FY 2003
Annual Report of Accomplishments and Results

Partnerships Unit
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Submitted by

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AGRICULTURAL RESEARCH PROGRAM

I. PLANNED PROGRAMS

A. *Goal 1: An agricultural system that is highly competitive in the global economy*

1. Overview

In connection with Goal 1, North Carolina A&T State University (NCA&TSU) has been active in the areas of agricultural competitiveness, biotechnology, small farm viability and alternative uses for agricultural products. Some highlights of the year are listed below while particular accomplishments/impacts appear under the Key Theme sections.

- NCA&TSU is facilitating trade development by assisting U.S. farmers and farm organizations in their marketing relations with developing countries. The University's International Trade Center approach to this goal is through international trade policy research, especially in tracking emerging issues that influence the competitiveness of North Carolina and U.S. agriculture. This past year, the Center conducted a major study to assess how the recent tariff rate quota (TRQ) policy was working for the tobacco industry. The work resulted in testimonials presented to the agricultural policy advisors for the Governor of the State of North Carolina.

- Survival of the NC small farm is particularly a concern since the market for its main crop, tobacco, is diminishing. The combination of quota cuts and other market factors are forcing many tobacco farmers to look for additional sources of income and alternative crops. Researchers at NCA&TSU are identifying the viability of high value cash specialty crops that small-scale NC farmers can successfully produce and that can give them the needed income and effective crop management strategies to be able to produce on small acreage and keep their family farming enterprises viable. In addition, research projects include edible and medical mushroom cultivation, pastured swine production, and cut flower production using tobacco greenhouses.

- A Field Day was held at the NCA&TSU University Farm in July, 2003, to show the results of research work in progress regarding 13 production studies for limited resource farmers in NC. Of the 150 persons attending, ten percent indicated on their evaluation forms that they would likely implement activities demonstrated at the Field Day on their own farms. This field day was a joint effort between Extension and research.

- Edible and medicinal mushrooms, popularly called exotic mushrooms, have been shown to have useful nutritional and health benefits. The technology for growing and

maintaining sustainable production of mushrooms as sources of food supplements in the South Eastern United States is currently in its infancy. In the mushroom biology and biotechnology laboratory, NCA&TSU researchers are engaged in the isolation and identification of edible and medicinal mushrooms that grow naturally in the wild in North Carolina for purposes of breeding and selection for suitable strains for use in cultivation under prevailing weather conditions in this region.

- American chestnuts were once a cash crop for U.S. Appalachia families. Disease (chestnut blight) severely decimated the American chestnut tree resulting in virtually no production of chestnuts in the U.S. In fact, in response to demand, the U.S. currently imports $20-40 million of chestnuts annually. The American chestnut industry would like to restore American chestnut tree and resume nut production. University researchers are assisting with this effort by using micropropagation techniques to produce fast growing blight resistant plants to help repopulate the American chestnut tree. They have successfully identified key growth regulators for enhancing axillary shoot proliferation, callus production and root initiation of the American chestnut (*Castanea dentata*). Their work also has identified the use of CPPU or TDZ in media cultures for optimum shoot growth and callus production. The research is identifying ways to improve *in vitro* regeneration efficiency of this recalcitrant species to provide a reliable production protocol.

- Researchers have identified novel genes in bovine neutrophils at the level of transcription by stimulating bovine blood PMN with bacterial endotoxin. This demonstates a way to control gene expression in cows with Ecoli Mastitis leading to the development of new therapeutics for improved animal health and milk production.

- Researchers have developed a methodology to ferment lactose to lactic acid with a conversion rate of 70 percent, using Bifidobacteria longum as a biological agent. This agent also inhibits the growth of pathogens. This offers a new product for incorporation into animal feed thereby improving the health of the animals and profitability of both dairy processors and animal producers.

Total Expenditures: Section 1445 and State Matching Funds = $1,187,543

FTE's: 8

2. Key Theme – Agricultural Competitiveness and Profitability

Description: The International Trade Center at NCA&TSU continues to assist farmers and producers in locating markets for North Carolina products. This activity is a collaborative effort between Cooperative Extension personnel and agricultural researchers.

Accomplishment/Impact:

- During the last year, the International Trade Center successfully helped forge a market for a North Carolina wine in Taiwan. About 1400 metric tons of grape wine was exported to Taiwan. The wine is sold on the wholesale market for a fixed $500 per metric ton. The total amount exported was about $700,000.

Source of Federal Funds: Section 1444 and 1445 of the National Agricultural Research, Extension, and Teaching Policy Act of 1977; State matching funds.

Scope of Impact: State Specific

3. Key Theme – Small Farm Viability

Description:
Researchers and Cooperative Extension personnel have combined efforts to offer technical assistance to small producers to seek alternatives to tobacco production. This has involved three persons who have joint appointments in research and Cooperative Extension. It has also involved Extension specialists and field staff.

One major effort has been to help small scale/part time farmers find new markets and higher profit margins by raising swine in ways that enhance flavor (through diet and genetics) as well as promotes the nutritious value of the fat (from diets that product higher levels of unsaturated versus saturated fat). This project is referred to as pasture pork, which allows swine to be raised in the fields versus confinement in pens. The result is more moist and flavorful pork that is being marketed to upscale restaurants and specialty grocers**.** The return on the pasture pork per pound is higher than the price per pound for the confinement pork market.

Another major effort involves growing exotic mushrooms by small scale and tobacco farmers. The researchers are locating strains of mushrooms that grow well in the three North Carolina regions (coastal, mountain, and piedmont). The substrate for growing the mushrooms is provided to farmers by the University and technical training workshops on the cultivation of these mushrooms are being offered throughout the state. Field Extension personnel are being trained and certified to hold these classes.

In addition, a team of researchers and Cooperative Extension personnel has selected appropriate production studies for limited resource farmers in North Carolina. Eleven separate studies are underway including hot peppers in rotation with cover crops, Spanish goal production in NC, and effects of cultivars and mulching on garlic yields in a Piedmont environment.

Accomplishment/Impact:

- As a result of a joint training effort with University Cooperative Extension staff in conducting pasture pork demonstration workshops, 34 small-scale farmers have reduced or eliminated their reliance on growing tobacco to producing pasture pork. During 2003 15 of these farmers produced 2,664 hogs for total sales of $311,659. In comparison these same farmers produced only 246 hogs in 2002 for total sales of $26,199. A major company is negotiating a contract with these farmers to purchase at least 500 hogs per month. The success of this venture demonstrates that pasture pork production is a viable income alternative for tobacco farmers.

- As a result of a joint training effort with University Cooperative Extension staff in conducting specialty mushrooms demonstration workshops, 152 small scale producers are now growing specialty mushrooms throughout North Carolina. These growers have been able to sell their mushrooms for prices at double or triple the prices typically obtained for the common white button ($2 to $3 per lb.) and portabella ($3 to $5 per lb.) mushroom. In one case with less than a $50 investment, in a 5-week fruiting period one farmer harvested a 105 pound crop of mushrooms that sold for an average of $10 per pound, for a profit of about $1,000. The University is currently negotiating with a company to buy and supply North Carolina grown specialty mushrooms for a major hotel chain.

Source of Federal Funds: Section 1444 and 1445 of the National Agricultural Research, Extension, and Teaching Policy Act of 1977; State matching funds. (In addition, funds have been received from the Golden Leaf Foundation for the pork and mushroom initiatives. Funds from the Smith Reynolds Foundation and from the NC Department of Agriculture have assisted with the mushroom project).

Scope of Impact: State Specific

B. *Goal 2: A safe and secure food and fiber system*

1. Overview

Under Goal 2, research activities have focused methods of food borne pathogen protection and testing various materials for substitution of antibiotics in animal disease control. Specific projects and their accomplishment/impacts are presented in the Key Theme sections.

Total Expenditures: Section 1445 and State Matching Funds = $368,641

FTE's: 3

2. Key Theme – Food Borne Pathogen Protection

Description: University researchers continue to study the development of rapid and effective detection and protection against food borne pathogens. This effort has focused on the use of natural foods and organisms to add human protection. A specific study has focused on bifidobacterium and the development of a compound that serves as both an anti-oxidant and microbial retardant. Work this year has expanded to include lipid oxidation prevention.

In addition, preliminary studies have focused on investigating alternatives to using antibiotics in poultry. One study has examined the use of mushrooms native to North Carolina as a way to control *Campylobacter jejuni*. Experimental batches of poultry litter were treated with a dried preparation of these mushrooms and compared with non-treated litter to determine the effectiveness in reducing *Campylobacter jejuni.* The results revealed that the mushroom treated litter was associated with a higher rate of pathogenic reduction than the untreated litter.

Accomplishment/Impact:

- As previously reported, an Israeli-based company adopted the use of the compound that is effective as an anti-oxidant and the control of microbe development. The product, Origanox, is marketed in the United States. Researchers have developed a methodology that will allow the product to prevent lipid oxidation. The company, Barrington Nutritionals, a component of the Israeli-based company, is incorporating this second capability of lipid oxidation control into the product.

- Preliminary results of a study indicate that dried mushrooms added to litter provide an effective and inexpensive way to control *Campylobacter jejuni* in poultry.

Source of Federal Funds: Section 1444 and 1445 of the National Agricultural Research, Extension, and Teaching Policy Act of 1977; State matching funds

Scope of Impact: State and National

C. *Goal 4: Greater harmony between agriculture and the environment*

1. Overview

Under Goal 4, researchers focused on the areas of agricultural waste management. Specific projects and their accomplishment/impacts are presented in the Key Theme described below.

Total Expenditures: Section 1445 and State Matching Funds = $1,190,551

FTE's: 4

2. Key Theme: Agricultural Waste Management

Description: Research continues on the efficacy of using constructed wetlands methodology to improve the water quality of agricultural wastewater. One concern is how to remove herbicides in runoff water. Constructed wetlands represent an option for medium sized farmers to treat wastewater contaminated with herbicides. Wetland cells with and without bulrushes ~~and~~ were compared for their ability to reduce concentrations of the herbicide altazine.

Accomplishment/Impact**:**

- An average reduction of 92% of altazine was associated with the wetland cells with bulrushes as opposed to a 68% reduction for wetland cells without bulrushes. These results indicate that medium size farmers now have an alternative of using constructed wetlands to deal with runoff contamination of the herbicide altrazine.

Source of Federal Funds: Section 1444 and 1445 of the National Agricultural Research, Extension, and Teaching Policy Act of 1977; State matching funds

Scope of Impact: State and National

II. Stakeholder Input Process

There have been no significant changes in the stakeholder input process since the last annual report.

III. Program Review Process

There have been no significant changes in our merit review and scientific peer review processes submitted as a supplement to our 5-Year Plan of Work.

IV. Evaluation of the Success of Multi and Joint Activities

Did the planned programs address critical issues of strategic importance?
Researchers in the Agricultural Research Program have participated in multi-state research efforts during the reporting period. These projects address critical and important issues:

1. **"Impacts of Trade Agreements and Domestic Policies on the Competitiveness and Performance of Southern Agriculture"**

2. **"Genetic and Functional Genomic Approaches to Improve Production and Quality of Pork"**

3. **"Nutritional Systems for Swine to Increase Reproduction."**

5. **"Use of Phytase in Sow Diets"**

Did the planned programs address the needs of under-served and under-represented populations of the State(s)?

No, most of these projects involved issues of all agricultural producers.

Did planned programs result in improved program effectiveness and/or efficiency?

Yes, the projects conducted were multi-state in their approach and provided results that were regional in scope and not just state specific. Through this approach, research can be strategically focused as well as save valuable resources/funds through an elimination of project and program duplication. Also, the focus is on interdisciplinary and multidisciplinary research and Extension efforts.

V. Integrated Research and Extension Activities

The School of Agriculture and Environmental Sciences continues to focus on six interdisciplinary and collaborative program initiatives: (1) Human and Community Development, (2) Biotechnology and Biodiversity, (3) Soil and Water Quality, (4) Agromedicine, Nutrition and Food Safety, (5) Small Scale Agriculture, and (6) International Trade and Development. Integrative efforts of research, Cooperative Extension and academic program are coalescing around these initiatives. The efforts support the University goals as well as the five USDA goals.

To enhance interaction, all faculty and Extension specialists are members of teams on at least one of the six program initiatives. Two co-leaders coordinate each team: one leader is a researcher while the other is an Extension specialist. The School is continuing to work on the six initiatives by developing concept papers to guide the research, teaching, and extension direction of each initiative. The concept papers are being developed by the teams of researchers and extension personnel and will be used by the School to determine research project appropriateness and allotment of the University's USDA and other resources.

Efforts are continuing in integrating research and Cooperative Extension efforts. Most notably is the increased inclusion of Cooperative Extension personnel in submitted proposals. We have identified the need for increased numbers of persons with backgrounds in agricultural economics (researchers) and livestock production (Cooperative Extension). Also, there are now four faculty members who have split appointments between research and Cooperative Extension.

The Deans and Associate Deans from North Carolina State University and North Carolina Agricultural and Technical State University are involved in a planning process of evaluating the potential of combining the research and Extension components of the two universities in the next planning cycle. A possibility exists of having one combined Research and Cooperative Extension Plan and thus one reporting process for North Carolina.

A goal overall is to improve the interaction of research and Cooperative Extension in joint efforts to identify and address critical and appropriate issues in the state.