Alcorn State University
Report of Accomplishments and Results

Evans-Allen Formula
Funded Research

FY 2004- 2005

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FOREWORD

We are pleased to submit the FY 2005 Report of Accomplishments and Results for the 1890 Evans Allen Formula Funded Research. The report presents summaries of project outcomes during the fiscal year, as well as the major milestones achieved.

The Evans Allen program continues to play a major role in helping Alcorn State University to implement research projects addressing important problems affecting the clientele. Alcorn State University's research projects are designed to contribute to the goals and priorities of USDA and CSREES.

We are grateful to the dedicated scientists and staff who carry out the daily research activities. In addition, we are thankful to our USDA collaborators, other government agency collaborators and private sector partners, for their commitment to and support of our agricultural research program at Alcorn State University.

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GOAL ONE- FY 2005: An agricultural system that is highly competitive in the global economy

Overview

Executive Summary

Research programs at Alcorn State University (including 1890 formula funded) are designed to generate new knowledge and enhance the utilization of existing knowledge to benefit the clientele and various stakeholders. These stakeholders include small and limited resource farmers, low-income rural residents, researchers, extension and outreach specialists, and policy makers. During Fiscal Year 2004-2005, agricultural research funded through Evans Allen under "goal one" emphasized three key themes: (1) research in animal production; (2) diversified production systems and alternative crops; and (3) enhancing the economic viability of small and limited resource farms in Mississippi.

Research in animal science evaluated the performance of ryegrass varieties for their nutritional value, dry matter, growth and maturity. The outcome of this research is expected to impact livestock producers in the region with new, adapted and more economical feed.

Research in diversified agriculture and alternative crops is represented in two new projects. The first project focused on selecting and testing alternative fruits and vegetables for optimum profitability under small or limited resource farm conditions. Research efforts addressed farming practices for blueberries, peanuts, hot peppers, cauliflowers, and hairy vetch. The second project under the category of diversified/alternative crops evaluated the technical feasibility of integrated pest management practices in sweet potato production in the Mississippi Delta and southwest Mississippi. Results obtained from these projects will be transferred to small and limited resource farmers, to enhance quality of enterprise selection, and increase crop yield, while reducing dependence on manmade chemicals.

A third project under "goal one" sought to evaluate factors that would enhance small farm profitability, with a focus on farm management, financial decisions, marketing and other factors affecting farm ownership/land loss by limited resource farmers in the region.

These projects and related FY 2004-2005 results are summarized and discussed in the section below.

Key Theme

1. Research in Animal Production

In this key theme area, a new project entitled ***"Performance Evaluation of New Ryegrass Varieties at Alcorn State University: Nutritional Value, Dry Matter, Growth and Maturity"*** started in October of 2004. During this period, the first study was designed to evaluate new varieties of ryegrass for nutritional content, dry matter yield and growth and maturity in Mississippi. This study is partially completed; a few more statistical analyses are needed to be ready for publication. A second study to repeat the previous study is required by this line of research. The impact of these studies will improve production efficiency in the livestock industry, consequently improving the economic well-being and quality of life of rural families in this industry in Mississippi.

Another project under the umbrella of research in animal production is entitled ***"Effects of Nutrition and Suckling on the Release of Reproductive Hormones in Cattle."*** The objectives of this study were to develop and provide management practices to small farmers that can be used to improve production efficiency in livestock operations. Several research studies were implemented or completed. Data collection from a study designed to evaluate the effects of injecting GnRH 48 hours after $PGF_2\alpha$ was completed; results from this study are being analyzed by a graduate student to prepare a thesis in partial fulfillment of the requirements for the degree of Master of Science in the Department of Agriculture. A research trial to evaluate the effects of early versus conventional breeding of post-pubertal Holstein heifers on conception rates and sex of the offspring is still in the phase of data collection. This particular study is a long term project since it requires a large number of replications. It is currently evaluated at the farm level. Two studies were conducted to evaluate the effects of exogenous progesterone (CIDR's) on the survival of embryos transferred to Angus recipient cows; data from these two studies have been published by the Journal of Animal Science. Another study was implemented to evaluate the effects of GnRH in combination with $PGF_2\alpha$ on the dynamic of follicular and luteal cells in post-pubertal Holstein heifers; the results from this study were also published by the Journal of Animal Science. Right after this last study, another trial was designed to monitor by ultrasonography, dynamics of follicular and luteal cells in post-pubertal Holstein heifers treated with GnRH in combination with $PGF_2\alpha$. Data from this study are being analyzed in the laboratory. Results from these two studies will be published as a thesis and submitted for publication to the journal of Theriogenology.

The impact of these projects will improve production efficiency in the livestock industry, and consequently improve the economic well-being and quality of life of rural families in this industry in Mississippi. The key theme area of Animal science received $94,172 of funding in FY 2004-2005.

2. Diversified/Alternative Crops

This project entitled ***"Selecting and Testing Alternative Fruits and Vegetables and Farming Practices for Optimum Profitability of Limited Resource Farmers"*** involves production of high-value cash crops such as blueberries, peanuts and other vegetable crops, which generate more net income per acre. A program of successful production and marketing of these crops may provide diversification for small farmers. This project is expected to boost small family farm productivity by making recommendations on high yielding adapted cultivars and production practices related to blueberries, vegetables and peanuts. Blueberries and peanuts are considered some of the most powerful and nutritious foods (AARP Magazine, Sep-Oct, 2003).

To evaluate blueberry cultivars, five cultivars of rabbiteye blueberry and four cultivars of Southern highbush were planted on March 8, 2005. These cultivars will be evaluated for their growth and production potential. Rabbiteye blueberry cultivars included in this study were Brightwell, Powderblue, Austin, Premier and Ocklocnee. Four cultivars of Southern highbush blueberry planted for evaluation were Jublee, Magnolia, Star and Misty. Experiments were also laid out to evaluate different types of organic matter and other materials incorporated into the soil before planting blueberry plants. Ten different treatments used were Control, Poultry Litter, Cow Manure, Promix, Organic Peat + Peat Moss, Ground Pine Bark, Vermiculite, Sand+Humus, Worm Castings, and Peat Moss. One gallon of each of these materials except control was incorporated into the soil and put into the hole where the blueberry plants were planted. The blueberry cultivar used for this study was Tifblue (rabbiteye type).

A field study was conducted to determine the effect of gypsum applications on >Alcorn Pat= peanut yield, seed size and quality. Seeds were planted on heap rows or ridges 1.1 m wide and 6.1 m long at a within-row plant spacing of 7.6 cm. Gypsum treatments were applied at the rates of 1.62, 3.24, and 4.86 kg/ha. Untreated rows represented the control. Fertilization with 67.0 Kg/ha of P_2O_5 and 130.0 Kg/ha of K_2O were based on soil test results. Yields were not different significantly, however seed size and quality were better at 4.86 Kg/ha gypsum application compared to lower rates.

Field studies were also conducted to determine the effect of plant density on AAlcorn Long Pod@ hot pepper yield potential. Hot pepper seedlings produced at the Alcorn greenhouse were transplanted into rows 1.1 m wide and 6.1 m long at a within-row plant spacing of 0.91 m. Transplanting of one, two, and three seedlings per hill represented the treatments. Fertilizer nitrogen was supplied by making two split applications for a total of 160 Kg/ha and a single application each of P_2O_5 and K_2O at field preparation for a total of 148 Kg/ha and 220 Kg/ha, respectively. Fruit harvest initiated 80 days from transplanting was terminated at the first killing frost. Some of the harvested pods were used for hot pepper sauce development. Yield per row increased with increase in plant density, whereas yield per plant decreased with increase in plant

density. Hot pepper sauce developed by processing red-ripe hot pepper pods is natural and, of excellent quality, and comparable to other commercially available hot pepper sauces.

Cauliflower was cultivated on no-till and conventional plots as a spring crop. The results showed that this shallow-rooted cole crop can be raised successfully on both no-till and conventional plots as there was no significant difference in biomass development and yield. Watermelon and hot pepper have been raised as summer crops on no-till and conventional plots. While hot pepper responded equally well on no-till plots compared with conventional plots, watermelon performed better on conventional plots compared with no-till. These crops have been raised again this year to have two years data for publication. No-till production of cauliflower and hot pepper can help farmers avoid unnecessary expenses on heavy machinery used for conventional farming. No-till production also prevents soil erosion.

Hairy vetch could be established as a winter cover on no-till and conventional plots of vegetable crops raised on Memphis Silt Loam. Biomass development of this crop has been thoroughly studied for the total fresh and dry biomass production, total nitrogen, C:N ratio and rate of decomposition. This crop survived the severe winter successfully showing that this is one of the crops that can be raised by farmers of Mississippi on their vegetable or row crop fields as a leguminous winter cover. The leaf area index and percent canopy cover recorded on this crop shows the high potential of this crop in erosion control during the winter season and it returns a large quantity of residue for the succeeding crops of spring. It is a soil conserving crop and replenishes the soil with plenty of nitrogen and other plant nutrients. This crop can help farmers of Mississippi to avoid spending money for nitrogenous fertilizers for their spring crops. The results of the study also showed that a heavy feeder can be planted as a succeeding crop after this winter cover.

Residue decomposition studies continue and the data will be available by the end of this year. The results of this study will help develop nutrient management programs for these crops. A research paper on the decomposition of hairy vetch is being prepared for presentation and publication. The final readings on the summer crops, watermelon and hot pepper, will be completed by August and September, respectively. The research plots were effectively utilized for training farmers, county agents, and students whenever we had seminars, workshops and field days. This project received $233,000 in Evans Allen Formula Funds during FY 2004-2005.

Under the subheading of Diversified/Alternative Crops, a second project entitled: ***"Improving Sweet Potato Production in Limited Resource Farming Systems through Cultivar Development and integrated Pest Management"*** was initiated in FY 2004-2005 at the Alcorn State University Demonstration Farm (Mound Bayou) and the

Biotechnology Farm on the ASU campus near Lorman.

The objectives were: (1) to identify cultural practices that will minimize damage to sweet potatoes caused by wireworms, (2) and to identify sweet potato breed lines and/ or cultivars that are resistant to wireworms and other soil insects.

Companion studies utilizing the cultivar 'Beauregard' interplanted with 'Georgia Southern' collards and 'Speckled Purple Hull' southern peas have shown possible alleopathic actions resulting in stunting, death of sweet potato vines and no storage root formation. This occurred at both Mound Bayou and the Biotechnology Farm.

Crop Rotations with southern peas may reduce the weed population of closely related to sweet potato species, i.e., morning glory, bind weed, while reducing wireworm population. This may save farmers millions of dollars from the application of pesticides and herbicides.

A split plot design utilizing the susceptible cultivar 'Beauregard', the resistant cultivar 'Resito' and resistant breed line SC1113 were initiated at the Demo Farm in Mound Bayou during the summer of 2005. Fall cover crop plantings of winter rye and 'Dwarft Siberian' kale were grown in these plots to determine wireworm populations incorporating GPS and GIS technology.

Thousands of seed from insect pollinated breeding lines that have resistance to wireworm and other soil insects were germinated in greenhouses and evaluated for storage root production. The most promising lines are being prepared for vegetative propagation and field testing during the growing season of 2006. The scope of this project is regional. Funding for this project was $233,000 in FY 2004-2005.

3. Small Farm Viability

In the area of Small Farm Viability, a new project was approved and its implementation began in FY 2004-2005. The general purpose of the project entitled ***"Evaluating Factors to Enhance Profitability and Sustainability of Limited Resource Farmers and Communities in Southwest Mississippi"*** is to study and evaluate factors that are likely to increase the financial viability of limited resource farms and communities in the region. Specifically the project seeks to address the following objectives: (1) To identify and analyze economic, and technical factors that will improve the profitability of limited resource farms in the region; (2) to examine farm and land ownership patterns of limited resource and family farmers in southwest Mississippi and explore strategies for reducing land loss and increasing maintenance of the family farm; (3) to determine and analyze factors that will promote economic growth and development in rural communities in Mississippi; and (4) to develop models that will generate higher profits for farmers and formulate policy recommendations for enhancing economic

opportunities and quality of life for limited resource and family farmers in southwest Mississippi. To date, the project has been successful and has achieved important milestones.

Secondary statistical data from Agricultural Census were compiled and analyzed to delineate farm structure in the study area, in terms of farm classes based on gross sales, acreage harvested, and the types of agricultural enterprises. Diversified agricultural activities are taking place in the broad study area. A comprehensive farm survey instrument was developed and used to collect primary data pertaining to the following: (1) updated socioeconomic and demographic information on small farmers; (2) farm characteristics; (3) farm management; (4) financial management practices; (5) marketing activities; (6) sources of market information; (7) training and technical assistance needs related to agricultural marketing; (8) off-farm employment and community issues related to farming; (9) new technology and organic farming; (10) small farmers' land loss issues; and (11) farm profitability. The responses have been coded; cleaned and preliminary analysis is currently ongoing.

Census data were analyzed to delineate the trends in Mississippi land holding (acreage) by blacks and other minorities from the 1950's to 2002. Previous work (with data extending from the 1954 Census of Agriculture up to the 1997 Census) has indicated statistically significant differences for the rate of change in the number of farms operated by blacks and other races and the number of farms operated by whites. Additional analyses have shown that the differences in the rate of change in farm numbers were not statistically significant when the data are extended to include the 2002 Census. This is primarily due to the general increase in white and nonwhite farm numbers in the 2002 Census, with nonwhite farms increasing at a faster pace than white farm numbers.

We have made good progress in studying and profiling the socioeconomic and demographic features of counties in the study area. Preliminary analysis of the data shows extremely interesting trends in terms of the social, economic and demographic changes in the region over the past thirty years. Even at this early stage of our study, we can infer that this region is one that continues to languish. Very few changes seem to be taking place that are likely to propel the region into a faster rate of growth. Some counties are suffering from a serious loss of rural jobs, in part due to the changing demand in agriculture and other natural resource industries. Some are being challenged by large rates of out-migration. Still, others are suffering from poor housing conditions, high rates of poverty, high rates of teenage pregnancy, high unemployment rates and the disturbing trend of the out migration of traditional businesses that were the bastion of the economic landscape of the region and there are few signs of a trend reversal any time soon.

As we move forward to further dissect the primary and secondary data, we will seek to analyze factors that have seemingly consigned many of the counties and residents in the region to a persistent cycle of uncertainty and a less than decent level of living.

We will identify factors that are unique to each county but are likely to promote a broad spectrum of economic well-being.

The scope of the project is regional. The project received $221,050 in Evans Allen funding to support personnel, travel, materials and supplies. Additionally, students were paid from Capacity Building projects.

GOAL TWO – FY 2005: A Safe and Secure Food and Fiber System **(None under Evans Allen Formula Funds in this reporting period)**

GOAL THREE – FY 2005: A Healthy, Well-nourished Population

Overview

Executive Summary

Alcorn State University is located in Jefferson and Claiborne Counties, Southwest Mississippi. Unfortunately, Jefferson County has the highest incidence of obesity in the nation. The university is committed to remedy this situation through research and outreach efforts. During this reporting period, one project was completed under Goal Three – A Healthy, Well Nourished Population. Efforts took place in this FY focused on preparing the Soynut Cookies for commercialization, i.e., the development of an attractive commercial packaging, total nutrient analysis, trademark application, and other activities necessary for successful market development. Additional information on project results is presented below.

Key Theme

1. Human Nutrition

The project entitled ***"Development of Low-Fat, Low-cholesterol recipes Using Soybeans as an Alternative Protein Source"*** has been completed after seven years of research at Alcorn State University. Accomplishments included: 1) Soy consumption survey at Alcorn State and Mississippi State Universities. An Alcorn State University student defended her thesis in spring, 2006 using the consumption survey. 2). Thirty-four recipes using soybeans and soy products were tested and retested incorporating comments from randomly selected panelists from the university. Twenty of these recipes, with acceptable scored, were developed. These recipes are being prepared for publication and distribution to the public. Laura Salazar, a Mississippi State University student collaborated on the project and defended her thesis "Adaptation of Recipes to Promote Soy Food Consumption by Participants in A Cardiac Rehabilitation Program" on April 7, 2003. 3) Institutional testing was also conducted with the twenty recipes. The Soy nut Cookies was one of the favored recipes with a mean score of 7.86. Further research was initiated to develop the cookies into a healthy marketable product. Artwork and packaging option was completed for the 2 oz. Cookie packages. The total nutrient analysis, trademark application, shelf- life testing, Universal Product Code (UPC) were completed by October, 2005. Additionally, the university secured a Health Permit from the Health Department to commercially prepare the cookies at the food facility. Registration for the facility with FDA was completed on February, 2006. The employee, Juliet Huam, received the ServSafe Certification on October 10, 2005. 4). A new artwork and packaging option is in the process of completion. An application for the trademark for the new artwork will be submitted to the Trademark Commission. This research will enhance the use of soybeans and soy products among low-income families. It will allow for the production of new markets for soy products with a favorable impact on the health of consumers. Additionally, it will provide consumers with food preparation, sensory-related, and nutritive-value information for a healthy food snack that has nutritional implications for the elderly and/or individuals with health-related problems. For instance, the cookies will provide consumers who may have high-level of cholesterol with an alternative, nutritious, low-cholesterol food source. The introduction and testing of the Soy nut Cookies at local high schools will enhance its acceptability among a younger group of consumers and expose them to the health benefits of soy food. As the cookies gain regional and national recognition and demand for the cookies increases, the consumption and production of soybean, the raw product, can be expected to increase in the long run. This key theme received $64,000 in Evans Allen Funding during FY 2004-2005.

GOAL FOUR – FY 2005: Greater Harmony between Agriculture and Environment

Overview

Research scientists at Alcorn State University are keenly aware of environmental concerns, and take into account these concerns in planning and implementation of research. For example, research projects involving production seek ways to impact yield, profitability and quality of life while having minimal impact on the original ecology and the environment. Greater harmony between Agriculture and the Environment is a theme that cuts across many projects and on-going activities at the university. However, no project was specifically dedicated to this theme with Evans-Allen funds in this reporting period.

GOAL FIVE – FY 2005: Enhanced Economic Opportunity and Quality of Life for Americans

The projects and results presented under Goals one and three will enhance economic opportunity and quality of life for Americans. Therefore, Goal Five was not addressed separately.

STAKEHOLDER INPUT PROCESS

Research often begins with a problem that needs to be resolved. Problem identification is crucial in designing research projects that will address the felt needs of society as a whole, the scientific community, or other identified stakeholders. The procedures and processes for obtaining stakeholders' input did not change significantly during the 2004-2005 FY as compared to previous years. Stakeholders' input is obtained through the following mechanisms:

- Researchers consult frequently with extension personnel; extension specialists conduct environmental scanning and meet regularly with farmers, rural residents and other stakeholders.

- Extension personnel conduct "town-hall" and community meetings with stakeholders; researchers participate in some of these meetings.

- Public officials (especially elected officials) provide input into the research by serving as intermediaries between their constituents and the university. On a number of occasions they have called attention to existing problems, which have been addressed by research scientists.

- Government employees collaborate with ASU personnel; they have provided valuable input into the research process and have enlightened university personnel on funding opportunities. In some cases, exchange of ideas resulted in joint projects, although few of these cases have been supported by Evans Allen formula funds.

PROGRAM REVIEW PROCESS

Some changes were planned and began to be implemented in FY 2004-2005. The current plan of work became effective in 2004-2005 and will end in 2005-2006. A new five-year plan of work will become effective at the end of the current fiscal year.

EVALUATION OF THE SUCCESS OF MULTI- AND JOINT-ACTIVITIES

Multi- and joint-activities continue to allow scientists at Alcorn State University to interact with colleagues on a state-wide, regional and national scale. The activities provide opportunities for interactions with experts in federal and state agencies as well as with leading private industries. These linkages include other 1890- land-grant universities, 1862 land grants, USDA and other federal agencies. Also, collaborative work continued with two major biotechnology research institutions. The research program addressed critical issues that are of importance to stakeholders. However, many of the issues have not been completely resolved and additional research and collaborations are expected in the future.

In evaluating the success of multi- and joint-activities, a series of questions are constantly being considered as follows:

1. Did the planned programs address the critical issues of strategic importance, including those identified by stakeholders?

2. Did the planned programs address the needs of underserved and under-represented populations of the state?

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

4. Did the planned programs describe the expected outcomes and impact?

The answer to all four critical questions is yes – the multi and joint activities are effective and are conducted in an efficient manner.