

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security - Plant Production Systems and Health

Reporting on this Program

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	5%	10%	8%	20%
202	Plant Genetic Resources	10%	10%	10%	10%
204	Plant Product Quality and Utility (Preharvest)	5%	5%	5%	5%
205	Plant Management Systems	18%	20%	12%	25%
206	Basic Plant Biology	10%	10%	10%	20%
211	Insects, Mites, and Other Arthropods Affecting Plants	10%	10%	10%	10%
212	Diseases and Nematodes Affecting Plants	10%	15%	10%	0%
213	Weeds Affecting Plants	12%	15%	10%	0%
216	Integrated Pest Management Systems	5%	5%	6%	10%
404	Instrumentation and Control Systems	1%	0%	3%	0%
511	New and Improved Non-Food Products and Processes	1%	0%	2%	0%
512	Quality Maintenance in Storing and Marketing Non-Food Products	1%	0%	2%	0%
601	Economics of Agricultural Production and Farm Management	3%	0%	4%	0%
602	Business Management, Finance, and Taxation	3%	0%	4%	0%
604	Marketing and Distribution Practices	6%	0%	4%	0%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	102.0	16.0	160.0	7.0

Actual Paid	125.0	18.0	156.0	8.8
Actual Volunteer	100.0	0.0	56.0	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
2216568	371855	2747727	922900
1862 Matching	1890 Matching	1862 Matching	1890 Matching
2216568	355249	2747727	162892
1862 All Other	1890 All Other	1862 All Other	1890 All Other
8090600	133427	19685750	1731324

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

3. How was eXtension used?

Communities of Practice are available in eXtension for an array of field, horticultural and ornamental crops and related areas that provide a resource for producers, handlers, processors and marketers.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	455872	1501185	16810	0

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

Patent Applications Submitted

Year: 2014

Actual: 18

Patents listed

Method and Compositions for Improvement in Seed Yield. 5051.834.WO

Pinnacle Southern Highbush Blueberry Plant. 14/120,395

Tobacco Inbred Plants NC174 SRC, CMS NC174 SRC, NC821-11 SRC, and Hybrid NC 5 SRC. 61/978,253

Tobacco Inbred Plants NC775 Bmr/Bmr SRC, CMS NC775 Bmr/Bmr SRC, and NC 645 Bmr/Bmr SRC and Hybrid NC 8 SRC. 61/978,340

Tobacco Inbred Plants NC1209-23 SRC, CMS NC1209-23 SRC, and DH98-325-5 SRC and Hybrid NC 6 SRC. 61/978,326

Tobacco Inbred Plants NC1426-11 SRC, CMS NC1426-11 SRC, NC1426-17 SRC, and Hybrid NC 4 SRC. 61/978,246

Tobacco Inbred Plants NC1209-23 SRC, CMS NC1209-23 SRC, and DH19 SRC and Hybrid NC 3 SRC. 61/978,244

Tobacco Inbred Plants Burley 21 SRC and CMS Burley 21 SRC. 61/978,312

Tobacco Inbred Plants NC 2002 SRC and CMS NC 2002 SRC. 61/978,305

Tobacco Inbred Plants NC 2000 SRC and CMS NC 2000 SRC. 61/978,247

Tobacco Inbred Plants Banket A1 SRC and CMS Banket A1 SRC. 61/978,253

Interspecific Hybrid Flowering Pear 'NCPX1'. 13/999,897

Miscanthus sinensis Grass Named 'NCMS1'. 13/999,797

Transcription Factors that Regulate Nicotine Biosynthesis in Tobacco. 5051.826.AR

Tobacco Inbred Plants NCBEX1D, NCBEX1MS and NC EX90. 5051.809.BR

Albizia Julibrissin Tree Name 'NCAJ1'. 5051.842

Tobacco Inbred Plants NCBEX1F, NCBEX1MS and NC EX90. 5051.809.RU

Tobacco Inbred Plants NCBEX1F, NCBEX1MS and NC EX90. 5051.809.IN

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	219	725	944

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

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

Year	Actual
2014	50

Output #2

Output Measure

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

Year	Actual
2014	1501185

Output #3

Output Measure

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

Year	Actual
2014	3107

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	More informed growers through highly focused non-degree credit workshops and other formalized group educational sessions.
7	Increased acreage of organic crops and specialty crops.
8	Number of discoveries of mechanisms that regulate the productivity of plants and the microorganisms that interact with them
9	Increased profit through the adoption of new production practices *and marketing locally*
10	New organic, farmers and agritourism markets established by individual entrepreneurs
11	Growers Adopting Improved Business Management Practices

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
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In 2013, prices for wild harvested ginseng reached record high of \$1,200 per dried pound. Watauga County has ideal growing conditions for ginseng, and landowners are interested in cultivating ginseng in ?wild-simulated? conditions to produce income from their forestlands. Wild populations of ginseng have become scarcer due to poaching and overharvesting. Cultivating ginseng in a wild-simulated or woods-grown environment can decrease pressure on wild populations and allow forest landowners to produce cultivated ginseng and seed for income from their forestlands.

What has been done

Cooperative Extension held a ginseng planting workshop and made individual visits to eight farms to demonstrate the proper soil fertility amendments and establishment and maintenance practices for ginseng production.

Results

Eight growers successfully planted 1,000 lbs of ginseng seed during the fall of 2014. Harvest of seed, rootlets and berries should conservatively yield more than \$1 million to these producers in four to eight years. In an example of alternative production system, NCA&T researchers examined high-tunnel vegetable production systems and discovered that the yields for high-tunnel systems employing conservation agriculture techniques were considerably higher than those of

conventionally produced vegetables. In addition to increasing yields, conservation agriculture also can improve soil quality, reduce land preparation, and control weeds.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Increased profit through the adoption of improved nutrient management practices

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nitrogen rates cannot be determined through soil test, and therefore North Carolina uses a concept known as the Realistic Yield Expectations (RYE). A database was developed over 15 years ago by an interagency group of soil scientists and agronomists. The database provides yield goals, nitrogen (N) factors, and the RYE N rate. The information includes, by county, yields for all major crops by soil series. The Interagency Nutrient Management Committee (NCSU Soils, NCDA&CS, USDA-NRCS, and NCDENR) determined that particularly for corn, which has new genetics, that the RYE may not be appropriate. Thus a group of soil scientists used N response

trials on corn for the last 15 years to determine optimum N rates and determine the appropriateness of corn RYEs.

What has been done

Experiments were randomized complete block designs with generally 4 replications. Often 4 to 6 N rates were tested but other factors such as spacing, fertilizer types, timing and placement were also considered. Irrigated experiments were deleted as the RYE database assumes rain fed conditions. Thus a total of 46 experiments were included in the analysis. The experiments represent 16 Soil Management Groups (SMGs): 10 in the Coastal Plain and three each in the Piedmont and Mountain.

Results

After analyzing the data, which was presented to the INMC, these RYE recommendations for corn were accepted at their meeting in May 2014 and the on-line RYE database was changed. Corn yields for each soil mapping unit, except the mountain floodplain soils, were increased by 20% and the N factor was decreased accordingly such that the N fertilizer rate remained the same. Because of this change in corn, the N factor for corn is no longer tied to the SMG but rather depends on the soil mapping unit. The revised RYEs have been updated on the NC Nutrient Management website. All farmers in North Carolina who produce corn should be determining their N rates based on this information. For many farmers, they could reduce fertilizer N, maintain yields, save money, and protect the environment by using the N RYE yields and N RYE rate.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants

Outcome #3

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	14

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Sweet potatoes are the most important vegetable crop produced in North Carolina, and the 1.58 billion pounds produced here account for roughly 50 percent of the nation's supply in 2014. To remain competitive, the state's growers need new varieties. All new varieties need to be high-yielding and resistant to diseases and insects for sustainable, environmentally sound production.

What has been done

NCSU has developed what is considered by some to be the world's premiere sweet potato breeding program, enhanced by a grower-participatory breeding project that is a long-term partnership between researchers, Extension agents and sweet potato farmers.

Results

In 2005, the program released 'Covington,' a new table-stock variety that has changed the landscape of U.S. sweet potato production significantly. Based on USDA NASS crop value estimates, the farm-gate value for 'Covington' in 2014 was about \$206 million. 'Covington' accounts for 90 percent of the North Carolina sweet potato crop, and it is also being grown in other states, accounting for roughly 40 percent of the U.S. sweet potato crop. In addition, the 'Sweet Caroline' series of ornamental sweet potatoes has now generated a total of \$1.7 million in royalties and has become the preeminent sweet potato series in the ornamental industry, generating an estimated \$80 million in receipts at the retail level since release. Such success has also seeded future progress by attracting significant grant funding from two global foundations: the Bill & Melinda Gates Foundation based in Seattle, Washington, and The Global Crop Diversity Trust based in Bonn, Germany. The Genomic Tools for Sweet Potato Improvement project is focused on developing next generation genomic, genetic and bioinformatics tools to facilitate sweet potato improvement in sub-Saharan Africa, while the Global Crop Diversity Trust project is exploring the feasibility of using wild relatives for sweet potato improvement.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

New techniques and products developed and released that can be commercialized

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	20

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Eastern North Carolina has traditionally been a leader in the tobacco industry, but that industry has been in decline, creating the need for new enterprises and jobs. The highly nutritious sweet potato, which grows well in the region, has been seen as a potential key to economic development.

What has been done

In collaboration with Universal Corporation consultants, engineers and researchers at NCSU developed an innovative new procedure to process sweet potatoes that are sound and wholesome but currently have been unused due to surface defects and less desirable shapes and sizes that don't affect their nutritional assets.

Results

In August 2014, Carolina Innovative Food Ingredients Inc. broke ground for a \$20 million sweet potato processing facility near Nashville, N.C., that will use the NCSU research to process sweet potatoes into value-added, high-quality, food-grade dehydrated and juiced ingredients for human and pet consumption. The company will target the \$60 billion health and wellness beverage market, the \$143 billion healthy foods market, and the global pet food business. Production is expected to begin during the first quarter of 2015, and the plant is expected to create more than 60 jobs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms

202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
206	Basic Plant Biology
212	Diseases and Nematodes Affecting Plants

Outcome #5

1. Outcome Measures

Increased profit through the adoption of new production practices

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	60000000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Because prices for commodities, including peanuts, are low relative to the cost of production, high yields are necessary for growers to maintain viable farm operations. Fungicides that control leaf spots and other peanut diseases represent one of the major inputs in peanut production. These fungicides are critical for producing high yields, but overuse increases the cost of production and increases the likelihood that fungicide resistant strains of pathogens will develop, rendering disease control ineffective. Excess fungicide use also can lead to outbreaks of non-target pests such as spider mites and may endanger sensitive habitats and species.

What has been done

Ongoing research North Carolina State University research has documented that the number of fungicide sprays applied to peanut could be reduced without sacrificing yield, particularly on partially resistant cultivars. Extension programs encouraged growers to reduce the number of fungicide sprays applied by delaying the start of calendar fungicide spray programs, planting cultivars with partial resistance to leaf spots and other diseases, and by using daily weather-based disease advisories.

Results

Growers in North Carolina average about 4 fungicide applications per year for leaf spot control, down from an average of 5-6 sprays per year 10 years ago. At an average cost of \$17 per spray, this represents a savings of \$17 to \$34 per acre out of a projected fungicide budget of \$85 per acre for five sprays or \$102 for six sprays. With peanuts harvested on 93,000 acres, this represents a statewide savings to growers of \$1.58 million to \$3.16 million in 2014. Reducing the number of fungicide applications on peanuts also reduces the risk of problems associated with excess use.

4. Associated Knowledge Areas

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

Outcome #6

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
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	189242

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Peanut pod maturity is very hard for farmers to determine because peanuts are underground and do not show signs of maturity above ground. Pod maturity determines the taste, milling quality, grade and shelf life, which in turn greatly affect the profit of the peanut farmer. Research has

shown that farmers can lose up to 19 pounds of yield per day if peanuts are dug too soon, and harvesting too late increases losses as mature pods shed from the plant.

What has been done

North Carolina Cooperative Extension centers held peanut maturity clinics designed to help growers determine optimum digging time. Agents in nine counties reported more than 200 participants with more than 23,000 acres of peanuts.

Results

Agents in the reporting counties estimated that by following Extension recommendations, growers saw increased sales of more than \$1.3 million.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Increased acreage of organic crops and specialty crops.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

North Carolinians consume far more organic vegetables than North Carolina growers produce. With a supply gap totaling over \$7 million, an opportunity exists for N.C. growers to enter this expanding market, but significant hurdles stand between an interested grower and a successful certified-organic operation. Beyond the complexities of certification, organic production requires a complete revision of production strategies.

What has been done

To assist 12 area growers in navigating the path toward certification, Cooperative Extension designed and offered a class series on certified organic vegetable production for new and transitioning growers. Topics covered included organic soils, insect, disease, and weed management with an emphasis on translating practical farm techniques into required farm plans and field records.

Results

In 2014, two new farm operations entered certified-organic production and three others began growing organically with the goal of becoming certified. New sales for the year are projected to increase by at least \$7,000 for new growers and more than twice that for past class participants who continue to expand organic production.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	18

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Health effects and trade restrictions resulting from mycotoxin contamination of food and feed are a worldwide problem, reducing yields and threatening human health. The global need for more high-quality grain for food, feed and biofuel production has raised the concern about mycotoxin contamination. Not only does contamination render grains unfit for human and animal food, but it also limits their use as biofuel sources. Resistant genotypes are not available, and cultural practices are not reliable. More effective control strategies are needed to sustain and increase corn production in North Carolina and the United States.

What has been done

NCSU scientists have taken multiple approaches to better understand infection of corn with *Aspergillus flavus* and *Fusarium verticillioides* and the factors that regulate mycotoxin production. First, they have monitored gene expression in these fungi and in developing corn seeds, and through these studies have identified genes that are specifically induced during this interaction. Second, they have begun a phenotyping project on near isogenic lines of corn that will allow them to develop new breeding strategies for the control of mycotoxin contamination. Third, they have continued breeding efforts to move resistance to fumonisin contamination into desirable genotypes. More recently they have initiated studies to predict the effect of climate change on aflatoxin contamination.

Results

Using genomic and bioinformatics, these scientists have identified candidate genes in maize for resistance to aflatoxin contamination that can be used for either marker-assisted breeding or transgenic approaches to develop resistant lines. In a similar example, NCA&T researchers evaluated a number of cowpea varieties for various traits to assess the impact of biological constraints including insects and disease. Cowpea, a versatile legume, is a critical crop for small growers, which account for 90% of the state's farmers. The results of this research have produced new knowledge on pest disparity between ecological zones with respect to incidence and composition. This will guide in the development of appropriate management tactics tailored to each location.

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

Increased profit through the adoption of new production practices *and marketing locally*

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	3250000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

North Carolina's tobacco market has declined significantly since 2004, leaving farmers with the need for new, high-value profits. At the same time, due to rising food costs, concerns over food safety and a desire to know where their food comes from, consumers are interested in purchasing more of their food locally. Supporting the purchase and distribution of local food is essential to sustaining local agriculture and growing the local food economy.

What has been done

North Carolina Cooperative Extension in Lee, Moore and Richmond counties, with its partners, has fostered Sandhills Farm to Table, an innovative cooperative local food hub that has pioneered access to local farm produce by local consumers. As Sandhills Farm to Table enters its fifth season, it is operationally profitable. In Lee County, for example, nearly 2,000 produce boxes were distributed, resulting in \$40,000 in sales. In total, the hub distributed fresh produce boxes to 1,100 households. However, this market is considered mature, with sales unlikely to expand beyond \$570,000 annually. To continue growing the food hub, Cooperative Extension worked with a number of partners to secure funding and build the cooperative's capacity.

Results

After a slow start in 2013, during which less than \$15,000 of produce was delivered to institutions, the cooperative increased sales nearly sixfold in 2014 to exceed \$85,000. The cooperative plans to expand this business in 2015 to achieve a sustainable business level of \$500,000. With letters of support and the offer of land from county managers, Cooperative Extension has submitted a \$1 million grant proposal to expand Sandhills Farm to Table's capacity to deliver local foods to local markets.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #10

1. Outcome Measures

New organic, farmers and agritourism markets established by individual entrepreneurs

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	741

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Increasingly families are approaching North Carolina Cooperative Extension for assistance in learning how to use the land and other resources they have not only to make food for their families but also to make a profit.

What has been done

Members of an Iredell County family approached a North Carolina Cooperative Extension agent about how they might use 10 acres. The agent advised them on all aspects of starting an agricultural business, including production, planning, management and marketing. The agent also encouraged them to attend a farm school to learn to create a business plan and to visit other farms to get first-hand accounts of what works and what doesn't.

Results

Family farmers completed the Piedmont Farm School and received certification of fresh produce Good Agricultural Practices. They also created a kitchen that is certified for baking to enhance income and sell farm products at local markets as well as at an on-farm roadside stand. Their farm now has an agritourism walking trail that includes educational activities to help the general public and school groups learn more about agriculture.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices

Outcome #11

1. Outcome Measures

Growers Adopting Improved Business Management Practices

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	20000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The average farmer in North Carolina is 57 years old and looking forward to retirement. We need new farmers to meet the demand for locally grown food in North Carolina. Many families are looking at ways to supplement their incomes and put their land into something productive. And many new farmers do not have the business or marketing skills needed to start a new business enterprise. This leads to costly mistakes and often failed farm business.

What has been done

In recent years, more and more farmers have been asking North Carolina Cooperative Extension how to farm or how to grow new crops. But knowing that there's more to farming than production skills, Extension agents began organizing farm schools that focused on the business side of agriculture. Today, those schools operate under the umbrella North Carolina Farm Schools. In 2014, more than 80 farmers participated in class sessions and field days associated with three farm schools, learning about business management and planning, as well as marketing skills that are key to long-term success.

Results

More than half of the students participated in a final class survey, with the following results: 86% indicated that they refined their business plan; 97% said they will be able to avoid financial mistakes as a result of what they learned; and 76% said they learned marketing techniques that will increase their profits.

4. Associated Knowledge Areas

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

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

Rapidly changing environmental and economic conditions (weather extremes, economic climate) influence producers' abilities to adapt to change while ensuring sustainable production systems. Continued effects of the economy on federal, state and local support for research and extension programs continue to challenge our research and extension enterprises. Likewise, regulatory and other governmental policies and rules influence the educational and research capacities of our programs and present challenges to producers, processors and marketers to comply with new and often expensive regulations. And in an environment of reduced funding, the program competition for existing funds becomes a greater challenge to manage. Nevertheless, emphasis is placed on those research and extension opportunities that have the greatest effect on sustainability of farms, families and businesses, i.e., economic, environmental, social and quality of life benefits.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Outcomes and impacts determined from our research and extension programs support the principle that our programs engage a wide array of users across the state, help support enterprise and marketing change (feed grains initiative), involve integration of research and extension efforts, and create significant economic value to the state in terms of added value from innovations in agricultural production, costs saved and enhanced marketing approaches. In addition, our research and extension enterprises represent productive

environments in which our faculty are productive in terms of peer reviewed publications and creation of intellectual properties.

Key Items of Evaluation

We are continually challenged to keep evaluation principles and tools aligned with plans of work, program implementation practices in the field, and outcome observations so that we can effectively report the results of our efforts. We are proud of the many accomplishments of this program. A couple examples:

The swine industry, NCSU, NC Department of Agriculture, NC Biotech Center collaboration that spent over \$1 million for research and education to stimulate feed grain production. Not counting increased corn and wheat production, additional grain from sorghum, which was promoted in the program, in just one year was worth an estimated \$33 million. Including increased corn and wheat production has increased the value of this effort even more.

Our plant breeding programs for sweet potatoes and peanuts have a record of generating new varieties that become the predominant varieties used by the industry in a matter of just a few years after release. 'Covington' sweet potato and 'Bailey' and 'Sugg' peanuts are three notable cultivars.