

**Alcorn State University
Report of Accomplishments and Results**

**Evans-Allen Formula
Funded Research**

FY 2005- 2006

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FOREWORD

In fiscal year 2005-2006, Alcorn State University scientists and other research personnel continued the implementation of research projects under the two-year plan of work that started in 2004-2005.

The 2006 FY was the last year under the “old” plan of work regime. A new joint plan of work between research and extension submitted in FY 2006, was approved and its implementation has begun. The new plan of work and its subsequent amendments were submitted electronically, and the annual reports of the new plan will be submitted electronically as well.

The Evans Allen program continues to play a pivotal role in Alcorn efforts to implement research projects addressing important problems affecting the clientele of the university, i.e., small and medium size farmers, disadvantaged, rural and urban families, and other stakeholders of the university. Undergraduate and graduate students participate in research projects working side-by-side with scientists, and research technicians. Furthermore, students participate at state, regional and national conferences through oral and poster presentations.

The projects reported herein were designed to contribute to the goals and priorities of the U.S. Department of Agriculture (USDA). The report is a summary outline of the major accomplishments and results for FY 2006.

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 2005-2006, 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 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 are being 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. Furthermore, this project sought to determine and analyze factors promoting economic growth and development in rural communities in Mississippi.

All these projects and related FY 2005-2006 results are summarized and discussed in this report.

Key Theme

1. Research in Animal Production

In this key theme area, a project entitled ***“Performance Evaluation of New Ryegrass Varieties at Alcorn State University: Nutritional Value, Dry Matter, Growth and Maturity”*** started in October of 2004. The objectives of these studies are to evaluate new varieties of ryegrass for nutritional content, dry matter yield and growth and maturity in Mississippi. During this period, two studies were conducted. The first study was implemented at Alcorn State University to evaluate three new ryegrass varieties. Data from this study was analyzed, presented and published as an abstract at the annual meeting and in the Journal of the Mississippi Academy Sciences respectively in February, 2007. The second study implemented in 2004, was conducted at the Brown Loam Experiment Station of Mississippi State University to evaluate nine new varieties recently developed. This study is partially completed; a few more statistical analyses are needed to be ready for publication. A third study was implemented in 2006 as a replication of the previous studies to re-validate data collected as required by this line of research. Samples are being analyzed in the laboratory.

The need to develop new feeding strategies and to identify new feeding sources for cattle has recently become more imperative. For many years, corn has been an important component of cattle diets because of its high energy value and low production cost; nevertheless, the demand of corn in the market for ethanol production has almost resulted in an increase in the price of that commodity that makes it uneconomical to be added to cattle diets. Consequently, the number of cattle farms in Mississippi and the nation are on a continuous decline. Extending the growing season of ryegrass, while maintaining its high nutritional value, would be a significant contribution to alleviate this problem. Thus, achieving the objectives of these studies will result in improving 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 PGF₂ α 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 additional 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 PGF₂α 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. In addition, these research data have been submitted for publication to the journal of Livestock Science on April 20, 2007. 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 and hCG in combination with PGF₂α. 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 2005- 2006.

2. Diversified/Alternative Crops

The project entitled “*Selecting and Testing Alternative Fruits and Vegetables and Farming Practices for Optimum Profitability of Limited Resource Farmers*” involves the evaluation of production practices for blueberries, peanuts, hot peppers and other vegetable crops. This project also has a major component on C factor research and residue decomposition studies on important vegetable crops.

Research on blueberry production (cultivar evaluation and incorporation of organic matter) was planned in consultation and cooperation with USDA Small Fruit Research Station, Poplarville, MS (Dr. James Spiers). To evaluate blueberry cultivars, five cultivars of rabbiteye blueberry and four cultivars of Southern high-bush were planted on March 8, 2005. Rabbiteye blueberry cultivars included in this study are Brightwell, Powderblue, Austin, Premier, and Ocklocnee. Four cultivars of Southern high-bush blueberry planted for evaluation are Jubilee, 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 Casting, and Peat Moss. One gallon of each of these materials except Control was incorporated onto the soil and put into the hole where the blueberry plants were planted. The blueberry cultivar used for this study was Tifblue (rabbiteye type). Blueberry plants planted for these two experiments have not reached the production stage yet. Therefore, no yield data could be recorded.

The effect of plant density on 'Alcorn Long Pod' hot peppers was repeated at the Alcorn Experiment Station. The overall yield per plant increased with decrease in plant density, whereas yield per unit area increased with increase in plant density. Similar yields were obtained for field-grown 'Alcorn Pat' peanut. Both peanut kernel size and hot pepper pod increased with decrease in plant density.

Hairy vetch as a winter cover could be successfully established 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 show that a heavy feeder can be raised as a succeeding crop after this winter cover.

Cauliflower was raised on no-till and conventional plots as a spring crop. The results show that this shallow-rooted cold crop can be raised successfully on both no-till and conventional plots, as there was no significant difference in biomass development and yield. Hot pepper was raised as summer crops on no-till and conventional plots. Hot pepper responded equally well on no-till plots compared with conventional plots. No-till production of cauliflower and hot pepper can help farmers avoid unnecessary expenses on heavy machinery used for conventional farming.

Interested growers may benefit by growing best-suited blueberry cultivars and by adopting most desirable and profitable cultural practices to produce blueberries. Interest in the production of both hot pepper and peanut is increasing among farmers. Many farmers will be growing hot peppers because of the market recently identified in Texas, as well as the availability of a handbook entitled "A Handy Guide To Hot Pepper Cultivation and Utilization". A handbook on peanut cultivation and utilization is yet to be completed.

The results of the residue decomposition studies will help develop nutrients management programs for cauliflower and hot peppers. A research paper on the decomposition of hairy vetch is being prepared for presentation and publication. The research plots were effectively utilized for training farmers, county agents, and students whenever we had seminars, workshops and field days.

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 implemented through

collaboration between researchers of Alcorn State Agricultural Sciences and the Biotechnology Center.

Replicated companion planting studies utilizing the sweet potato cultivar 'Beauregard' interplanted with 'Georgia Southern' collards and 'Speckled Knuckle Purple Hull' southern peas and a control ('Beauregard' in pure stand) were initiated during the 2005 and 2006 growing season at the Biotech farm at Alcorn State, Ms and Mound Bayou, Ms.(2005 only). There were interesting observations made. The southern pea and sweetpotato treatments had significant ($p < .05$) smaller plant stands (2.0) than the collard treatment (4.5) and control (5.0). This suggests that the 'Speckle Knuckle Purple Hull' southern pea may have allelopathic effects on 'Beauregard' sweetpotato which inhibited its growth and survival. Further studies under a controlled environment with sealed pots to collect leachates are needed. These leaches will require chemical analysis to properly identify these substances.

The control ('Beauregard' sweetpotatoes in pure stand, 120 bushels per acre) and the collard treatment (97 bushels per acre) had significantly ($p < .05$) larger total marketable yields than the southern pea treatment (3.92 bushel per acre). There were no significant differences in cull (none marketable storage roots). The greatest losses occurred in the control (32.65 bushels per acre), followed by the collard treatment (27.43 bushels per acre) and the southern pea treatment (0.65 bushels per acre). There were no significant differences ($p < .05$) among treatments for insect(wireworm larva feeding scars). The greatest damage to storage roots (3.75 feeding scars) was found in the control treatment ('Beauregard' in pure stand), followed by the collard treatment (2.25 feeding scars). The least damage (1.0 feeding scars) was observed in storage roots grown under the southern pea/sweetpotato treatment. This treatment appears to be very useful in controlling wireworms, however it appears to be allelopathic to 'Beauregard' sweet potatoes.

Further studies including rearing wireworm larva and feeding diets of leachates from 'Speckle Knuckle Purple Hull' southern peas may be necessary. Hopefully, bio-pesticides and natural herbicides may be developed to control closely related weed species, i.e., morning glory or bindweed. The development of cultural practices and bio-pesticides will reduce the production cost for small and large sweet potato growers while reducing the amount of harmful pesticides in the environment. This would improve the yield, farm income and quality of life of those who adopt the new and innovated practices. Billions of dollars will be saved from production cost. This will be a win-win situation for all that are involved.

3. Small Farm Viability

In the area of Small Farm Viability, a project was approved and its implementation began in FY 2004-2005.

The project entitled “*Evaluating Factors to Enhance Profitability and Sustainability of Limited Resource Farmers and Communities in Southwest Mississippi*” was developed based on observations from extension sources, preliminary research findings in the body of literature, and in an attempt to address one of Alcorn’s priority research themes.

The project addresses problems and issues associated with low farm income, small farmers’ knowledge and skills affecting economic and financial performance, minority land and farm loss, and impaired growth in rural and limited resource communities in Mississippi.

It is clear that production agriculture in the United States has changed and continues to change with increased mechanization, continued adoption of new technologies, growing capital investment per worker, increasing use of external capital, increasing farm size and risk, and new marketing techniques. Indeed, farmers are continually encountering new information that affects their farming operation. Answers to questions such as, what commodities to produce, how should they be produced, what inputs should be used, how much of each input should be used, how to finance the business, and when and how to market the commodities produced are constantly changing as new information becomes available. These modifications have brought with them new management problems that have greatly impacted many farmers, especially those with limited resources. These farmers must learn to continually rethink their decisions as economic and environmental conditions change.

The overall objective of the project was to evaluate factors that would influence the profitability, sustainability, and economic opportunities for limited resource farmers and communities in southwest Mississippi. The specific objectives (research areas) were the following: (a) To identify and analyze economic, non-economic and technical factors to improve the profitability of limited resource and family farms in southwest Mississippi; (b) 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; (c) To determine and analyze factors promoting economic growth and development in rural communities in Mississippi; (d) 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.

The team completed two years of project activities. Milestones that have been met to date are as following: (1) analysis of secondary statistical data from Agriculture Censuses to assess the trends in land loss/holding for various demographic groups; (2) the development of a comprehensive farm survey instrument to address aspects of objectives one, two and three listed above; (3) collection of data from farmers and rural residents; (4) coding and tabulation of survey data for analysis. Analysis of the survey data is going

this summer. Progress was made in studying and profiling the socioeconomic and demographic features of counties in the study area. Analysis of the data shows interesting trends in terms of the social, economic and demographic changes in the region over the past thirty years. Results indicated that the southwest region of Mississippi 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.

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 implemented 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 scores, 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 “ The Original Alcorn Soynut Cookies” and packaging was completed in March, 2007. Information, such as Nutrition Facts, Ingredients, UPC code and Allergens, that met FDA requirements were included in the packages.

An application for a trademark for the new artwork is being submitted to the Trademark Commission. Additionally, a website to promote the cookies will be created and included under the Alcorn website page. 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 implementing 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. Even though no Evans-Allen funds were expended by the university in this key theme, the Mississippi River Research Center (funded by State of Mississippi) continues to conduct research on watershed studies and assessing the impact of agricultural production activities on soil and water quality. Some examples of research conducted (or completed) at the center in FY 2006 include the following: (1) land use influence on soil hydraulic properties in the Homochito watershed; (2) quantification of phosphorus and heavy metals movement in soil treated with heavy metal; and (3) establishing runoff plots to study water quality in residential lawns and golf courses in Brooksville, MS.

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

The results presented under Goals one and three will enhance economic opportunity and quality of life for Americans. Therefore, Goal Five was not addressed separately, in project specifically designed for that theme.

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 2005-2006 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

The current plan of work began in fiscal year 2004-2005 and ended in 2005-2006. A new five-year plan of work was submitted electronically in FY 2006 and became operational in FY 2006-2007. The current plan of work is a joint program between research and the cooperative extension program at the university.

Researchers submit reports to the research director periodically. Additionally, report of program activities and progress are submitted to CSREES as required by the federal program regulations. The research program went through a civil rights program review in FY 2003-2004.

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.