



## Agricultural Research Program

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NORTH CAROLINA A&T STATE UNIVERSITY  
SCHOOL OF AGRICULTURE

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July 12, 1999

Dr. George Cooper  
Deputy Administrator, Partnerships  
USDA/CSREES  
Room 3851, South Building  
Washington, DC 20250

Dear Dr. Cooper:

Forwarded herewith are North Carolina A&T's plan of work as required under the Agricultural Research, Extension and Education Reform Act of 1998 (AREERA). Should you have any questions, please contact Benjamin Forbes at 336.334.7612.

Sincerely,

Charles A. Panton  
*Associate Dean for Research*

Enclosure

<b><u>Principal Investigators</u></b>	<b><u>Project Title</u></b>
Marihelen Kamp-Glass	Improving Performance in Two Acid/aluminum Tolerant Alfalfa Cultivars
M. R. Reddy and K. Li	Environmentally Sound Cropping Systems for Enhancement of Farm Income
Chung W. Seo	Utilization of Agricultural By-products from Commodity Crops Such as Peanut Shells, Corn Cobs
Willie Willis	Campylobacter Jejuni Intervention Strategies and Antibiotic Resistance of Broiler at the Production Level
Chung W. Seo	Nutritional, Physical, Chemical and Sensory Properties of Low-fat Ground Meat Processed by Supercritical CO <sub>2</sub>
Kofi Adu-Nyako and Alton Thompson	Food Choices — Perceptions and Purchase Behavior of Persons in Black Belt States
M. R. Reyes, G.A. Gayle, C.W. Raczkowski, and G.B. Reddy	Evaluating the Performance of Erosion and Water Quality Models
C.W. Talbott, G.B. Reddy, C. Raczkowski, M.R. McKinnie and J. Henson-Upshaw	Integrated Crop and Sylvan Systems with Swine: A State and National Initiative
Godfrey Ejimakor	Rural Restructuring: Causes and Consequences of Globalized Agricultural and Natural Resource Systems.
Anthony Yeboah and Donald McDowell	Exploring Survival Issues Among Minority Farm Operators in North Carolina
Carolyn S. Turner	Food Safety Practices among the Elderly

## **GOAL 1: TO ACHIEVE AN AGRICULTURAL PRODUCTION SYSTEM THAT IS HIGHLY COMPETITIVE IN THE GLOBAL**

**Project Title:** Improving Performance in Two Acid/Aluminum Tolerant Alfalfa Cultivars

**PI:** Marihelen Kamp-Glass, (*Natural Resources and Environmental Design*)

### **National Goals (1, 2, 4, 5)**

**An agricultural system that is highly competitive in the global economy.** In the Piedmont of North Carolina and throughout the Appalachian region and in much of the soil of North America, costly soil amendments are needed to raise soil pH to the level needed to grow the world's number one forage crop, alfalfa. Amendment costs and terrain make amending the soil impractical. Alfalfa cultivars, which grow in acid soils, will increase acreage of production and eliminate many amendment costs making the product less expensive.

**A safe and secure food and fiber system.** Increased forage lands will allow increased production of livestock at lower costs, keeping supply adequate to meet the rising demand.

**Greater harmony between agriculture and the environment.** Environment quality can be improved. The dense rhizosphere of alfalfa makes it a natural defense against soil erosion. Nitrogen fixed in grazing soils eliminates the need for added Nitrogen and prevents contamination of surface water with nitrates that contribute to alga proliferation and subsequent loss of free oxygen.

**Expanded economic opportunity and quality of life for Americans.** The Appalachian region is notorious for its poverty and reliance on coal mining. If currently unused land were put into livestock production, marginal small family farms would have a cash crop to sell, and acreage, which provided excellent grazing lands for a variety of ruminants.

### **Statement of Issues**

Much of the Appalachian area is classified as economically depressed. Much of the land is infertile or unusable because of the rugged stony terrain, the acid pH of the soil and the toxicity of Manganese and Aluminum at low pH. Amending the soil is not practical since it is not possible to amend stony sub-surface layers, steep slopes and because the cost is prohibitive even where possible. Development of forage crops for these soils would eliminate the need for soil amendments, rendering stony, steep acreage capable of being used as grazing lands.

### **Performance goals**

- To develop two acid aluminum tolerant cultivars for use as forage crops in soils with low pH and metal toxicity.

- To multiply sufficient seed for multiplication and release through agricultural extension agencies.
- To put currently unusable land into economically viable production.

### **Output Indicators**

- Technical and non-technical bulletins and scientific papers containing an analysis of the data.
- The announcement of cultivar releases.

### **Output Indicators (to be done at project termination)**

### **Key Program Components**

- The development of in-vitro screening methods for acid aluminum tolerance in alfalfa
- Development of directed breeding for the desired trait.
- Development of multiple shoot organogenesis for increased plant production as well as a genetic transformation system.
- Release of genetic materials.

### **Internal and External Linkages**

- Internal linkages consist of scientists in the Horticulture program with soil scientists in the Department of Natural Resources and Environmental Design.
- External linkages have been established between the University and the USDA CSREES Research Station in Beckley, WVA and the Lucerne Improvement Group at the Waite Institute, Western Australia.

### **Target Audiences**

- Farmers and herdsman in any area of the globe with acid soils and a climate suitable to the growing of alfalfa.

### **Program Duration**

Three years

### **Allocated Resources**

Approximately \$122,000 per year

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**Project Title:** Environmentally Sound Cropping Systems for Enhancement of Farm Income

**PIs:** M. R. Reddy and K. Li

### **National Goals 1 and 4**

An agricultural system that is highly competitive in the global economy and (4) An agricultural system which protects natural resources and the environment.

### **Issues**

Stakeholder sessions on farms and rural communities in different regions of North Carolina for the past few years have pointed out farmers concerns for lack of adequate soil testing information under cover crop management on nutrient release for the following crop. Other concerns included need for alternate practices in production agriculture to reduce chemicals and avoid contamination of natural resources such as soil, water and food chain. Also, in need of high value crops.

### **Performance Goals**

Farmers access to appropriate soil test information under cover crops on nutrient release for the following crop, sustainable production practices, reduction of chemicals in production agriculture, use of on farm resources and natural processes such as nitrogen fixation and conservation of natural resources.

### **Output Indicators**

- Improved soil testing under cover crops.
- Development of sustainable production practices.
- Production research results on high value crops such as seedless watermelon.

### **Outcome Indicators**

- Increased access to appropriate soil testing information to North Carolina producers.
- Greater farmer confidence in sustainable production practices.
- Reduced use of agricultural chemicals, increased use of on farm inputs and natural process and lower production costs.
- Production of high value crops and increased farm income.

### **Key Program Components**

Research project will focus on:

- Improved soil testing information under cover crops to North Carolina farmers by appropriate sampling and testing;
- Sustainable production practices by adopting natural processes such as nitrogen fixation through green manures;
- Alternate and high value crops for North Carolina farms.

### **Internal and External Linkages**

Partnerships will be continued with extension, federal labs, and the universities as related to this performance goal. We will concentrate on shared responsibilities for the agreed research objectives of the project.

### **Target Audiences**

The focus is on farmers and consumers of North Carolina. Special attention is given to limited resource farms and fruit and vegetable farms.

### **Program Duration**

Five years

### **Allocated Resources**

<u>Current</u>	<u>FY2000</u>	<u>FY2001</u>	<u>FY2002</u>	<u>FY2003</u>
\$124,256	\$130,000	\$135,000	\$140,000	\$145,000

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**Project Title:** Utilization of Agricultural By-products from Commodity Crops Such as Peanut Shells, Corn Cobs

**PI:** C. W. Seo

### **National Goals 1 and 4**

#### **Statement of Issues**

Peanut, corn and soybean generate enormous quantities of waste each year which is difficult to dispose of since it has little or no value. This creates a need to convert these by-products to useful, value added products.

Metals contamination of wastewater is a serious and ongoing problem because of the numerous chemical manufacturing, metal plating, photo processing industries throughout the United States. Since contaminated wastewater can easily find its way into both surface and ground water, this problem should be of great concern to anyone who obtain their drinking water from these sources.

Two problems of considerable environmental significance to the United States, in general, and to individual agricultural/industrial states, such as North Carolina, in particular. Should be addressed.

#### **Performance Goals**

To develop and enhance the natural adsorbent properties of select agricultural by-products from peanuts, corn cobs and soybean hulls. They can be used in industrial and municipal wastewater process systems for metal removal.

**Output Indicators**

We will have data comparing our adsorbents with commercial adsorbents obtained identical experimental conditions. We will be able to give potential users as to the physical and chemical properties of our products.

**Outcome Indicators**

Our products will be stable adsorbents with high adsorption efficiency and capacity for use in industrial and municipal wastewater treatment systems. This leads to obtain clean water for human consumption.

**Key Program Components**

We propose to produce adsorbents from peanut shells, corn cobs and soybean hulls. The by-products will be ground to a particle size of 2mm. The ground products will be treated with citric acid and phosphoric acid and expose to temperature 120 C and 180 C. The processed products will be tested for metal adsorption efficiency and capacity. The adsorption efficiency and capacity data will be compared with the data of commercial adsorbents. The optimum treatment procedures will be established to produce adsorbents for the by-products.

**Internal and External Linkages**

Internal linkages consist of faculty members in the Department of Chemical Engineering and Agricultural engineering.

External linkages have been established with the Southern Regional Research Center, ARS, USDA.

**Target Audiences**

Commodity farmers, Wastewater treatment industries.

**Program Duration**

3 years

**Allocated Resources**

\$280,000



**Project Title:** Impacts of Trade Agreements and Economic Policies on North Carolina Agriculture

**PIs:** William A. Amponsah and Xing Dong Qin

### **National Goal (1)**

**To achieve an agricultural production system that is highly competitive in the global economy.** Determine the economic consequences of trade impacts stemming from changes in domestic and foreign agricultural and economic policies, and trade agreements and assess alternative strategies to improve the competitiveness of U.S. and Southern agriculture.

### **Statement of Issues**

The influence on North Carolina agriculture of domestic and international policy reforms and changes in trade agreements is important. Indeed, trade and competitive impacts arising from changes in domestic agricultural policies (such as the 1996 FAIR Act), as well as continued reforms in trade agreements (such as the WTO and NAFTA), are expected to determine the continued competitiveness of the U.S. and the state's agricultural sector. North Carolina is an important contributor to U.S. agricultural production, processing and exports. The state is a major supplier of cotton and products, peanuts, poultry and products, tobacco, etc., and a major contributor to the production of grains, soybeans, feeder cattle, pork and dairy products. Therefore, changing domestic and international policies on North Carolina agriculture also influence the food and agricultural supply of the nation as a whole.

### **Performance Goals**

- To determine the economic consequences of trade impacts stemming from changes in domestic agricultural and economic policies.
- To determine the economic impacts of continued reforms in trade agreements on trade competitiveness.
- To recommend alternative strategies to improve trade competitiveness.

### **Output Indicators**

- A comprehensive agricultural trade data base on U.S. and North Carolina is developed and accessible through the Internet.
- Reports of key North Carolina commodities and their performance in trade are available.
- Research information/output is successfully disseminated through the North Carolina A&T State University's International Trade Center.

### **Outcome Indicators**

- Use of agricultural trade data base by researchers, businesses, policy makers and students.

- Improved body of knowledge on North Carolina agricultural trade competitiveness.
- North Carolina A&T State University's International Trade Center improves advisory information about agricultural trade policy and U.S. trade competitiveness

#### **Key Program Components.**

- Collection of comprehensive data on domestic and international markets for key North Carolina agricultural products.
- Modeling effects of domestic and international agriculture and economic policies crucial for determining agricultural trade competitiveness.
- Strategies formulation to help agribusinesses in maintaining competitiveness.

#### **Internal and External Linkages**

- Encourage the pooling of interdisciplinary researchers at A&T who are involved in international trade, marketing, international agribusiness marketing and international business development.
- Investigators already belong to the Southern Trade Research Group, S-287 and International Agricultural Trade Research Consortium, and serve on research leadership positions nationally with the American Agricultural Economics Association and the International Association of Agricultural Economists. Through the International Trade Center, the scientists collaborate on research with USDA agencies such as the Economic Research Service, Farm and Foreign Agricultural Service and Rural Business-Cooperative Service.

#### **Target Audience**

- Economics and international trade research scientists, extension facilitators, USDA agencies, North Carolina Department of Agriculture, U.S. Department of Commerce and their North Carolina regional offices, agribusinesses, farmers, policy makers, students, etc.

#### **Program Duration**

Four years (through September 30, 2003).

#### **Allocated Resources**

\$100,000 per year.

## **GOAL 2: A SAFE, SECURE FOOD AND FIBER SYSTEM**

**Project Title:** Campylobacter Jejuni Intervention Strategies and Antibiotic Resistance of Broiler at the Production Level

**PI:** Willie Willis

### **National Goal 2**

A safe and secure food and fiber system. To ensure an adequate food and fiber supply and food safety through improved science based on detection, surveillance, prevention and education..

### **Statement of Issue**

Campylobacter is reported to be the most frequent cause of human food borne illness in the United States (CDC, FSIS, 1997). It cost the consumers one billion dollars annually. Poultry products have been identified as a major vehicle of human Campylobacteriosis. The intestinal contents is the primary source of Campylobacter entry into the processing plant. Reducing Campylobacter Jejuni colonization in chickens at the farm can potentially reduce the incidence of infections in humans.

### **Performance Goals**

- To further the knowledge on how and why chicks get infected and why some do not.
- To reduce the colonization and frequency of shedding of Campylobacter Jejuni in broilers.
- To research pre-harvest intervention strategies for contamination reduction.
- To determine why Campylobacter Jejuni become resistance to antibiotics so readily and find alternate treatments.

### **Output Indicators**

- A reduction in Campylobacter Jejuni colonized broilers at the production farm.
- Intervention strategies at pre-harvest time to reduce fecal shedding.
- Scientific papers published on Campylobacter Jejuni decreasing susceptibility on true resistance to antibiotics in broiler production.

**Outcome Indicators** — (To be done at project termination)

### **Key Program Components**

- Trails were to be conducted on the farm utilizing infected and non-infected broiler chickens as models to study the ecology of Campylobacter jejune.

- A two-year study utilizing broiler chickens at the production level to study long term antibiotics feeding susceptibility on resistance.
- Pre-harvest in prevention strategies will be studied using broiler chickens to reduce the shedding of *Campylobacter* Jejuni, prior to arrival to the processing plant.

#### **Internal and External Linkages**

- Internal linkages will consist of the Food Microbiologist in the Human Environment and Family Sciences Department and in the Animal Science Department.
- External linkages have been established over the years with Dr. Norman Stern's at the Russell Center in Athens, Georgia.

#### **Target Audiences**

All persons consuming poultry and poultry products in the nation and the world.

#### **Program Duration**

Three years

#### **Allocated Resources**

Approximately \$140,000 per year



**Project Title:** Nutritional, Physical, Chemical and Sensory Properties of Low-fat Ground Meat Processed by Supercritical CO<sub>2</sub>.

**PI:** C. W. Seo

#### **National Goals 2 and 3**

##### **Statement of Issues**

Dietary saturated fatty acids and cholesterol are known to increase the incidence of coronary heart disease. Providing consumers with low-fat meat products is a dominant product development issue of the meat industry in recent years.

One of the new approaches to the development of Low-fat ground meat is using supercritical carbon dioxide extraction method (SC-CO<sub>2</sub>). Supercritical carbon dioxide can penetrate a sample matrix like a gas but have solvating properties like a liquid, and non-toxic, non-flammable, inexpensive and environmentally acceptable solvent. The environmental and health concern about organic solvents is the major impetus for the adaptation of this technique for the food processing industry.

Developing acceptable low-fat ground meats using SC-CO<sub>2</sub> is an important issue to be addressed.

### **Performance Goals**

- To optimize fat extraction conditions for the efficient fat extraction for fresh meat using SC-CO<sub>2</sub>.
- To study the sensory, physical, chemical, cooking properties of meat containing low-fat processed by SC-CO<sub>2</sub>.
- To determine the shelf-life of processed meat determined by the degree of lipid oxidation during storage.

### **Output Indicators**

The following data will be collected:

- Data on the optimal extraction condition for processing using the supercritical system.
- Data on the lipid oxidation of the processed meat during storage.
- Data on the sensory, physical, and chemical properties of the products.

### **Outcome Indicators**

We will be able to produce low-fat ground meat (pound scale) which is palatable.

### **Key Program Components**

Meat will be purchased from the local grocery store and chopped. For each extraction, about 150-200g of meat will be loaded into the 1 liter extraction vessel and extracted for fats. The packing method will be adapted from the report of Seo et al. (1996). The extraction pressure will be 5,000 to 9,500 psi. The targeted fat content in the meat will be 3, 6, 9%.

The TBA test will be used to follow lipid oxidation of the meat during storage. Sensory tests and other chemical physical tests on meat will be performed to determine the properties of the meat.

### **Internal and External Linkages**

A faculty member in the Department of Agricultural Engineering will be involved. External linkages will be established with the Northern Regional Research Center, ARS, USDA.

### **Target Audiences**

General consumers and meat processing industries.

### **Program Duration**

3 years

### **Allotted Resources**

\$290,000



**Project Title:** Improving Performance in Two Acid/Aluminum Tolerant Alfalfa Cultivars (*see Goal 1*)



**Project Title:** Food Safety Practices among the Elderly (*see Goal 5*)



## **GOAL 3: A HEALTHY, WELL-NOURISHED POPULATION**

**Project Title:** Food Choices — Perceptions and Purchase Behavior of Persons in Black Belt States

**PIs:** Kofi Adu-Nyako and Alton Thompson

### **National Goals 3 and 4**

#### **Statement of Issues**

Shifts in demographics, extensive media coverage of food borne illness, changes in cooking and eating habits, and advances in science are important factors contributing to the increased attention to food safety issues. While many of the food borne illnesses cases result from consumer mishandling of foods, through improper storage and/or preparation, most consumers consider food safety a food industry issue. Such misperceptions create problems for targeting efforts at attenuating food borne illnesses.

Food borne illnesses are costly in terms of treating illnesses and loss of productivity, and death. USDA/ERS estimated the cost of illness due to seven food borne pathogens associated with meat and poultry products to range from \$4.5 billion to \$7.5 billion annually.

#### **Performance Goals**

- To increase awareness of food safety issues and food borne illnesses of persons in the Black Belt region
- To increase knowledge of food preparation and food handling practices of persons in the Black Belt
- To influence the purchase behavior of persons in the Black Belt region
- To promote healthy food choices of persons in the Black Belt region

#### **Output Indicators**

- A representative data base of food safety perceptions and purchase behavior of persons in the Black Belt region
- Technical and non-technical bulletins and scientific papers containing an analysis of these data
- Recommendations for food safety educational programs to be use by the Cooperative Extension Service and other outreach programs
- Information as input in risk analysis
- Information to evaluate public regulatory initiatives

#### **Outcome Indicators (to be done at project termination)**

#### **Key Program Components**

- The sampling frame consisted of counties in five South Atlantic States (North Carolina, South Carolina, Virginia, Georgia and Florida) with a disproportionate

share of African American population (more than 12 percent). Using a stratified sampling design, with random digit dialing, 317 telephone interviews were completed.

- The database fills a crucial void in studies of food safety by including an important U.S. sub-population, persons in the Black Belt Region who may be at higher risk of food borne illnesses. The behavior of this sub-population may be different from the general populations and whose circumstances may predispose them to behavior that may not be conducive to reducing the risk of food borne illness.
- Rural decline, inadequate education programs, and acute problems of poverty, poor health, substandard housing and underemployment, historically, have largely characterized the Black Belt region.

### **Internal and External Linkages**

- Internal linkages consist of an interdisciplinary team of scientists in the Departments Agricultural Education, Economics and Rural Sociology, Human Environment and Family Sciences and Animal Sciences.
- External linkages have been established with the North Carolina Office of Minority Health, Economic Research Service, Food Safety and Inspection Service, Tennessee State University and the University of Kentucky.

### **Target Audiences**

Persons in the Black Belt states of the South Atlantic region of the South

### **Program Duration**

Three Years

### **Allocated Resources**

Approximately \$125,000 per year

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**Project Title:** Nutritional, Physical, Chemical and Sensory Properties of Low-fat Ground Meat Processed by Supercritical CO<sub>2</sub> (*see Goal 2*)

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## **GOAL 4: TO ACHIEVE GREATER HARMONY (BALANCE) BETWEEN AGRICULTURE AND THE ENVIRONMENT**

**Project Title:** Evaluating the Performance of Erosion and Water Quality Models

**PIs:** M. R. Reyes, G.A. Gayle, C.W. Raczkowski, and G.B. Reddy

### **National Goal 4**

**An agricultural system which protects natural resources and the environment.**

Enhance the quality of the environment through better understanding of and building on agriculture's and forestry's complex links with soil, water, air, and biotic resources.

### **Statement of Issues**

Erosion and water quality models (EWQM) are tools to determine 'best management practices.' Since 1980 several EWQMs were developed. Performances of these models were evaluated for different parts of the United States. However, most of these models were tested when water quality data were very limited. Furthermore, studies on testing several EWQMs from the same database source are very few. From consultations with several EWQM scientists a study dealing with model evaluation is necessary for guiding EWQM users.

### **Performance Goals**

- to evaluate the performance of several EWQMs
- to create comprehensive databases on the Internet for EWQM testing
- to start an EWQM library.

### **Output Indicators**

- a "user's guide for help in deciding the most appropriate EWQM specific to a user's situation
- a comprehensive database accessible through the Internet for future EWQM evaluations
- an EWQM library started at North Carolina A&T State University (A&T)

### **Outcome Indicators**

- use of EWQM by water quality extension experts measured through workshop attendance and number of inquiries
- substantial literature in the EWQM library
- services given to EWQM clients like access to comprehensive database, lending EWQM literature, and summarization of field experimental data.

### **Key Program Components**

- testing is necessary to know the predictive performance of EWQMs
- a "user's guide" for applying EWQM technology is needed by extension experts
- EWQM database fills a crucial void for improving the efficiency of EWQM development and testing
- EWQM library is likely the only one in the nation

### **Internal and External Linkages**

- Internal linkages consists of an interdisciplinary team of scientists involved in soil tillage, soil microbiology, soil and water management, and erosion and water quality modeling
- External linkages have been established with several USDA agencies and several universities

### **Target Audiences**

- Research scientists, extension experts, NRCS staff, environmental consultants, undergraduates, graduate students, chemical and environmental companies, and modern high tech farmers

### **Program Duration**

- Three years

### **Allocated Resources**

- \$100,000 per year



**Project Title:** "Integrated Crop and Sylvan Systems with Swine: A State and National Initiative"

**PIs:** C.W. Talbott, G.B. Reddy, C. Raczkowski, M.R. McKinnie and J. Henson-Upshaw

### **National Goal 4**

#### **Statement of Issues:**

Research and academia have done an excellent job in promoting animal and labor efficiency by utilizing large environmentally controlled, confinement operations. Through this transition, we have basically ignored and written off the importance of the small producer as a vital resource for maintaining food security, enhancing the environment and ensuring market competition. With the new State waste management regulations, even limited resource swine producers will need to change their current practices in order to maintain a balance of nutrient inputs and outputs, assure optimum ground water quality and protect against non-point pollution from swine waste runoff. Based on NC Senate Bill 1217, (passed 2/18/97) farmers keeping hogs

on dry lots must rotate them annually onto another lot and harvest the vegetation grown after the hogs are removed.

Farmers will need to change their current practice of raising pigs on dry lot to avoid accumulation of excess nutrients in one area and comply with non-discharge regulations. Limited resource swine farmers will continue to abandon raising hogs if they don't perceive there are alternative, low cost and profitable options to their current practices.

This project emphasizes methods for maintaining swine on dry lots that are appropriate to limited resource farmers while promoting sustainable, profitable production. There are no research programs addressing the needs of the small scale swine producer in NC. Small scale, minority farmers are leaving agriculture at twice the rate of white farmers.

### **Performance Goals:**

Our experiment will quantify: 1) nutrient run-off, and accumulation, while the pigs are on the dry lots (mulch and bare ground, — Dr. Raczkowski); 2) potential pathogen transfer from swine waste (E-coli in runoff and collected on tissue/fruit or seeds — Drs. Upshaw and Reddy); 3) parasite loading from dry lots with leaves vs. bare lots (and possibly using herbal wormer vs. conventional — Linda Phillips and Dr. Upshaw); 4) potential to develop organic soil for growing organic vegetables (plants grown with conventional inorganic amendments vs. those grown with composted mulch and manure — Dr. Raczkowski); 5) differences in performance (forage utilization, growth, carcass quality, maternal ability, reproductive efficiency and parasite/health status) from conventional crosses (Hampshire x Landrace crosses) vs. Hampshire crossed with Tamworth (HxT), as well as those mated with Tamworth (HxL x T) vs. (HxL x Duroc) as Terminal Sire crosses; and 6) impact of stocking density on forest vegetation, and cooling properties of forest environment on reproductive efficiency of sows.

### **Output Indicators:**

During the months of Oct-Mar, groups of six gestating sows will be maintained on eight plots (50'x50') containing mulch (leaves) or bare ground. Nutrient run-off and plant nutrient availability and productivity will be measured in the two types of plots with swine and compared to eight control plots (with and without leaves) without swine. No inorganic amendments will be added to plots with swine; conventional applications of fertilizer will be added to plots without swine (controls). Productivity of crops from differing plot treatments will be assessed, as well as potential to develop soil for growing organically grown vegetables. Sows will move to Sylvan plots or conventional plots during the months of Apr-Sep).

### **Outcome indicators:**

- Reduction in waste nutrient runoff.
- Development of organic soils to grow value-added crops.
- Reduction in feed costs by forage substitution for concentrate feeding in gestating sows.
- Identification of genotypes appropriate to utilization of alternative feed resources.

**Key Program Components:**

- Nutrient recycling
- Low input/value added marketing

**Internal and External Linkages:**

- A&T -- Natural Resource and Environmental Design: Reddy, Raczkowski
- Cooperative Extension Program: M.R. McKinnie
- USDA Forest Service: Mr. Albert Coffey
- NCSU Forage Extension Program: Jim Green
- Arkansas State Univ.: Dr. Bud Kennedy
- Farmers: Greg Gunthorpe IA; Small scale swine producer

**Target Audiences:**

- Limited resource/ small scale livestock producers

**Program Duration:**

- Three years

**Allocated Resources:**

Southern Region SARE Program: \$156,000

Dean's Matching: \$15,000

Evans Allen: \$247,000



**Project Title:** Rural Restructuring: Causes and Consequences of Globalized Agricultural and Natural Resource Systems.

**PI:** Godfrey Ejimakor

**National Goal 4**

An Agricultural System Which Protects Natural Resources and the Environment.  
Enhance the quality of the environment through better understanding of and building of agriculture's and forestry's complex links with soil, water, air and biotic resources.

**Statement of Issues**

Restructuring of rural communities is one of the inevitable consequences of the global integration of product, labor, capital and natural resource markets, sometimes referred to as globalization. This restructuring is most pronounced in communities that are dependent on farming and natural resource Systems due to changes in the markets land, labor and other resources. Community life and well being will undergo changes as both individuals and communities look for strategies to cope with the change(s).

### **Performance Goals**

An enhanced understanding of changes in the food system is desirable as an indicator of the changes in the reliability and cost of food to consumers. Emerging patterns of response to restructured agricultural systems will also help to shape individual and community development strategies. Activities which are consistent with the goals include a documentation of the social and economic changes within the agricultural and natural resource systems, identification of mechanisms by which globalization affects farms, organizations, families and communities and assessment of strategies used by individuals and communities in response to rural restructuring.

### **Output Indication**

Primary data will be collected on individual perceptions and experiences with the effects of globalization. Secondary data will also be used to determine how globalization may have affected market variables such as natural resource and labor prices in selected communities.

### **Outcome Indicators**

An increased understanding of the effects of globalization on families and communities will aid the development and design of social responses to cushion any adverse impacts. Communities will be in a better position to come up with endogenous development strategies in response to globalization.

### **Key Program Components**

A national survey will be conducted using a sample of approximately 10,000 households.

### **External Linkages**

This is a regional research project and links many land grant universities and the Southern Rural Development Center.

### **Target Audiences**

The target audiences include community development professionals, agricultural and natural resource policy analysts and environmentalists.

### **Program Duration**

Five years.

### **Allocated Resources**

Approximately \$200,000



**Project Title:** Chemical and Physical Quality of Reduced- and Altered-fat Table Spreads

**PI:** Margaret J. Hinds, Ph.D.

#### **National Goal 4:**

##### **Statement of Issues**

Table spreads (viz., reduced- and altered-fat butters, margarines and other butter substitutes) are a main source of dietary fat. Excess dietary fat or the improper types of fat may lead to adverse health conditions, e.g., heart disease. Researchers and leading health groups have advised that consumers should decrease consumption of saturated fatty acids and trans fatty acids, and replace them with mono-unsaturated and polyunsaturated fatty acids. Butter naturally contains saturated fatty acids whereas margarine contains trans fatty acids that are formed during hydrogenation of mono- and poly-unsaturated fatty acids.

Producers of reduced- and altered-fat butters and margarines all claim that their products are heart-smart. Currently, FDA requires food labels to provide information on quantities of total fat, saturated fat, polyunsaturated fat, and cholesterol. However, neither information on quantity of trans fatty acids nor of individual fatty acids is provided. Thus consumers are unaware of the quantity of trans fatty acids or medium-chain fatty acids they consume per serving of margarines/spreads.

##### **Performance Goals**

- To derive information on fatty acid profiles and sterol content, along with additional information on possible changes in physical properties and flavor components during prolonged storage of currently-manufactured table spreads
- To increase knowledge and awareness of dietary fat issues and their health implications.
- To enhance consumers' ability to select table spreads with optimal nutritional and aesthetic qualities.

##### **Output Indicators**

Technical scientific papers containing information on detailed fatty acid profiles (including trans fatty acids), sterol levels, lipid oxidation and production of off-flavors during storage, and changes in physical properties (e.g., color, spreadability, emulsion stability) during storage of name-brand table spreads.

Bulletins for consumers containing: 1) A comprehensive review of the fatty acid profiles (including trans fatty acids), and changes in color, spreadability, emulsion stability, flavor during storage of name-brand table spreads; and 2) Simple, objective, and accurate explanations of the pros and cons of saturated, mono-unsaturated, poly-unsaturated, medium-chain, and trans fatty acids, and sterols in the diet.

Recommendations for education programs on dietary issues of fat to be used by Cooperative Extension Service and high school teachers, and other outreach programs. Information to evaluate present labeling of table spreads and related products.

### **Outcome Indicators**

To be done at project termination.

### **Key Program Indicators**

Freshly-processed samples of (eight or more brand-name products of) reduced- and altered-fat table spreads will be obtained from processors and/or distributors, and stored at refrigerated temperatures according to manufacturers' recommendations. Chemical tests to be carried out are: detailed qualitative and quantitative evaluation of fatty acid profiles including trans fatty isomers and essential fatty acids, lipid oxidation, and analysis of flavor volatiles. Physical tests will include color, spreadability, water activity, and emulsion stability. Shelf-life studies will be carried out monthly or bimonthly for up to 15 months or up to maximum shelf-life of products as recommended by the manufacturers.

### **Internal & External Linkages**

Internal Linkages will include scientists from Human Environment & family Sciences collaborating with scientists from Natural Resources & Environmental Design, and Cooperative Extension.

External Linkages will be established with Extension Agents of Family & Consumer Sciences, High School Science Teachers, and National Consumer Education Groups.

### **Target Audience**

All consumers of table spreads will benefit from the information derived from this project.

### **Program Duration**

Approximately three years.

### **Allocated Resources**

Approximately \$150,000 per year.

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**Project Title:** Food Choices — Perceptions and Purchase Behavior of Persons in Black Belt States (*see Goal 3*)

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**Project Title:** Improving Performance in Two Acid/Aluminum Tolerant Alfalfa Cultivars (*see Goal 1*)

◆ ◆ ◆ ◆ ◆

**Project Title:** Environmentally Sound Cropping Systems for Enhancement of Farm Income (*see Goal 1*)

◆ ◆ ◆ ◆ ◆

**Project Title:** Utilization of Agricultural By-Products from commodity crops such as Peanut Shells, Corn Cobs (*see Goal 1*)

◆ ◆ ◆ ◆ ◆

## **GOAL 5: TO ENHANCE ECONOMIC OPPORTUNITIES AND THE QUALITY OF LIFE AMONG FAMILIES AND COMMUNITIES**

**Project:** Exploring Survival Issues Among Minority Farm Operators in North Carolina

**PIs:** Anthony Yeboah and Donald McDowell

### **National Goal 5**

#### **Statement of Issues**

- Questions regarding the future and survivability of farmers, especially the small and limited resource farmers is of great concern to policy makers.
- The continuous structural changes in agriculture and its impact on the U.S. economy as reflected by its role in the nation's economy.
- For more than five decades, there has been a continuous decline in the number of small family farms and a steady increase in the number of large farms. Why?
- Despite a plethora of public and private programs, many concerns and needs of farmers for whom certain programs were developed, especially, minority and small limited resource farmers were not adequately addressed.
- Past data indicate that the focus of past policies has been narrow and limited largely to the needs of the relatively few large commercial agricultural producers.

Addressing the above concerns will also satisfy many of the goals of Small Farm Commission. That commission concluded their report by outlining eight policy goals as a national strategy for the small farms. The policy goals are:

- Recognize the importance and cultivate the strength of small farms.
- Create a framework of support and responsibility for small farms.
- Promote, develop, and enforce fair, competitive, and open markets for small farms.
- Conduct appropriate outreach through partnerships to serve small farm and ranch operators.
- Establish future generations of farmers
- Emphasize sustainable agriculture as a profitable, ecological, and socially sound strategy for small farms.
- Dedicate budget resources to strengthen the competitive position of small farms in American agriculture.
- Provide just and humane working conditions for all people engaged in production agriculture.

### **Performance Goals**

- To obtain base line information on small and minority farmers in North Carolina via the collection of demographic and socio-economic data.
- To assess the major problems and issues confronting the farmers continued operation/survival.
- To explore, analyze and evaluate the feasibility and risk of alternative practices associated with the production, marketing, financing, legal, and human resources issues affecting farmers survival.

### **Output Indicators**

- Decrease the exit rate of farmers involved in agricultural production
- Assist farmers in engaging in alternative production enterprises
- Establishment and maintaining of a catalogue/directory of minority and small farmers.
- Obtaining a list of the primary needs and concerns of farmers.

### **Outcome Indicators**

- Number of farmers contacted and participating in the project
- Development of resource material utilized by farmers
- Number of agricultural professional involved and assisting with the project
- Increased production of alternative enterprises
- Changes in the financial performance of the farm operators

### **Key Program Components**

- A directory of small and minority farm operators in North Carolina
- An assessment and evaluation of farmers Production, Marketing, Finance, Legal, and Human Resources for the primary purpose of reducing risks associated with each activity.

### **Internal and External Linkages**

- Linkages will the established with the following entities:
- North Carolina Department of Agriculture
- Departments in the School of Agriculture
- USDA/Agricultural Marketing Service
- Land Loss Prevention Project, Durham, North Carolina
- North Carolina Cooperative Extension Program
- Black Farmers and Agriculturist Association

### **Target Audiences**

The target audience will consist of individual directly and indirectly involved in production agriculture. Moreover, the primary targeted audience is small and minority farmers in North Carolina.

**Program Duration**

The project will begin in the Fall 1998 and should be completed by the Fall 2001.

**Allocated Resources**

\$183,246



**Project Title:** Food Safety Practices among the Elderly

**PI:** Carolyn S. Turner

**National Goals 2 & 5****Statement of Issues:**

Food borne illness is a concern to all age groups but is particularly a concern for the elderly, persons 65 years or age and older. The weakened immune system of older adults makes them more susceptible to diseases including those from food-related problems. The elderly segment is the fastest growing portion of the population.

Education is a key intervention in combating food safety issues and the elderly population. Research-based information is needed to develop educational programs and materials regarding specific food handling procedures of elderly persons. An important variable is the living pattern and the related living environment amenities available to them.

**Performance Goals:**

- To describe the food safety practices of older adults.
- To identify unsafe food safety practices of older adults.
- To determine the relationship of food safety practices among older adults to certain behavioral factors (e.g., meal patterns, attitudes/beliefs and knowledge).
- Provide data for the development of an assessment protocol to identify elderly persons who practice unsafe food safety habits as well for the development of effective training materials to educate seniors on safe food handling practices.

**Output Indicators:**

- A data book including the study variables and factors impacting the variables will be shared with state agencies and Extension personnel.
- News articles will be shared with agencies and groups working with the elderly population within the state.
- Papers will be presented at professional meetings.
- Journal articles will be submitted.
- Educational programs and materials will be developed for the target audience.

**Outcome Indicators:** (to be developed at end of study).

**Key Program Components:**

- A conceptual framework includes the following variables: gender, kitchen facilities, meal pattern, knowledge, and attitudes/beliefs. Eight hypotheses have been developed to analyze the relationship of the variables in the framework.
- Phase I involves focus group interviews as preliminary to the instrument development. Independent living older adults will be asked to discuss their food safety practices, meal patterns, available kitchen facilities, food-handling practices, and related topics. The survey instrument will be developed at the end of this phase.
- Phase II involves implementing the survey using the instrument developed in Phase I. The sample will consist of persons eating at congregate meal sites in Guilford County, North Carolina. Data will be collected through personal or telephone interviews. Data will be analyzed according to the hypotheses and subgroups of the respondents.

**Internal and External Linkages:**

Internal linkages will include scientists from the Department of Human Environment and Family Sciences and the Department of Agricultural Education, Economics, and Rural Sociology. Cooperative Extension personnel also will be included.

External linkages will include Extension specialists in food safety from the Cooperative Extension at NC State University and the Guilford County United Services for Older Adults.

**Target Audiences:**

The primary targeted audience is the older adult who lives independently and prepares some food at home. Educational materials and assessment protocols will be developed based on the results of the study.

**Project Duration:**

Three years.

**Allocated Resources:**

Approximately \$188,000.



**Project Title:** Improving Performance in Two Acid/Aluminum Tolerant Alfalfa Cultivars (*see Goal 1*)



<b><u>Principal Investigators</u></b>	<b><u>Project Title</u></b>
Marihelen Kamp-Glass	Improving Performance in Two Acid/aluminum Tolerant Alfalfa Cultivars
M. R. Reddy and K. Li	Environmentally Sound Cropping Systems for Enhancement of Farm Income
Chung W. Seo	Utilization of Agricultural By-products from Commodity Crops Such as Peanut Shells, Corn Cobs
Willie Willis	Campylobacter Jejuni Intervention Strategies and Antibiotic Resistance of Broiler at the Production Level
Chung W. Seo	Nutritional, Physical, Chemical and Sensory Properties of Low-fat Ground Meat Processed by Supercritical CO <sub>2</sub>
Kofi Adu-Nyako and Alton Thompson	Food Choices — Perceptions and Purchase Behavior of Persons in Black Belt States
M. R. Reyes, G.A. Gayle, C.W. Raczkowski, and G.B. Reddy	Evaluating the Performance of Erosion and Water Quality Models
C.W. Talbott, G.B. Reddy, C. Raczkowski, M.R. McKinnie and J. Henson-Upshaw	Integrated Crop and Sylvan Systems with Swine: A State and National Initiative
Godfrey Ejimakor	Rural Restructuring: Causes and Consequences of Globalized Agricultural and Natural Resource Systems.
Anthony Yeboah and Donald McDowell	Exploring Survival Issues Among Minority Farm Operators in North Carolina
Carolyn S. Turner	Food Safety Practices among the Elderly
Margaret J. Hinds	Chemical and Physical Quality of Reduced- and Altered-fat Table Spreads
William A. Amponsah and Xing Dong Qin	Impacts of Trade Agreements and Economic Policies on North Carolina Agriculture