systems after attending local trainings and conferences.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Number of stream miles restored

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	5	5

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 areas and some have traditionally farmed right up to the edge of the creek. Unprotected riparian areas can lead to streambank instability and loss of land, increased transport of nutrients to streams and loss of wildlife habitat.

What has been done

NC State University has developed an comprehensive education program to improve the practice of stream restoration in addressing stream degradation. This program includes a series of River Course workshops in which over 2000 professionals have learned about stream assessment, design, construction, and monitoring. NC State University has provided leadership since 1998 for the biennial Southeast Stream Restoration Conference. More than 60 grant-funded projects across the state have been used to demonstrate and evaluate stream restoration practices.

Results

The quality of stream restoration projects has improved in the past decade, as professionals have gained increased understanding of stream restoration principles and applications. Funding for projects has increased as resource agencies determine that previous projects are successful in meeting water quality and habitat goals. [Eight-hundred fifty-one] people received training or attended a conference related to stream restoration in 2008.

4. Associated Knowledge Areas

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

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

Year	Quantitative Target	Actual
2008	25	95

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

Since 1997, nearly 100 demonstration sites have been established across the state, and a series of conferences, workshops and study tours has been offered to stormwater professinals. NCSU has brought stormwater ucation to the public by the use of 1) the world wide web (www.bae.ncsu.edu/stormwater) 2) Stormwater BMP Design Courses (now BAE 575) taught at NC State, and 3) Production of Media shows, PSAs and videos. Design standards for a wide array of stormwater BMPs have been or are being established by NCSU faculty.

Results

Hundreds of professionals have been educated through Extension events (such as workshops, tours, web courses, NCSU classes) on stormwater treatment annually. In 2008, over 300 people attended the 2nd National Low Impact Development Summit in Asheville, NC. Extension agents have been trained to deliver effective stormwater education programs to the public. New design standards have been developed and used throughout the state by the engineering and regulatory community. Lanscapers have received training on stormwater BMP maintenance. The general public was educated through PSAs running on TV and on the radio, though a user-friendly and interactive stormwater resources web site, and through a stormwater video made for TV.

4. Associated Knowledge Areas

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

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

Year	Quantitative Target	Actual
2008	5	77

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

Over 1000 people received HAACP (Hazard Analysis adn Critical Control Points) training in 2008. Two-hundred twenty received new HAACP certification and 24 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

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Training in the use of irrigation systems for frost protection seems ot be an ongopiong need, as weather vagaries require precision actions at exactly the proper times.A continuing drought also directed extension focus towards management strategies and techologies (and associated workshops/sessions) towards water resource management and conservation.

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

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

1. Evaluation Studies Planned

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

Evaluation Results

An evaluation of the impact of animal waste system training via a designed survey was initiated two years ago and completed in 2008. The surveys were designed to evaluate change in management and equipment directly associated and attributed to training offered through NC State.

Four-hundred, twenty-one surveys were sent to individuals who attended the first two years of training programs. One-hundred, thirty-seven responses were received (33% return). The majority of training attendees responded that information and guidance that was presented in the training was implemented upon return to their facility. For instance a total of 321 equipment assessments were made by 102 individuals who assessed their system after training. This is over 3 assessment items per individual and reflects that several aspects of the animal waste application system were assessed for proper operation. In addition to hardware changes, 35% of respondents said that operational and management decisions were changed due to information learned at training.

Survey responses show a positive correlation between training and better irrigation system operation due to assessment, equipment maintenance and operational changes. Hence, environmental benefits include more efficient nutrient use on land application fields, and less risk of introducing nutrients into the environment.

Key Items of Evaluation

Program #6

V(A). Planned Program (Summary)

1. Name of the Planned Program

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

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies	20%	20%	20%	
502	New and Improved Food Products	15%	15%	15%	
503	Quality Maintenance in Storing and Marketing Food Products	10%	10%	10%	
504	Home and Commercial Food Service	5%	5%	5%	
711	Ensure Food Products Free of Harmful Chemicals, Including 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%	
	Total	100%	100%	100%	

V(C). Planned Program (Inputs)

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

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	53.0	0.0	60.0	0.0
Actual	53.0	0.5	62.0	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
936091	0	492597	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1554041	0	4834485	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
2091660	23805	33266295	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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

2. Brief description of the target audience

Primary food producers, food processors, foodservice operators, county extension agents, state and federal regulatory agencies, commodity associations, news media and consumers. The primary audience 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

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	2100	3300	0	0
2008	18600	36000	0	0

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

Patent Applications Submitted

Year	Target
Plan:	4
2008 :	4

Patents listed

Lactobacillus Acidophilus Nucleic Acid Sequences
Lactobacillus Acidophilus Nucleic Acid Sequences Encoding Two Component Sensing and Regulatory Proteins, Anitmicrobial Proteins and uses Thereof
Lactobacillus Acidophilus Nucleic Acid Sequences Encoding Fructo-oligosaccharide Utilization Compounds and uses Thereof
Process for making whey proteins having improved thermal stalbility in beverage applications at neutral pH

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	2	4	
2008	10	90	100

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Target	Actual
2008	500	510

Output #2

Output Measure

- Relevant and impacts focused research projects to be conducted

Year	Target	Actual
2008	50	45

Output #3

Output Measure

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

Year	Target	Actual
2008	15	30

Output #4

Output Measure

- Number of firms adopting quality and safety strategies

Year	Target	Actual
2008	50	400

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

Year	Quantitative Target	Actual
2008	975	1302

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Safe and sustainable food systems are essential to our state and national economy and quality of life for North Carolina citizens. The need is to protect the food supply from contamination and to develop new and improved products and processing technologies. The issue is to reduce the incidence of food borne illness and to ensure continued safety and healthy foods for consumers.

What has been done

Food safety education and training workshops have been conducted by Extension peronnel for red meat, poultry, seafood, dairy and juice processors to reduce or elminate food safety hazards in the food supply. In addition food safety plans based on the Hazard Analysis and Critical Control Points (HACCP) approach have been implemented. Those individuals responsible for food safety must complete non-degree credit certification training in order to comply with state and federal regulations.

Results

Over 400 industry and regulatory personnel were certified under either the International HACCP Alliance or Seafood HACCP Alliance in 20 workshops. This allowed industry members to comply with mandatory regulatory requirements to verify food prevention plan and weekly Critical Control Point (CCP) records. These trained individuals have demonstrated proficiency in knowledge and skills to ensure fewer opportunities whereby unsafe food may cause food poisoning or related illnesses.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	50	436

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

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

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Number of companies adopting new technologies

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	30	69

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

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

4. Associated Knowledge Areas

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

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
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	30	3200

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

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

4. Associated Knowledge Areas

KA Code	Knowledge Area

503	Quality Maintenance in Storing and Marketing Food Products
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources.
502	New and Improved Food Products
504	Home and Commercial Food Service
501	New and Improved Food Processing Technologies
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

Year	Quantitative Target	Actual
2008	10	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

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

4. Associated Knowledge Areas

KA Code	Knowledge Area
503	Quality Maintenance in Storing and Marketing Food Products
502	New and Improved Food Products
504	Home and Commercial Food Service
501	New and Improved Food Processing Technologies

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

Recent food borne illnesses have increased demand for non-degree credit workshops, meetings and conferences planned in 2008. 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 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 participants surveyed were asked to rate information and technical assistance a on a scale of 1 to 5; 1 being the highest score and 5 the lowest score. Participants rated the knowledge and technical skills of program instructors are excellent and the impacts to both the individuals and businesses as very good to excellent. Many if not all businesses would not continue production operations without having completed the food safety certification program offered through Extension workshops. The same businesses cited technical information and services that aided in commercialization of new products and/or implementation of new processing technologies with impacts of over 40 million dollars to the state economy. Knowledge gained enabled participants to increase their job security and marketability in the food industry. Behavior change was the most noticeably impact based on the number of individuals who gained sufficient knowledge and confidence to prepare and implement improved food safety and quality control programs in their own businesses or employing firms.

Key Items of Evaluation

Program #7

V(A). Planned Program (Summary)

1. Name of the Planned Program

Human Nutrition and Health

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
702	Requirements and Function of Nutrients and Other Food 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%	
	Total	100%	100%	100%	

V(C). Planned Program (Inputs)

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

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	34.0	2.5	16.0	0.0
Actual	34.0	2.5	17.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
880453	75894	145220	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1055574	75894	1960413	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
744451	10350	1151178	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The Nutrition and Health program will promote optimum nutrition and health through diet and lifestyle in all North Carolinians regardless of gender, income, age, or race/ethnicity. Education programs addressing diet, healthy, and chronic disease prevention will be offered to North Carolinians of diverse income levels, age groups, genders, and/or cultural backgrounds across the state. Programs offered will include Give Your Heart A Healthy Beat, Project Eat Right: Add to Life Program, Color Me Healthy, Eat Smart, Move More, Weigh Less, 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 recepients and community coalitions. No time is more important than childhood to promote healthy eating and health practices. Children in North Carolina do not consume enough fruits or vegetables and have diets that are low in fiber and higher in fat than recommended. Children in North Carolina need quality nutrition education to help positively influence their food choices. For nutrition education efforts to be effective they must also include parents and care givers. Helping families make informed decisions about their nutrition will help ensure that North Carolina's children grow to reach their full mental and physical potential. Overweight in children in North Carolina continues to rise. Treatment of overweight and obesity is difficult. Preventing overweight and obesity in children is essential to address this issue. Demographic changes in North Carolina's population continue to impact nutrition and health issues. The fastest growing age group in the state is the 65 years-and-over segment. The elderly run disproportionate risks of malnutrition and poverty as well as poor overall health status. In fact, over 85% of older adults suffer from chronic diseases and could benefit from dietary intervention. The general nutrition needs of the well elderly must be addressed; however, the needs of the elderly for prevention of malnutrition and chronic disease actually begin much earlier in life. Programs addressed to young adults and the middle-aged consumers will continue to impact the health of the population as it "ages." Women are employed in greater numbers, and many of them are among the ranks of the working poor. Over 80% of women who had school-aged children were working outside the home; 67% of women with youngest child under six years were in the labor force. For working parents with very limited resources, lack of after-school and summer programs for youth are a major concern.

V(E). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	18000	40000	2500	7500
2008	155954	412628	32836	18093

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

Patent Applications Submitted

Year	Target
Plan:	5
2008 :	6

Patents listed

Peptide Aptamers that Bind to the Rep Proteins of ssDNA Viruses
Controlliing Biofilms with Small Molecules: Methods and Compositions
Controlliing Biofilms with Small Molecules: Methods and Compositions
Method of Identifying Hydrogen Evolving Diazotrophic Bacteria
Methods of Treating Infuenza Viral Infections
Peptides and Methods of Their Use as Therapeutics and Screening Agents for Human Immunodeficiency Virus and Other Retroviruses

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	3	4	
2008	11	70	81

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Target	Actual
2008	2100	4217

Output #2

Output Measure

- Targeted audiences participate in workshops on food and nutrition

Year	Target	Actual
2008	15000	130966

Output #3

Output Measure

- Child care providers attend training on food and nutrition

Year	Target	Actual
2008	3000	2990

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

Outcome #1

1. Outcome Measures

Program participants increase knowledge that will promote a healthier diet

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	10500	19564

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

Over 19,000 North Carolinians who participated in programs conducted by NC Cooperative Extension increased knowledge on how to promote a healthy diet. While knowledge does not indicate behavior change, certainly it is a step in moving toward lifestyle changes in diet that promote optimal health.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Program participants increase skills that will promote a healthier diet

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
2008	10500	12935

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

Over 12,000 North Carolinians who participated in programs conducted by NC Cooperative Extension acquired skills as to how to have a healthy diet. While acquiring skills does not indicate behavior change, certainly it is a step in moving toward lifestyle changes in diet that promote optimal health.

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Educational program participants make one or more positive dietary change

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	8500	24429

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

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

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	3100	2990

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

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

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	1850	2272

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

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

Results

Over 2,000 child care providers who attended training increased their knowledge about nutrition and physical activity in children. These providers serve over 18,000 preschool children across the state. By changing practices at the child care center level, we create an environment that is supportive of healthy eating and physical activity behaviors. Childcare providers participating in training increased the level of nutrition education taught in the preschool classroom as well as the amount of physical activity for the children. One way this was achieved was by using the Color Me Healthy curriculum, a program designed for the preschool classroom on healthy eating and physical activity. This curriculum has been shown to be an effective tool at increasing nutrition knowledge, fruit and vegetable recognition and willingness to try new foods in the children.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
703	Nutrition Education and Behavior
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 health eating and physical activity. These factors include the physical and social environment of families, communities and organizations; the policies, practices and norms within the social and work settings; and their access to reliable information. Lasting changes in health behaviors require physical environments and social systems that support positive lifestyle habits. In order for individuals (adults and children) to make positive lifestyle changes with respect to healthy eating and physical activity, changes need to be made in the surrounding organizational, community, social and physical environment. Without these changes, successful health behavior change is difficult to achieve and sustain. Confidence in adopting and maintaining a behavior may be strengthened when the physical and social environment supports the new behavior. Policy and environmental interventions can improve the health of all people, not just small groups of motivated or high risk individuals. NC Cooperative Extension continues to work using the 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 activitycontinue to challenge our ability to make improvements in eating and physical activity patterns.

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

1. Evaluation Studies Planned

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

Evaluation Results

There are many ongoing evaluation efforts in the area of healthy eating and physical activity across North Carolina. The following will highlight evaluation from the Expanded Food and Nutrition Education Program. EFNEP helps families and youth with limited resources—those most at risk to suffer from hunger, food insecurity and the ability to connect with available support systems.EFNEP offers practical nutrition information, food preparation, food resource management and food safety education in settings convenient for the participants. EFNEP graduates reflect significant, lasting improvement in eating behaviors and healthy food habits.

North Carolina EFNEP Reaches Diverse Audiences

In 2008, 4,928 families enrolled in EFNEP 10,339 participated in 4H 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, 72% used food labels more often to make food choices, 93% improved in one or more food resource management practices, 45% of participants increased the amount of physical activity, 98% of participants improved their diet, 63% increased fruit consumption, 53% increased vegetable consumption, 59% increased consumption of calcium rich foods Recent research shows the positive effects of families eating together. In North Carolina, we track meals eaten together as an indicator of participant families' well being. In 2008 clients were asked "How often do you eat meals or snacks with one or more family members?" After EFNEP participation, 62% of families more often ate together. Through a series of classes, 4H EFNEP participants learn basic nutrition, the importance of daily physical activity, how to make healthy food choices, and food safety in preparation and storage. Evaluation data shows the following: 77% of the youth reported eating a variety of foods, 82% increased their knowledge of human nutrition, 87% increased their ability to select low cost, nutritious foods, and56% improved practices in food preparation and safety.

Key Items of Evaluation

North Carolina EFNEP Reaches Diverse Audiences

In 2008, 4,928 families enrolled in EFNEP 10,339 participated in 4H 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, 72% used food labels more often to make food choices, 93% improved in one or more food resource management practices, 45% of participants increased the amount of physical activity, 98% of participants improved their diet, 63% increased fruit consumption, 53% increased vegetable consumption, 59% increased consumption of calcium rich foods Recent research shows the positive effects of families eating together. In North Carolina, we track meals eaten together as an indicator of participant families' well being. In 2008 clients were asked "How often do you eat meals or snacks with one or more family members?" After EFNEP participation, 62% of families more often ate together. Through a series of classes, 4H EFNEP participants learn basic nutrition, the importance of daily physical activity, how to make healthy food choices, and food safety in preparation and storage. Evaluation data shows the following: 77% of the youth reported eating a variety of foods, 82% increased their knowledge of human nutrition, 87% increased their ability to select low cost, nutritious foods, and56% improved practices in food preparation and safety.

Eat Smart, Move More, Weigh Less (ESMMWL)

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 heating and physical activity The program provides opportunities for participants to track their progress and keep a journal of healthy eating an dphyscia activity behaviros. Preliminary analysis of pilot data indicate that pariticipants have lost an average of 8.5 pounds by the end of the program (n=440).

Program #8

V(A). Planned Program (Summary)

1. Name of the Planned Program

Famlies 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%	
	Total	100%	100%	100%	

V(C). Planned Program (Inputs)

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

Year: 2008	**Extension**		**Research**	
	1862	**1890**	**1862**	**1890**
Plan	25.0	5.0	0.0	0.0
Actual	25.0	5.0	11.0	0.0

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

Extension		**Research**	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
380755	151787	397036	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
762359	151787	2721839	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
990626	0	1419871	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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

2. Brief description of the target audience

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

V(E). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	40550	120300	2200	8400
2008	36965	114993	8654	8008

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

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	3	0	
2008	14	5	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Develop and conduct Family Resource Management training and workshops.

Year	Target	Actual
2008	20	46

Output #2

Output Measure

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

Year	Target	Actual
2008	40	86

Output #3

Output Measure

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

Year	Target	Actual
2008	35	225

Output #4

Output Measure

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

Year	Target	Actual
2008	6	3

Output #5

Output Measure

- Conduct parenting education training for county agents

Year	Target	Actual
2008	5	9

Output #6

Output Measure

- Conduct educational workshops for consumers related to healthy homes

Year	Target	Actual
2008	25	38

Output #7

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
2008	30	555

Output #8

Output Measure

- Conduct debt reduction training workshops

Year	Target	Actual
2008	5	6

Output #9

Output Measure

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

Year	Target	Actual
2008	10	10

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	OUTCOME NAME
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

Year	Quantitative Target	Actual
2008	1000	337

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Basic skills and socializztion and educational motiviation are first taught in the home. Many of NC's youth, however, are growing up in environments that lack parental supervision and support. Quality time is lacking and children need this time in order to build trusting relatinships. The consequence of these circumstances is youth may suffer from anti-social and harmful behavior such as dropping out of school, becoming addicted to drugs and alcohol, behaving disruptively in school, participating in criminal activity or joining gangs.

What has been done

Family and Consumer Science agents are actively addressing these important concerns through educational programs focused on parenting and family life issues. These efforts help to strengthen families by developing parenting skills. Agents provide focused educational opportunities through workshps, trainings, conferences and camps that address the very real and urgent needs of parents and their children.

Results

As a result of participating in focused parenting educaitonal experiences, 1822 parents report using postive parenting practices; 1643 parents adopted appropriate guidance and supervision practices, and 1357 parents adopted appropriate disciplinar practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
2008	1500	1483

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Many North Carolinians lack basic financial managment skills, including basic financial decision making, goal setting, planning and budgeting. The result of this lack of skill is families/indivdiuals find themselves in difficult financial situations. The consequence of these situations can be long term.

What has been done

Family and Consumer Science agents teach basic financial management skills in order to assist families/indivduals in developing and using budgets, tracking spending, setting financial goals, and using credit wisely. These skills assist individuals/families in managing economic change that will occur throughout their lives.

Results

In addition to those individuals/famlies using basic money management skills, 267 youth wrote financial goals, 8690 participants gained knowledge in basic financial managment,4002 participants gained skills in basic financial management, and 3064 families/individuals developed a household budget.

4. Associated Knowledge Areas

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

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
2008	1500	761

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The economic crisis has affected many North Carolinians. Predatory lending, rising indebtedness, and job loss threaten the finacial stability of many individuals/families. The increase in home foreclosures and personal bankruptcies as a result of of these economic realities have created an uncertain future for many.

What has been done

Family and Consumer Science agents have conducted a number of workshops and trainings to assist individual/families in weathering the difficult economoy. The educational experiences focus on increasing financial managment skills, such as budgeting, credit management, bill paying and savings plans. These skills help families/individuals in improving their financial situation now and in the future.

Results

A number of indicators help to measure an increase in financial status. In North Carolina, 1956 families and indiviudals followed a budget, 485 opened a savings account for the first time, 224 used home foreclousre prevention strategies, and 788 reduced their debt.

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
2008	500	788

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Personal bankruptcies and home foreclosures are on the rise across the country and in North Carolina. The current state of the economy is such that more families/individuals are looking for ways to reduce debt and increase persnal savings. Reducing the level of indebtedness among households leads to a healthier economy and greater financial security.

What has been done

Family and Consumer Science agents, along with agencies and other program partners, have edeveloped and implemented educational programs that assist families/individuals in reducint debt. Along with reducing debt, programs also focus on the importance of creating a personal/family savings.

Results

Just under 200 non-limited income individuals/families and 591 limited income individuals/families reduced their debt. In addition to reducing debt, 1311 familes/individuals increased their savings, 485 individuals/families opened a savings account for the first time, and 107 youth saved money.

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
2008	500	375

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Quality of life in later years is closely related to financial security in later life. Its important that individuals and families learn solid financial management practices long before their retirement years. Unfortunately, many individuals fail to plan for retirement and do not understand what resources will be need for later years.

What has been done

Family ad Consumer Science agents, along with various partners, developed and implemented educational programs related to financial security in later life. These programs included preparing for retirement and estate planning and are designed to increase knowledge and develop skills ncecessary to plan for retirement years.

Results

As a result of educational programs focused on retirment planning, 1270 program participants gained knowledge in retirement planning and 499 participants gained skills in retirement planning.

4. Associated Knowledge Areas

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

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.The over all economy of both the nation and the state play a significant role in the adoption of specific practices.Increasing unemployment, rising foreclosures, and a tightening of the credit market all affect individual finances.The economic woes affect family dynamics and support the need for additonal education for individuals and families.In additon to economic issues, families must also 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 education programs in Families and Communities is on-going and takes place at various times throughout the year.The method of evaluation is determined by each Family and Consumer Science agent and is chosen based on its appropriateness for the audience, the data being collected and its fit within the agent's plan of work.Evaluation of Family Financial Management progras reveal that : 3064 families and indivudals developed a household budget, 1311 families and individuals increaed their savings, 485 families and individuals opened a savings account for the first time and 224 individuals and families prevented foreclosure.Evaluation of parenting programs reveal that: 1822 parents use positive parenting practices, 1643 parents adopted appropriate guidance, supervison practices, 1357 adopted appropriate disciplinary practices, and 287 fathers increased theri involvement with their children at home, school and in the community.

Key Items of Evaluation

Program #9

V(A). Planned Program (Summary)

1. Name of the Planned Program

Youth Development

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
806	Youth Development	100%	100%	100%	
	Total	100%	100%	100%	

V(C). Planned Program (Inputs)

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

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	40.0	6.0	0.0	0.0
Actual	60.0	6.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
545040	182160	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1759320	182160	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
2206620	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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

2. Brief description of the target audience

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

V(E). Planned Program (Outputs)

1. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	45000	200000	200000	600000
2008	20914	104570	239904	709149

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

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	3	0	
2008	14	0	14

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Fostering Relevant & Challenging Learning Experiences

Year	Target	Actual
2008	20000	20000

Output #2

Output Measure

- Strengthening Civic Responsibility through Leadership and Volunteerism

Year	Target	Actual
2008	20000	20000

Output #3

Output Measure

- Preparing for an Employable Future

Year	Target	Actual
2008	20000	17300

Output #4

Output Measure

- NurturingHealthyLifestyles

Year	Target	Actual
2008	20000	19000

Output #5

Output Measure

- Developing Life Skills

Year	Target	Actual
2008	{No Data Entered}	50000

Output #6

Output Measure

- K-12 Academic Achievement

Year	Target	Actual
2008	{No Data Entered}	17103

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: 4-H Clubs, School Enrichment, Special Interest and Resident/Day Camps Nurturing Developing Life Skills
6	Youth Involved: 4-H Clubs, School Enrichment, Special Interest and Resident/Day Camps K-12 Academic Achievement

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
2008	20000	23958

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 Camps. Camps and educational conference center operations continue to grow in celebration of being exemplary units in the certification system managed by the American Camping Association.

What has been done

Over 23,958 youth participated in 4-H day and residential camping in 2008. 5,888 youth discovered the world during 16 units weeks of junior camping and 12 weeks of specialty camps including: Marine Science and Sailing, Cloverbud Camping (ages 6 8), Fur, Fish & Game Camp, Horsemanship, Shooting Sport, Adventure Camp, and Challenge Camp while over 18,070 youth participated in community-based day camps.

Results

Camp participants gained significantly in both life skills and knowledge. Knowledge gains were seen in the following areas: safety, environment, personal responsibilities, making responsible 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
2008	20000	22282

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

A total of 239,904 youth participated in 4-H programs across the state with over 160,828 involved in 4 H Clubs and School Enrichment; 108,645 involved in Short term/Special Interest activities

Results

Fifty eight (58) counties emphasized the new Strengthening Civic Responsibility through Leadership and Volunteerism program initiative. These 4-H professionals worked with youth and adult volunteers in a variety of program areas including: civic engagement and volunteerism. The Civic Engagement programs reported 16,064 participants indicated an increase in knowledge regarding volunteerism; and that over 737 participants served in new roles on community boards or councils. While over 8,476 participants increased their knowledge of effective leadership practices. In 2008, the Strengthening Civic Responsibility through Leadership and Volunteerism initiative had an estimated value to society of over $8.6 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
2008	20000	17300

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

Youth in fifty four (54) counties benefited as a result of involvement in community based programs that focused on Preparing for an Employable Future Initiative which includes: career pathways, entrepreneurship, K-12 programs and STEM. Career Pathway programs reported 2,199 youth increased their knowledge of viable career pathways and 1,120 youth set career goals as a result of their involvement in 4-H programs.

Results

Some indications of Progress included:
11,874 youth participated in Public Speaking / Presentation Programs
5,492 youth participated in Consumer Education / Financial Literary Programs
15,041 youth participated in Career / Employability Programs
10,112 youth participated in Entrepreneurship and Economic / Business Programs

Some Impacts included:
345 youth obtained a higher paying job or improved job status
143 obtained their educational goals (high school diploma, GED, etc.)
82 started their own business
10,786 participated 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
2008	20000	19000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

What has been done

Thirty nine (39) counties emphasized the Nurturing Healthy Lifestyles program initiative. These 4-H professionals worked with youth in a variety of program areas including: fruit and vegetable consumption, ways to be physically active, managing stress, decreasing tobacco and alcohol use, fire safety, and outdoor adventures.

Results

A snapshot of impacts include: 17,631 youth increased their knowledge of different ways to be physically active; 11,498, youth increased physical activity evidenced through activity log or pedometer; 6,439 youth reported reducing their consumption of sugar-sweetened beverages; and 3,424 youth reduced consumption of fast food.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #5

1. Outcome Measures

Youth Involved: 4-H Clubs, School Enrichment, Special Interest and Resident/Day Camps Nurturing Developing Life Skills

2. Associated Institution Types

•1862 Extension
•1890 Extension

3a. Outcome Type:
Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	{No Data Entered}	50000

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 programs' 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 Seventy six (76) counties benefited as a result of involvement 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 47,421 youth increased their problem solving skills and 33,544 youth gained goal setting skills as a result of their involvement in 4-H programs.

Results

Some indications of Progress included:
47,421 youth gained problem solving skills;
49,544 youth gained communication skills;
33,544 youth gained goal setting skills;
20,597 youth gained conflict resolution skills; and
30,961 youth increased their knowledge about diversity (family types, culture, etc.).

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #6

1. Outcome Measures
Youth Involved: 4-H Clubs, School Enrichment, Special Interest and Resident/Day Camps K-12 Academic Achievement

2. Associated Institution Types

•1862 Extension
•1890 Extension

3a. Outcome Type:
Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	{No Data Entered}	17103

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 not longer the case. Today, high school is the pathway to higher education, career success and a productive adulthood. Nationally, 70 percent of all students in public high schools graduate, and only 32 percent of all students leave high school qualified to attend a four-year college.

What has been done

Youth in twenty two (22) counties benefited as a result of involvement in Extension K-12 Academic Achievement programs which includes: homework completion; EOG / EOC test scores; study skills and test taking. Homework completion programs reported 16,670 youth increased their homework completion skills and 10,469 youth increased the quality of their homework as a result of their involvement in 4-H programs.

Results

Some indications of Progress included:
16,670 youth increased their homework completion skills;
10,469 youth increased the quality of their homework;
7,073 youth increased their EOG test scores;
17,103 youth increased their class participant; and
550 parents reported being more engaged in their youths homework.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

The national budget crisis and it's trickle down effect 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 educational programs. Despite Extension'sfooting in communities when parents struggle with holding down a job and making a living wage their youth are certainly impacted. Despite some program areas decrease in numbers the overall 4-H youth development program number increased by over 39,000 in 2008.Our K-12 (School Enrichment) program experienced a 16% increase in participants and our overall 4-H volunteer support number increased by 16.5%.

Other factors affecting outcomes include:

Appropriation changes, Public Policy changes, Competing Public Priorities, Competing Programmatic Challenges, Population Changes.

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

Evaluation Studies Planned

•Retrospective (post program) •Pre & post (program) •Formative (on-going) •Case Study •Comparisons between program participants (individuals, group, organization) and non-participants

Description

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

Data Collection Methods

•Sampling •On-site •Structured •Unstructured •Observed •Tests •Surveys Description

Objective/goal teams identify and collect data with stated measures of progress and impact indicators for each identified sub-group. Data collection ranges from qualitative to quantitativemeasures for program user knowledge, attitude, skill and aspiration change to data collection to insure structure and process validity.

Key Items of Evaluation

Programs are evaluated for impact by objective/goal in the context of the current State Long Range Plan.The impacts are reported in three separate, related systems:ES 237, the North Carolina Extension Reporting System, and the knowledge, attitude, skill and aspiration assessments for the individual programs.