Alcorn State University
Report of Accomplishments and Results

Evans-Allen Formula
Funded Research

- FY 2003 -

Dr. Clinton Bristow, Jr.
President

Dr. Franklin D. Jackson
Interim Research Director

Alcorn State University
Alcorn State, MS 39096-7500

FOREWORD

Alcorn State University is unique among the group of institutions of higher learning which are referred to as the 1890s. While the other 1890s were established with funds generated through the Second Morrill Land-Grant Act of 1890, "Alcorn University of Mississippi"--its original name--was established in 1871 with proceeds generated through the First Morrill Land-Grant Act of 1862. From its very inception, "Alcorn University of Mississippi," now Alcorn State University, has sought to meet the needs of the residents of Mississippi through teaching, research, and service.

The agricultural research efforts and activities of the university were significantly expanded in 1971 when the Alcorn State University Branch of the Mississippi Agricultural and Forestry Experiment Station was established on the Lorman campus of Alcorn State University. Funding under the Evans-Allen Formula Funds Program has played and continues to play a significant role in assisting the university to target agricultural research programs to: 1) increase the income of limited resource farmers through improved farming practices, marketing, and adding value to agricultural products; 2) improve the quality of life for rural residents through improved standards of living; and 3) protect the environment through education and improved farming practices.

Alcorn State University maintains unwavering commitment to its stakeholders. This commitment is evidenced in the term that is now used to describe the institution--**communiversity.** Communiversity is defined as an institution that is academically strong and is community oriented. Consequently, the agricultural research programs--funded through Evans-Allen Formula Funds and through other sources, such as the Capacity Building Grant Program--seek to meet the needs of the university's clientele, especially limited resource farmers, family farmers, and farm families.

This FY 2003 Annual Accomplishments Report provides a synopsis of some of the accomplishments of Evans-Allen/state-match funded projects during 2002-2003. In reviewing this synoptic report, it is important to bear in mind that agricultural research accomplishments tend to

be cumulative; therefore, the fruits of research efforts may not be evident during the time of the greatest effort, but rather as an outburst of marvelous accomplishments during a subsequent reporting period.

We are proud of the dedication, hard work, and accomplishments of our Evans-Allen funded scientists; and we are equally grateful to the U.S. Department of Agriculture and its professionals for their continued support of our research efforts on behalf of the residents of Mississippi, in particular, and the nation, as a whole. We will continue to conduct agricultural research geared toward improving the standard of living and the quality of life of limited resource individuals, while at the same time protecting and enhancing our environment--we will continue to expand and strengthen the "communiversity" concept.

George Bates
Associate Research Director (Former)

Napoleon Moses, Dean
School of Agriculture, Research, Extension, and Applied Sciences

Franklin D. Jackson, Interim Research Director
and Vice President of Institutional Advancement, Planning, and Research

GOAL ONE FY 2003: An agricultural system that is highly competitive in the global economy

Overview

Executive Summary

During 2002-2003, the 1890 formula funded research at Alcorn State University, relative to the national USDA Goal One cited above, focused on five projects which are of particular importance to limited resource farmers and farm families which are the primary clientele of the university's formula funded research activities. The research activities which were initiated in previous years and continued during 2002-2003 are submerged under the following themes: 1) Animal Production Efficiency, 2) Diversified Alternative Agriculture, 3) Plant Production Efficiency, 4) Risk Management, and (5) Small Farm Viability.

Alcorn State University has had a successful history of working with limited resource individuals to optimize the utilization of limited acreage in order to increase productivity, efficiency and profitability; therefore, the research conducted through the assistance of formula funds is geared toward the needs of small and limited resource farmers and the rural community.

Limited resource farmers, in general, do not have large acreage; therefore, they are unable to compete with large landowners in the production of row crops such as cotton, soybean, rice, and so forth, where the net return per acre tends to be less than the net return per acre for vegetables and other alternative and high value enterprises. Consequently, the research during the 2002-2003 fiscal year focused on vegetable production, fruits and nuts production, and improving the conception rate of dairy animals.

Limited resource farmers continue to suffer disproportional losses to their farming operations in times of calamities; therefore, research continued during 2002-2003 on farm management and risk reducing strategies for small agricultural producers. Marketing of agricultural products continues to be a major challenge of limited resource farmers; therefore, during 2002-2003, research continued on the analysis of the economic performance of small farm marketing strategies. Highlights of the accomplishments of the individual projects are presented in the applicable sections of the report; however, a few results and impacts applicable to Goal One: "An agricultural system that is highly competitive in the global economy" are as follows:

1. A study was conducted and the data submitted for publication on evaluating the effects of exogenous progesterone (CIDR,s) on the survival of embryos transferred to Angus Cows. The project will potentially impact beef and dairy cattle production, and farm income generated from these livestock enterprises.

2. Field experiments conducted with sweet potato on Dexter silt loam revealed that transitional and organic cropping systems will support No. 1 sweet potato at a better rate, while the conventional (chemical intensive cropping) system enhances protein, fat, and ash contents. A study revealed that in lemon grass production in Southwest Mississippi, closer spacing will enhance lemon grass volatile oil content and increase yield of marketable shoots. Furthermore, Jamaican Sorrel can adapt to the soil and climatic conditions of Southwest Mississippi and could be a viable alternative crop for limited resource farmers in the region.

3. Spatial technology using global positioning system (GPS) was evaluated for its impact on profitability of sweet potato production by small farmers in the Mississippi Delta. As a result of this research, several limited resource farmers have adopted GPS technology which enables them to be more efficient in their application of fertilizers and pesticides.

4. Research in fruits and nut crops is continuing, allowing small farmers and landowners to grow adapted peach, nectarine, plum, and pecan cultivars to enhance their income.

5. Research in the area of risk management is shedding new light on the characteristics and risk management strategies and needs of small farmers in Mississippi. Results derived from this research will impact future directions in the efforts to assist this socially-disadvantaged farm group.

6. Research in the area of marketing strategies and market intelligence applicable to small farmers provided new empirical knowledge of the organic produce procurement practices of supermarkets and grocery stores and its potential impact as a niche market for small farmers in Mississippi.

Key Themes

1. Research in Animal Production

Four studies were implemented or completed under the project, "Effects of Nutrition and Suckling on the Release of Reproductive Hormones in Cattle." Data from a study implemented to evaluate the effects of injecting GnRH 48 hours after $PGF_2\alpha$ was completed. This data is ready to be submitted for publication. 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. A third study was conducted and data submitted for publication on evaluating the effects of exogenous progesterone (CIDR's) on the survival of embryos transferred to Angus recipient cows. The fourth study evaluates new varieties of ryegrass for nutritional content, dry matter yield and growth, and maturity in Mississippi. This study is in the final stage of data collection. The impact of these studies will improve production efficiency in the livestock's industry consequently improving the economic well-being and quality of life of rural families in this industry in Mississippi. This project was funded for $94,172 under the Evans-Allen program. This project has a multi-state, multi-national scope. It would be applicable to all areas where cattle are grown.

2. Diversified/Alternative Crops

Advances in technology, improved farm management, increase in farm size, and genetic potentials of available plants have contributed significantly to the recent increase in agricultural productivity in Mississippi. Field experiments conducted on a Dexter silt loam were used to determine the effect of three cropping systems (conventional, transitional and organic) on sweet potato yield and quality during the 2002 and 2003 growing seasons. Findings indicate that both the transitional and organic cropping systems will support No. 1 sweet potato production at a better rate than the conventional (chemical-intensive) cropping system. In general, conventional cropping

system will enhance sweet potato protein, fat and ash contents, but not dry matter and crude fiber more than other cropping systems.

The effect of three within-row plant spacings (30.0, 45.0, and 60.0 cm) on lemon grass growth potential and quality was determined on a Memphis silt loam soil during the 2002 and 2003 growing season. Findings indicate that lemon grass transplanted into field plots in the spring in southwest Mississippi will grow to maturity providing at least two harvests of marketable leaves before the first killing frost in the region. Those allowed to overwinter will provide additional harvests of marketable yields during the second growing season. Closer spacing will enhance lemon grass volatile oil production and greater yield of marketable shoots.

Four within-row plant spacings were also used to determine the effect of plant density on Jamaican Sorrel yield potential during the 2003 growing season. (1) Findings indicate that this tropical plant can adapt to the soil and climatic conditions in southwest Mississippi to add to the list of alternative crops grown by limited-resource farmers. (2) Fruit yields per plant increased as plant density decreased, whereas yield per unit area increased as plant density increased. (3) Preliminary study indicates that this plant could be a good source of such value-added products as juice, jelly, rope and wine. (4) While a manuscript entitled "Sweet potato Yield and Quality as Influenced by Cropping Systems," a Thesis entitled "Effect of Plant Spacing on the Yield and Quality of Lemon grass" has just been completed by my graduate student. All findings have been presented at professional meetings in Atlanta Georgia, Biloxi Mississippi, Albuquerque New Mexico and Tupelo, Mississippi. The scope of this project covers all areas where these crops are grown, and more specifically, Mississippi Delta silt loam soils.

Alternative Crops

This project entitled "*Optimizing Mississippi Delta Sweet Potato Profitability Using Spacial Technology*" involves sweet potato produced as an alternative crop for small limited resource farmers in the Mississippi Delta. The '*Beauregard*' sweet potato cultivar produced during the growing season (May 2003 to October 2003) on a 2.72 acre plot at the Alcorn State University Demonstration Farm utilizing 21 Global Position Satellite parts as references. Soil types at this location are very similar to those utilized by small limited resource farmers throughout the Mississippi Delta, i.e., Arkansas, Louisiana, and Mississippi.

All data were statistically analyzed. Results indicated that the total marketable sweet potato yield from the 2003 growing season was significantly greater than that of the 2001 growing season and significantly lower than the 2002 growing season. Total marketable yield from the 2003 season may be a result of favorable environmental factors, i.e., temperature and/or rainfall. The 2003 growing season was characterized by adequate rainfall fairly distributed evenly throughout the duration. The 2001 season was extremely hot and dry. The 2002 growing season was characterized by heavy rainfall which enhanced weed growth and provided favorable conditions (wet fields) for storage root losses due to rot. All of the 21 GPS points had different soil texture class varying from sandy loam to silty clay.

Several small limited resource farmers have adopted GPS technology which enables them to be more efficient in their application of fertilizer and pesticides. Overall their sweet potato operations have become more profitable. Evans-Allen Funds in the amount of $114,111 were used to support this research during the period 2003-2004. Additional research is being continued during this growing season (June through October 2004). The scope of this project is regional.

3. Plant Production Efficiency

This project entitled "*Low Input Sustainable Production of Fruits and Nuts*" is the latest phase of an ongoing effort to promote fruit and nut crops for small farmers. Fruit production could be a good alternative available to small acreage landowners for increasing income under intensive agricultural use of their limited land resources. Observations made and preliminary data collected so far showed that low input treatment of fruit tree spray (*insecticides and fungicides*) may not be effective. Spraying at lower doses and concentrations was not very effective to control plant diseases and insects as compared with pesticides sprayed at normally recommended and higher doses. Highly adapted peach, nectarine, plum and pecan cultivars for Southwest Mississippi soils and climatic conditions have been identified which can be planted and successfully grown in this area. Several farmers have attended field days and visited the orchard and learned about adapted, high yielding cultivars of fruits and production practices related to fruit production as an alternative enterprise. Interested fruit growers can learn more about low-input fruit production practices in future years.

The information collected on pecan cultivars evaluation showed that pecan cultivar "*Pawnee*" came in production two years earlier than the other cultivars but produced lower yields. From the limited yield data collected so far, it can be concluded that a pecan cultivar "*Desirable*" produced the highest yield per tree followed by Stuart, Melrose, Cape Fear and Pawnee. Pecan production could be an important long term source of income for small farmers. A small persimmon orchard was also established to evaluate persimmons as an alternative fruit crop for Southwest Mississippi. Six cultivars of Japanese persimmons were planted for this purpose. Japanese persimmon cultivars planted include Fuyo Imoto, Ichikkei, Saijo, Hachiya and Tenenashi. This project was supported and funded with $ 94,330 from Evans-Allen funds. The scope of this project is regional.

4. Risk Management

This key theme area is represented by a project entitled "*Evaluation and Development of Farm Management and Risk Reducing Strategies for Small Agricultural Producers*." The general objective of this project is to evaluate farm management practices of small agricultural producers and develop risk reduction strategies that may strengthen the socioeconomic conditions and competitiveness of small farms, not only in Mississippi but nationally. During this period, the following objectives were accomplished:

- A field survey was conducted to determine farm and risk management practices that are currently used by small farmers in Mississippi and to what extent these practices are guided by economic and managerial principles. Results from an analysis of the data suggest that farm and risk management practices are quite similar among farmers in the survey. A majority of the farmers do not formulate specific strategies to protect against price and production risks. In addition, age, farm size, education level, and farm income have no significant effect on how producers manage production and risk on their farms.

- Information from the field survey was also used to determine how small farm producers access and use institutional credit, information technology, and other productive resources in spreading production and marketing risks. Results indicate that only an insignificant proportion of farmers use institutional credit, information technology, and other productive resources to hedge against production and marketing risks. Most producers do not fully understand the application of financial risk management strategies even though they are aware that such strategies exist. Sixty percent of the farmers feel that farm price fluctuation is the riskiest factor, followed by increasing production cost, uncertainties in farm programs, and variability in crop yield. According to a majority of farmers, changes in land lease arrangements or changes in environmental regulations are less risky factors affecting their farm management practices. No more than 20 percent of the farmers seek assistance from financial institutions or governmental agencies when confronted with financial risk.

- Additional field surveys were conducted this past period in four Delta counties. Additional field surveys were also initiated in three selected Southwest Mississippi counties. Data from these surveys were used to determine the degree to which market and technological changes have affected management, production and economic opportunities of small farmers in the Delta and Southwest Mississippi counties. A statistical analysis was conducted to determine farmers' usage and familiarity with computers and how this technology has affected their capacity to store and process farm management data and decision-making. Using ANOVA and multiple regression technique, the impact of this technological change on management, production, and economic opportunities were measured for

each farm class. In addition, a detailed and in-depth impact study has been incorporated into a graduate research thesis and the field data is being analyzed to accomplish the stated thesis objectives. This analysis is continuing and results will be reported shortly. In general, results from this study will impact the understanding of the characteristics and risk management needs of small limited-resource farmers in Mississippi and provide information for future efforts to assist this socially disadvantaged farm group. Scope of this project covers all areas of the state where limited-resource farmers are found. $63,606.00 from Evans-Allen funds were expended in support of this research.

5. Small Farm Viability

In this area, a project entitled "*Analysis of the Economic Performance of Small Farm Marketing Strategies*" is being conducted at the university. The overall goal of the project is to investigate the economic performance of current and potential marketing strategies available to small farmers in Mississippi. One study examined the current procurement practices of Mississippi grocery stores and supermarkets for organic fruits, vegetables, specialty products and the potential impact of those products on small farm income. U.S. consumers spend in excess of $ 7 billion annually on organic products. Results of the retail survey in Mississippi indicated a growing demand for organic food products in the state, similar to the national trend. Grocery stores and supermarkets in the state sell a large assortment of organic produce, but the products with the highest frequency of sale are organic tomato (77% of retail stores responding to the survey), organic cucumber (55% of respondents), organic sweet potato (52% of respondents), organic squash (47% of respondents), organic okra, organic pumpkin, organic basil and garlic. The majority of locally owned stores sell less than $5,000 worth of organic produce per year, while the majority of national franchises generate sales of organic produce between $15,000 and $20,000 annually. Procurement practices of the stores are categorized by store type and size of the commercial establishment. The national franchises procure organic produce through their company warehouses, brokers and distributors, but would be inclined to purchase organic produce locally if available. Most of the organic produce in demand can be grown locally, and sold at a price significantly higher than the price of conventional produce. Generally, results of this study indicate that organic production and marketing could be a profitable niche market, and therefore should be integrated in the portfolio of marketing strategies for small farmers in the state. The scope of this project is regional.

GOAL TWO: A Safe and Secure Food and Fiber System **(None)**

GOAL THREE: A Healthy, Well-nourished Population

Overview

Executive Summary

It is an undisputed fact that good health is necessary for sustainable quality of life and that nutrition is related to health. Alcorn State University serves a population in Southwest Mississippi where one county--Jefferson County--in which a portion of the university's main campus is located has the infamous distinction of having the highest incidence of obesity in the nation. Soybean is known to include many ingredients that promote health and reduce the incidence of diseases related to poor nutrition and obesity. It is known that the primary clientele served by the university tend to consume much red meat for their source of protein. Therefore, under the theme of human nutrition a project entitled "Development of Low-Fat, Low-Cholesterol Recipes Using Soybeans as an Alternative Protein Source" is quite appropriate. The project continued during 2002-2003 and is expected to be completed during 2003-2004. The project has sought to develop a number of recipes for the use of soybean as a good source of protein. Some 34 recipes have been tested and products involving 20 recipes have been developed. During this reporting period, one student from a collaborating institution completed thesis utilizing data from this project. Additional information on the project is included in the following section.

Key Theme

1. Human Nutrition

A project entitled "*Development of Low-fat, Low-Cholesterol Recipes Using Soybeans As an Alternative Protein Source"* is in its sixth year at Alcorn State University. Accomplishments during this period include: 1) The completion of a soy consumption survey at Alcorn State and Mississippi State Universities. A Mississippi State University student defended her thesis using the consumption survey data. 2) Thirty-four recipes using soybeans and soy products were tested and retested incorporating the comments of panelists from the University. Twenty of these recipes, which received acceptable scores, were developed. These recipes will be published and distributed to the public. 3) Institutional testing was completed with the twenty recipes. 4) Several taste-test sessions were conducted with the Soynut Cookies. The total nutrient analysis of the cookies was completed. We are in the process of designing the labels and packaging options to promote the Soynut Cookies. 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 product consumers, especially among minority groups. Evans-Allen funds for $89,309 were expended on this project. The scope of this project is regional.

GOAL FOUR: Greater Harmony Between Agriculture and Environment

Overview

Executive Summary

Research scientists at Alcorn State University are keenly aware of environmental concerns, and take into account these concerns in the 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 one project entitled "Use of Azadiractin Extract as Broad Spectrum Pesticide for Vegetables" is discussed below as an example of efforts related to this important national goal.

Key Theme

The project entitled "Use of Azadirachtin Extract as Broad Spectrum Pesticide for Vegetables" is consistent with National Goal Four. Neem has been recognized as a natural insecticide in tropical regions where it grows. Research undertaken with this project has discovered more efficient means of extracting azadirachtin from the neem tissue by use of different solvents. Producers and consumers are expected to benefit from the use of biologically friendly means of pest control. Furthermore, these new methods are expected to be cost effective, provide safer sources of food, and protect the environment. These new methods reduce the amount of chemical pesticides that have to used in agricultural production. The scope of the project is regional, but could have impact on production systems at the national and international levels. This project was phased out during the fiscal year because of personnel changes.

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

Discussion under Goals One and Three are applicable to Goal Number Five; therefore, Goal Number Five was not addressed separately.

STAKEHOLDER INPUTS PROCESS:

The procedures and processes for obtaining stakeholders' input did not change significantly during 2002-2003 as compared to 2001-2002. The essential mechanisms used are as follows:

- ❒ Consultation with extension personnel who meet regularly with producers and rural residents. Extension personnel hold "town meetings" to get stakeholders' input. Research personnel also attend these events.

- ❒ Stakeholders visit research sites for direct interaction with scientists. Such visits may take place at field days or on less formal occasions.

- ❒ Input from public officials. Many elected and appointed public officials serve as intermediaries between their constituents and the university. On a number of occasions they have called attention to existing problems, which were then addressed by research scientists.

- ❒ Input from employees of other USDA agencies. We enjoy a collegial relationship with scientists of other USDA agencies or employees who possess a science background. Interchanges with these persons give helpful insights into research opportunities and have led to establishment of joint efforts in a number of cases, although few of these are supported by formula funding.

PROGRAM REVIEW PROCESS

There have been no significant changes in the program review process since the five-year plans were submitted, except for refinements and clarifications. Some changes are planned for 2004-2005.

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. A number of additional collaborations were established during 2002-2003, including a number of universities and research centers in Ghana and two major biotechnology research institutions in the United States. 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 were asked during the evaluation of the 2001-2002 program year. They were again asked during the evaluation of the 2002-2003 program year. The questions are 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 under served 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 cited is yes--the multi- and joint-activities are effective and are conducted in an efficient manner.