

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

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I. Report Overview

1. Executive Summary

OVERVIEW

The School of Agriculture and Environmental Sciences (SAES) continues to focus on its six strategic program initiatives that have been realigned to correspond with NIFA's top five priorities: (1) Human and Community Development, (2) Sustainable Energy [SAES-Biotechnology and Biodiversity], (3) Climate Change [SAES-Soil and Water Quality], (4) Food Safety [SAES-Agromedicine, Nutrition and Food Safety], (5) Global Food Security and Hunger [SAES- Small Scale Agriculture, and International Trade and Development], and (6) Childhood Obesity. Overall, 2009 was a productive year with highlights and accomplishments in the following areas:

Program Growth

Once again, the Agricultural Research Program (ARP) in the School of Agriculture and Environmental Sciences (SAES) at North Carolina A&T State University (NCA&TSU) exceeded the previous year's extramural funding and achieved the highest amount ever received by the program. The program's outside funding grew by 25 percent over the previous year. This occurred, in large part, due to our success with meeting or exceeding funding goals for the six program initiatives. It also occurred as a result of the school's success in receiving 32 grants and full complement of the School's allotted initial Evans-Allen state grant funding. SAES's partnership with the National Center for Food Protection and Defense of the U. S. Homeland Security has led to additional funding from the agency.

The SAES is in its fourth year as a partner in the new North Carolina Research Campus (NCRC) at Kannapolis, North Carolina. The NCRC is funded by the North Carolina General Administration for the 16 state-funded universities. Our laboratories are only three-fourth staffed but fully operational. The opportunity to participate in this new research consortium grew as a result of our active and successful research and demonstrated capacities involving the Agromedicine, Nutrition and Food Safety Initiative. Our primary research focus is on post harvest technologies, with specific emphasis on fruits and vegetables. Several tours and seminars were conducted during the year to introduce SAES faculty to the NCRC consortium and engage faculty in the various research initiatives of the consortium. SAES administrators and faculty identified areas of bio-mass utilization from by-products obtained from production of fruits and vegetables and economic analyses of potential commercial uses of those products as leading areas for faculty research.

The program continues to grow despite changes in administration. The SAES Dean, Dr. Alton Thompson, continued his appointment as the Interim Provost and Vice Chancellor for Academic Affairs and the Interim Dean, Dr. Donald McDowell, continued to provide leadership for the School during the year. A new Associate Dean for Research, Dr. Shirley Hymon-Parker, was appointed and joined the university on September 1, 2009.

Due in part to administrative changes, two expected accomplishments this year did not occur. The evaluation specialist position was not filled and planning concerning combining NCA&TSU Plan of Work with that of North Carolina State University was postponed.

Breakthroughs and Developments

The SAES researchers continue their efforts in addressing food safety related to peanuts. Clinical studies being conducted with the University of North Carolina at Chapel Hill School of Public Health are designed to confirm the hypoallergenicity of treated peanuts and hopefully the absence of allergic reaction among patients who are exposed to the treated peanuts. Obtaining confirmation of reduced or absent allergic reaction among patients would be a key finding in demonstrating the safety of the product and enhancing its potential for commercialization.

Results of food safety study suggest that natural ingredients may be used to control the growth of Salmonella in peanut butter. This finding has great potential because it shows that control of a pathogen causing illness may be possible without the use of any chemicals. Additionally, process technology can change the quality characteristics of the finished product. Findings from the study are not related to any previous work done in this area. Thus, researchers plan to continue this study and possibly file a disclosure or patent of their work.

Coordination with Cooperative Extension

One of the major goals of SAES is the continued integration of the Cooperative Extension and the Agricultural Research Programs. Past integrated activities have yielded positive impacts on issues facing North Carolina. Work will also continue on combining NCA&T State University's NIFA Plan of Work with that of North Carolina State University, which should yield more impactful outcomes. Critical to this development, however, is the independence and lack of critical mass of the research scientists and Cooperative Extension Specialists to pursue research and agricultural support services consistent with the mission of SAES and NCA&TSU. One productive strategy this past year was to coordinate combined efforts of Research and Cooperative Extension on several Evans-Allen projects and Capacity Building proposals, especially in the Human and Community Development and Food Safety arenas. These efforts were a result of several meetings held throughout the year to help researchers increase their understanding of how issues that families, groups and communities face might be incorporated into research proposals involving research and outreach. Extension faculty was also in attendance and sought collaboration on proposed research initiatives. Successful examples of collaboration between Extension and research include the demonstration and training of crop and livestock production technology during Small Farms Week, and field days. The continued success of such efforts will be evidence once vacant positions in Extension are filled with extension specialists that complement the work of research faculty.

Regional Projects

Currently, research scientists are involved in four regional projects: (1) Economic Impacts of International Trade and Domestic Policies on Southern Agriculture (SCD331); (2) Genetic and Functional Genomic Approaches to Improve Production and Quality of Pork (NC 1037), (3) Local Food Choices, Eating Patterns, and Population Health (NC1033:7); and (4) Managing and Marketing Environmental Plants for Improved Production, Profitability, and Efficiency (1021).

HIGHLIGHTS FROM PLANNED PROGRAMS

Human and Community Development

Work continues on creating coordination among the Community Based Organization (CBO) in the Southeast US to address issues facing the region. A major conference ("Nonprofits in the Service of Communities: Experiences from the Field") was held that focused on data sharing and collaboration. Participant evaluations indicate that the workshop was successful. The project developed a database of CBOs involved in collaborative efforts to address poverty and gathered descriptive data on collaboration efforts among the groups.

A study seeking to understand the underlying factors affecting health care in the Black Belt was completed. The data collected from the surveys were geocoded to identify the spatial characteristics of the Black Belt Region. The regional analysis yielded mixed results. The maps that were developed show some relation between surveys results and their spatial location, but the scale at which the data were collected did not allow the causes to be specifically determined. Nevertheless, the analysis provided a good indicator of some overall trends, and has provided a preliminary step to more local analyses, producing a better idea of the localized factors that should affect the variance among data points.

Sustainable Energy [SAES- Biotechnology and Biodiversity]

Animal waste remains a major problem in NC that negatively impacts quality of life for many rural citizens and profitability of the livestock industry. Researchers are investigating a hydrothermal liquefaction process that is anticipated to have positive impact on both of these problems by converting waste into usable biofuels.

Researchers are also gaining new knowledge about the immune response in goats and cows at the molecular level, which is expected to lead to new management strategies for producers. The study focused on natural resistance to parasitic infection in goats. The effect on gene expression of Nystatin, a lipid raft inhibitor and anti-fungal agent, was tested, yielding positive results. Twelve DNA sequences have been identified and deposited in GENBANK. Identification of genes and systems relevant to understanding of host parasite system could lead to control strategies that might reduce U.S. livestock losses upwards of \$48 billion annually from infectious bacteria and parasites.

A major economic impact on North Carolina swine producers are the pathogenic outbreaks and contaminations caused by the disease scours. Efforts are underway to study the mechanisms of virulence and to develop vaccines for possible prevention and treatment. This is particularly important in that North Carolina ranks second nationally in swine production. The Gastroenteric Disease Center at Penn State University is a major collaborator. The current focus is on the study of antigenic components of pathogenic and E.coli isolates of porcine origin from North Carolina and assessing their feasibility as vaccines for the prevention of these diseases.

Climate Change [SAES- Soil and Water Quality]

Researchers are continuing their work using the NCA&T University farm to develop and evaluate ways to improve soil and water quality in the state. Specifically, the focus is on sustainable tillage practices as well as on providing alternative ways for small farmers to treat hog wastes.

Food Safety[SAES-Agromedicine, Nutrition and Food Safety]

Peanut skins are a by-product of the peanut processing industry with reportedly little or no economic value. However, they are rich in polyphenols, including procyanidins, catechins, phenolic acids and resveratrol. The results of two studies suggest alternative value-added utilizations of peanut skins as a dietary supplement and food preservative. These studies indicate that (1) long term ingestion of peanut skin correlate with improved serum profile in test rats and that (2) peanut skin extracts exhibited significant antibacterial effect in raw ground beef.

A study aimed at developing biocontrol and hurdle technology to enhance microbial safety fresh produce was conducted looking at lytic bacteriophages as natural enemies of bacteria and logical candidates for the control of foodborne pathogens. The study investigated the effect of bacteriophage treatment on the survival of E.coli O157:H7 in liquid media and on green leafy lettuce. The results suggest the EHEC-specific phage cocktail has the potential to control E.coli O157:H7 contamination in fresh produce, thereby, benefiting the fresh produce industry, as well as increasing the microbial food safety of the American food supply.

Researchers are also producing a high quantity of alpha-galactosidase and beta-galactosidase for health benefits. They are working on developing a new technology that could be applied in the food industry to ensure food-grade probiotics of over expressed alpha-galactosidase and beta-galactosidase. This research team is interested in response surface methodology as a tool to optimize the production of these enzymes. They are also interested in using chemical mutagenesis to produce high enzyme producing mutant for potential application in food products.

Global Food Security and Hunger[SAES -Small Scale Agriculture & International Trade and Development]

A survey focusing on the determinants of small farm success in North Carolina was completed. Due to the declining numbers of small farm production in the state, it is critical to determine what can be done to reverse this trend. Previous studies have suggested that viable predictors of success for small farm operators included: education in the use computers (including programming and financial management), effective marketing strategies, enterprise diversification and income. A questionnaire/survey was developed to test previous findings and case studies were conducted for further verification. The result revealed that farmers rarely utilized computers and instead kept manual records. The findings also suggest that income may not be as important as believed. The overall "love of farming" seemed to be the driving force behind the farmer's view of success, not profit.

SAES researchers have found that there are alternative nutrient sources for enhancing profitability and environmental stewardship in livestock production. The target audiences of this study were limited resource and sustainable livestock producers across NC and other Southeastern US regions. This project provided insights into less expensive alternative feeds/forage for livestock. Pearl millet is a forage crop that is more tolerant to drought and at the same time has comparable nutritional value when compared to the traditional corn forage crop. Severe drought has and continues to be a dominant crop production constraint across the Southeastern US, especially for live stock producers. With increased climate change and variability, the risk of drought will likely also increase and the pattern of drought sensitive areas may become more irregular. Providing information on alternative feed source for livestock will help mitigate economic risk associated with reduced crop yield or total failure due to moderate or severe drought.

Although major breakthroughs in marketing NC food and agricultural products abroad has been limited, there has been substantial study of the marketing opportunities for NC producers and sharing of this information with producers and potential entrepreneurs. This continued focus and effort is expected to yield future benefits for North Carolina producers.

Childhood Obesity

SAES scientists have also derived data useful to understanding the impact of location on the access and affordability of food. Study results were presented to local and statewide planners and policy makers who were invited to attend a conference about the local food environment in Greensboro. Attendees were provided with information regarding food access in relation to availability and affordability of food in general, and fruits and vegetables in particular, in Greensboro. Data presented at the conference showed that the availability of fruits and vegetables is lower in low income areas of the city than in higher income areas. However, the quality of fresh fruits and vegetables available in low areas were better or equal to higher income areas.

An on-going longitudinal study has been examining the food preferences, food selection, and eating practices of African American parents and their pre-school aged children. The goal of the project is to determine the factors that influence the food preferences, selections and eating habits of participants, and educate parents and children about healthy eating and physical activities that can improve their health and quality of life.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	18.0
Actual	0.0	0.0	0.0	20.3

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

- Combined External and Internal University External Non-University Panel

2. Brief Explanation

The primary responsibility of the research director is to determine the need, priority, and scientific feasibility of the proposed projects and the development and implementation procedure for project documentation, merit review, and selection. The procedure assures that the research proposals are scientifically sound, relevant to society's food and agricultural needs, and not duplicative of efforts undertaken elsewhere. Prior to proposals development, alignment of the topic with the needs of the state and the direction of the six program initiatives in the School of Agriculture and Environmental Sciences is determined. Upon agreement by the department chair, the associate dean for research, the research director, and the principal investigator prepare a proposal on the topic for submission through the Evans Allen program. The merit review process includes a review by five peer reviewers from both within and outside the University who are knowledgeable in or familiar with the area of research. The principal investigator is responsible for incorporating suggestions made by the reviewers and must give reasons for any substantive suggestions not included or addressed. The proposal is then reviewed by the associate dean for research who determines if additional review and substantive revision is necessary. Upon acceptance by the associate dean for research and research director, the proposal is submitted for budgetary review by the Office of Agricultural Research and then transmitted to NIFA/USDA for approval.

III. Stakeholder Input**1. Actions taken to seek stakeholder input that encouraged their participation**

- Targeted invitation to traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Other (Grassroots Leadership Conferences)

Brief explanation.

There are on-going activities that encourage stakeholder participation. In addition to the formal meetings involving Agricultural Research Program administrators and stakeholders, the program conducts several outreach activities as a means for gathering input from those impacted by the school's research activities or who use the research results. One major event is the Small Farms Week, an activity jointly sponsored by the Cooperative Extension Program and the Agricultural Research Program. During this week, farmers, commodity group representatives, and consumers attend activities held both on and off campus involving Extension and research. A second major event is the Grassroots Leadership Conference. Administrators and researchers in the Agricultural Research Program participate in three conferences held in the three Extension programming regions of the state (eastern, central and mountain) to listen to the issues, concerns, and the needs of farmers, community leaders, residents, volunteers, members of the Strategic Planning Council, specialized committee members and county and staff members. These grassroots conferences also assist the Agricultural Research Program in needs assessment for proposal development and program priorities. Through these activities, SAES shares information about research underway at the University, and receives input from those that use the research results. Other major outreach activities include field days that bring farmers, commodity groups, and consumers into direct contact with specific SAES scientists and research projects. Feedback is also sought about research and research related activities by the scientists, their research teams, and by staff associated with ARP and the University; the input is then shared

with SAES and incorporated into future research activities.

A major statewide commission that continues to affect our research program and all aspects of the School of Agriculture and Environmental Sciences is UNC Tomorrow, an initiative of the General Administration for the 16 public state universities. This initiative is affecting the substance and community involvement with the research program particularly related to concerns of global readiness and economic transformation of communities. Our planned programs support multiple aspects of these concerns.

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 External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

Brief explanation.

The individual and group stakeholders are identified by their membership in organizations that are agriculturally -related in the state. This includes all farmers and grower groups, cooperatives and community organizations. The dean, other administrators and many faculty members serve on various boards across the state that either serve stakeholders or have stakeholders on the boards.

Diverse methods (advisory groups, town hall meetings, conferences, workshops, etc.) are used to collect information and data on stakeholder needs. There is a proactive effort including face-to-face meetings with groups as well as reading/reviewing current documents (strategic plans, newspapers, newsletters, etc.) that identify research needs of individuals and communities in North Carolina.

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
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Meeting specifically with non-traditional groups
- Other (Reading/reviewing documents by groups or about groups that describe needs)

Brief explanation.

The method for collecting the information primarily is through meetings and also includes surveys completed by the faculty as well as published reports and white papers.

3. A statement of how the input will be considered

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

Brief explanation.

Administrators and faculty use the input about stakeholder needs in determining the direction and nature of research projects as well as in hiring scientists needed in the identified subject matter areas.

Brief Explanation of what you learned from your Stakeholders

Major input from the stakeholders confirm their continuing concern about the funding issues: (1) bioeconomy, (2) health, wellness and nutrition, (3) special enterprises, (4) 4-H and youth development, and (5) water quality and quantity.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	3726534

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	0	5689668
Actual Matching	0	0	0	6856504
Actual All Other	0	0	0	330331
Total Actual Expended	0	0	0	12876503

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from				
Carryover	0	0	0	607814

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Human and Community Development
2	Sustainable Energy
3	Climate Change
4	Food Safety
5	Global Food Security and Hunger
6	Childhood Obesity

V(A). Planned Program (Summary)**Program # 1****1. Name of the Planned Program**

Human and Community 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
601	Economics of Agricultural Production and Farm Management				20%
802	Human Development and Family Well-Being				15%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities				15%
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures				20%
805	Community Institutions, Health, and Social Services				30%
	Total				100%

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	4.1
Actual	0.0	0.0	0.0	4.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	3031966
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	2492992
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	185811

V(D). Planned Program (Activity)**1. Brief description of the Activity**

Conduct research studies in the following areas; (1) to determine the challenges of new manufactured home owners in the site installation of the units and to develop recommendations to the industry for improving the installation process, (2) to develop

a database of community-based organizations (CBOs) by location, program priorities, capacity and method of operation to encourage collaboration among CBOs, policymakers, businesses and development agencies, and (3) to define factors that impact leadership development in rural areas that could lead to new or improved programs for developing future leaders and contributing to the sustainability of rural communities.

Presented findings at professional meetings.

Published research findings in professional journals.

Shared findings with Extension educators, end users, stakeholders, and with other groups that may use the information in improving collaboration and/or methods of information delivery.

2. Brief description of the target audience

- Individuals and families living in rural areas
- Underserved populations
- Rural communities
- Policy makers
- Community based organizations
- Scientific Community

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	513	434473	44	0
Actual	733	447000	73	0

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

Patent Applications Submitted

Year: 2009
 Plan: 0
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	5	
Actual	0	5	2

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # entries in database of community-based organizations

Year	Target	Actual
2009	110	63

Output #2

Output Measure

- # presentations at professional meetings

Year	Target	Actual
2009	8	5

Output #3

Output Measure

- # media occurrences

Year	Target	Actual
2009	12	7

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# organizations accessing and using database of community-based organizations
2	% improved leadership development in rural communities
3	# policy makers using data to change policies affecting individuals, families and communities

Outcome #1

1. Outcome Measures

organizations accessing and using database of community-based organizations

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

% improved leadership development in rural communities

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

policy makers using data to change policies affecting individuals, families and communities

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Public Policy changes
- Government Regulations

Brief Explanation

The outcomes listed in the Human and Community Development Planned Program focus on long term attainment. The identified measures are very specific to studies in increasing the effectiveness of community based organizations, in developing rural community leadership and in improving the quality of manufactured housing. These initiatives take time to achieve.

There are also other research studies that are having impact in this planned program. However, outcomes and measures of these outcomes will be reported once fully developed. The new leadership in the research program will need to address these needs.

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

1. Evaluation Studies Planned

- During (during program)

Evaluation Results

Key Items of Evaluation

V(A). Planned Program (Summary)**Program # 2****1. Name of the Planned Program**

Sustainable Energy

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation				20%
201	Plant Genome, Genetics, and Genetic Mechanisms				10%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants				10%
302	Nutrient Utilization in Animals				10%
308	Improved Animal Products (Before Harvest)				20%
311	Animal Diseases				10%
403	Waste Disposal, Recycling, and Reuse				20%
	Total				100%

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	2.8
Actual	0.0	0.0	0.0	3.4

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	280517
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	310489
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	27714

V(D). Planned Program (Activity)**1. Brief description of the Activity**

Scientist conducted research to expand understanding of the mechanism of scours and characterize strains that cause the disease; to improve understanding of the biology of edible and medicinal exotic mushrooms to be able to identify appropriate

commercial strains; they also developed technologies to convert corn stalks and cheese whey into biofuels and biomaterials including hydrogen, bioethanol and succinic acid; they experimented with non-antibiotic additives in poultry production to control poultry diseases of *Campylobacter jejuni* and *Salmonella*; and to decipher gene expression associated with combating bacterial infection (mastitis) in cattle.

Conduct tours, workshops and other activities to share findings with Extension educators and with companies that may commercialize products.

Gave presentations at professional meetings and during various Cooperative Extension programs

Publish findings in professional journals and in the Agricultural Research Program research magazine

Seek patents for new discoveries

2. Brief description of the target audience

Companies involved in biotechnology applications
Farmers involved in or considering producing agricultural products using biotechnology
Consumers

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	932	434473	176	0
Actual	1050	447000	144	0

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

Patent Applications Submitted

Year: 2009

Plan: 1

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	7	
Actual	0	16	16

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # presentations at professional meetings

Year	Target	Actual
2009	8	16

Output #2

Output Measure

- # media occurrences

Year	Target	Actual
2009	3	2

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	# of licenses of current patents
2	# breakthroughs in new uses for biomass or other agricultural co-products in North Carolina
3	# improved plant production resulting from new propagation techniques
4	# technologies to prevent/treat animal diseases

Outcome #1

1. Outcome Measures

of licenses of current patents

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

breakthroughs in new uses for biomass or other agricultural co-products in North Carolina

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

improved plant production resulting from new propagation techniques

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

technologies to prevent/treat animal diseases

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Public Policy changes
- Government Regulations

Brief Explanation

New ideas for patents and intellectual property are underway but they are not reporting new items at this time.

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

1. Evaluation Studies Planned

- During (during program)

Evaluation Results

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Climate Change

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				34%
112	Watershed Protection and Management				22%
133	Pollution Prevention and Mitigation				8%
205	Plant Management Systems				28%
403	Waste Disposal, Recycling, and Reuse				8%
	Total				100%

V(C). Planned Program (Inputs)

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	1.8
Actual	0.0	0.0	0.0	1.8

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	188241
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	147139
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Scientists conducted research studies to develop low-cost water filtration systems using nutshell-based activated carbons; determine and measure the effectiveness of cover crops in meeting the nutrient needs in organic cropping systems; use constructed wetlands for treatment of swine wastewater; and assess how soil management practices, especially no-till approaches, affect soil quality over time.

Presented findings at professional meetings.

Published research findings in professional journals.

Shared findings with Extension educators and with other groups that may use the information to improve the viability of small scale agricultural operations.

2. Brief description of the target audience

- Extension educators
- Small-scale and limited resource farmers
- Environmental groups interesting in preserving soil and water quality

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	437	434473	0	0
Actual	577	447000	0	0

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

Patent Applications Submitted

Year: 2009
 Plan: 0
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	6	
Actual	0	4	4

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # field days

Year	Target	Actual
2009	1	1

Output #2

Output Measure

- # presentations at professional meetings

Year	Target	Actual
2009	5	6

Output #3

Output Measure

- # workshops on improved soil and water management practices

Year	Target	Actual
2009	4	4

Output #4

Output Measure

- # media occurrences

Year	Target	Actual
2009	6	7

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of farmers adopting improved soil and water quality management practices
2	Development of water treatment (wetlands) for small-scale farmers

Outcome #1

1. Outcome Measures

Number of farmers adopting improved soil and water quality management practices

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	50	41

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Intensive tillage and limited reintroduction of low organic matter are two major factors contributing to soil degradation in the southeastern United States. Small scale vegetable growers need information on pre-determined combinations of practices they can adopt that will rapidly and effectively improve soil quality and crop productivity.

What has been done

Research has been completed that has contributed to the knowledge base in using no tillage, cover crops and compost to improve soil quality. A workshop was held to share this information with small scale producers.

Results

Forty-one producers attended the workshop. All participants reported that the information presented was most useful and helpful in their on-farm operation.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Development of water treatment (wetlands) for small-scale farmers

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Government Regulations

Brief Explanation

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

1. Evaluation Studies Planned

- During (during program)

Evaluation Results

Key Items of Evaluation

V(A). Planned Program (Summary)**Program # 4****1. Name of the Planned Program**

Food 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
204	Plant Product Quality and Utility (Preharvest)				10%
502	New and Improved Food Products				30%
503	Quality Maintenance in Storing and Marketing Food Products				10%
701	Nutrient Composition of Food				18%
703	Nutrition Education and Behavior				12%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins				20%
	Total				100%

V(C). Planned Program (Inputs)

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	4.6
Actual	0.0	0.0	0.0	4.4

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	424674
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	2499120
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Scientists conducted studies to determine functional food ingredients from selected North Carolina agricultural by-products; to evaluate select plant extracts as potential food preservatives and anticarcinogens; to enhance the microbiological quality of probiotic supplements; to determine food knowledge and practices among different population subgroups and develop targeted

and focused intervention methods for maximum effect; and improve healthy eating and physical activity of Hispanic women.

Present findings at professional meetings and with Cooperative Extension agents and programs

Publish research findings in professional journals and Agricultural Research Program's research magazine.

Seek patents for new discoveries.

Conduct tours, workshops and other activities to share findings with Extension educators and with companies that may commercialize products.

2. Brief description of the target audience

The target audience for this research are the following:

Extension educators for use in programs and outreach activities

Companies involved in health and nutrition related products and/or food safety

Consumers

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	979	434473	69	0
Actual	2460	447000	86	0

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

Patent Applications Submitted

Year: 2009

Plan: 1

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	7	
Actual	0	13	13

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # presentations at professional meetings

Year	Target	Actual
2009	6	17

Output #2

Output Measure

- # media occurrences

Year	Target	Actual
2009	8	5

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	# hispanic and other minority women adopting healthy nutrition and exercise practices
2	# of companies purchasing licenses for food and food safety related patents
3	# breakthroughs in new technologies to address food safety
4	# new food products that industry can manufacture to improve health

Outcome #1

1. Outcome Measures

hispanic and other minority women adopting healthy nutrition and exercise practices

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

of companies purchasing licenses for food and food safety related patents

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

breakthroughs in new technologies to address food safety

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

new food products that industry can manufacture to improve health

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Populations changes (immigration, new cultural groupings, etc.)
- Other (National public health problem)

Brief Explanation

These outcomes are long-term in nature. Current studies are focused on these outcomes. Broader outcomes and measures need to be developed for this planned program.

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

1. Evaluation Studies Planned

- During (during program)

Evaluation Results

Key Items of Evaluation

V(A). Planned Program (Summary)**Program # 5****1. Name of the Planned Program**

Global Food Security and Hunger

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
202	Plant Genetic Resources				10%
205	Plant Management Systems				15%
401	Structures, Facilities, and General Purpose Farm Supplies				20%
604	Marketing and Distribution Practices				15%
610	Domestic Policy Analysis				20%
611	Foreign Policy and Programs				20%
	Total				100%

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	3.2
Actual	0.0	0.0	0.0	5.2

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	1653524
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	1406764
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	116806

V(D). Planned Program (Activity)**1. Brief description of the Activity**

Conduct studies in the following areas: (1) defining opportunities for rural entrepreneurs and connecting them with small-scale agricultural enterprises and existing rural businesses and prospective entrepreneurs; (2) determining viable alternatives to tobacco for small scale producers including floriculture production in tobacco greenhouses, outdoor and indoor mushroom production, and specialty melons and other crops; (3) seek improved methods for washing green leafy vegetables for use

especially by small scale farmers; (4) identify factors influencing successful small farm operations in North Carolina that can be developed into a protocol for evaluating the predicted success of small farm operations; (5) economic assessment of changes in trade agreements; (6) bioterrorism threats and economic fuel requirements on various industry sectors; and (7) new domestic and international markets for North Carolina producers with particular emphasis on small scale operations.

Present findings at professional meetings.

Publish research findings in professional journals.

Share findings with Extension educators and with other groups that may use the information to improve the viability of small scale agricultural operations, and use to assist small scale producers in finding markets for their products.

2. Brief description of the target audience

The targeted audiences include the scientific community, the general public, small-scale farmers and operations, small businesses, producers of small scale agriculture, and traditionally underserved populations and communities in North Carolina.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	943	434473	0	0
Actual	5040	447000	0	0

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

Patent Applications Submitted

Year: 2009

Plan: 0

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	6	
Actual	0	12	12

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # presentations at professional meetings

Year	Target	Actual
2009	7	24

Output #2

Output Measure

- # media occurrences

Year	Target	Actual
2009	9	9

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Increase in number of producers/growers of alternative crops/enterprises
2	Increase in production and sales of alternative crops and enterprises
3	% farmers in groups indicating increase in knowledge about small scale operations
4	# of small farmeres and businesses trained and becoming involved in export of their products
5	# of new regional or national markets found for NC products
6	# of small farmers and businesses trained in finding regional and national markets for thier products

Outcome #1

1. Outcome Measures

Increase in number of producers/growers of alternative crops/enterprises

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Increase in production and sales of alternative crops and enterprises

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

% farmers in groups indicating increase in knowledge about small scale operations

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	75	150

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With the decline in tobacco production in the state, many small scale farmers are forced to either cease farming or shift production to viable alternatives.

What has been done

Scientists have researched and developed alternative production opportunities for small scale farmers particularly in the areas of pasture pork, mushrooms, and organic vegetables. This information has been shared in many forms and very effectively through field days on the university farm.

Results

The Small Farms Conference is held annually at NCA&T and part of the conference is a field day on the university farm. One hundred and fifty persons participated in the field day and 44 responded to an evaluation survey. Respondents indicated that the information presented was helpful and relevant, especially the sessions on marketing locally grown crops, mushroom production training, and seeding and transplant management. Once again, all indicated that they would likely attend farm field days in the future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
401	Structures, Facilities, and General Purpose Farm Supplies

Outcome #4**1. Outcome Measures**

of small farmeres and businesses trained and becoming involved in export of their products

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

With the decline in tobacco production in the state, many small scale farmers are forced to either cease farming or shift production to viable alternatives.

What has been done

Scientists have researched and developed alternative production opportunities for small scale farmers particularly in the areas of pasture pork, mushrooms, and organic vegetables. This information has been shared in many forms and very effectively through field days on the university farm.

Results

The Small Farms Conference is held annually at NCA&T and part of the conference is a field day on the university farm. One hundred and fifty persons participated in the field day and 44 responded to an evaluation survey. Respondents indicated that the information presented was helpful and relevant, especially the sessions on marketing locally grown crops, mushroom production training, and seeding and transplant management. Once again, all indicated that they would likely attend farm field days in the future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
610	Domestic Policy Analysis
611	Foreign Policy and Programs

Outcome #5

1. Outcome Measures

of new regional or national markets found for NC products

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	20

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Connecting farmers with potential buyers of their products is the lifeline of financial success for small farmers.

What has been done

Scientists in agricultural economics involved with the International Trade and Development Center met with farmers to train them and connect them with viable markets.

Results

The Center identified a broker/retailer and a restaurant operator who is willing to buy free range pork directly from farmers at a premium price. As a result 20 small pork farmers are negotiating a contract with the potential buyer to supply 15 pigs per farmer per week.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices
610	Domestic Policy Analysis

Outcome #6

1. Outcome Measures

of small farmers and businesses trained in finding regional and national markets for thier products

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Small farmers and businesses need to know how to market their products in local, regional and national markets. This knowledge can assist them in increasing sales and boost their success in today's economy.

What has been done

Agricultural economists have completed studies on local, regional and national markets for NC products and have offered this information through activities of NCA&T's International Trade and Development Center.

Results

The scientists have assisted businesses and individuals in learning more about domestic markets. Two hundred and fifty individuals and 27 businesses benefitted from the conferences, courses, and individual meetings.

4. Associated Knowledge Areas

KA Code	Knowledge Area
610	Domestic Policy Analysis

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Public Policy changes
- Government Regulations
- Other (Negotiations at the WTO)

Brief Explanation

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

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)
- Case Study

Evaluation Results

Key Items of Evaluation

V(A). Planned Program (Summary)**Program # 6****1. Name of the Planned Program**

Childhood Obesity

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
724	Healthy Lifestyle				60%
802	Human Development and Family Well-Being				40%
	Total				100%

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	1.5
Actual	0.0	0.0	0.0	0.5

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	110746
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)**1. Brief description of the Activity**

Conduct research that will: (1) identify food preferences, food selections, and eating practices of African American parents and their pre-school aged children; and (2) determine factors that influence the food preferences, selections and eating habits of African American parents and their pre-school aged children.

Present findings at professional meetings.

Publish research findings in professional journals.

Share findings with parent, healthcare professionals, Extension educators and other groups that may use the information to improve the viability of small scale agricultural operations, and use to assist small scale producers in finding markets for their products.

2. Brief description of the target audience

The targeted audiences include parents, the scientific community, the general public, and healthcare professionals

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	163	434473	0	0
Actual	86	447000	0	0

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

Patent Applications Submitted

Year: 2009
 Plan: 0
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	5	
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # presentations at professional meetings

Year	Target	Actual
2009	5	2

Output #2

Output Measure

- # media occurrences

Year	Target	Actual
2009	8	2

Output #3

Output Measure

- # of research projects focusing on developing regional and international markets for NC products
Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	# of different NC products exported
2	# of small farmers and businesses trained and becoming involved in export of their products
3	% of increased income by farmers and businesses served by the International Trade Center
4	% of stakeholders who use the information and policy research in their decision making
5	# of new regional or national markets found for NC products
6	# of small farmers and businesses trained in finding regional and national markets for their products
7	# parents with increased knowledge about appropriate portion sizes of food in-take for the entire family
8	# parents making healthier food selections for themselves and their children

Outcome #1

1. Outcome Measures

of different NC products exported

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

of small farmers and businesses trained and becoming involved in export of their products

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

% of increased income by farmers and businesses served by the International Trade Center

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

% of stakeholders who use the information and policy research in their decision making

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

of new regional or national markets found for NC products

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

of small farmers and businesses trained in finding regional and national markets for their products

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

parents with increased knowledge about appropriate portion sizes of food in-take for the entire family

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

parents making healthier food selections for themselves and their children

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Competing Programmatic Challenges

Brief Explanation

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

1. Evaluation Studies Planned

- After Only (post program)
- During (during program)

Evaluation Results

Key Items of Evaluation