

Alcorn State University
Report of Accomplishments and Results

Evans-Allen Formula
Funded Research

- FY 2004 -

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FOREWORD

This Accomplishment Report for Alcorn State University's Evans-Allen funded program covers the period of October 1, 2003 through September 30, 2004. The accomplishments of the individual projects are briefly discussed.

The Evans-Allen funded projects continued to play a significant role in assisting the university in carrying out its land-grant mission, particularly in meeting research needs of limited resource farmers in Mississippi. All funded projects are related to and supportive of goals and priorities of the United States Department of Agriculture.

We are thankful to the dedicated scientists and staff members who contribute to the success and accomplishments of the Evans-Allen funded and related research projects at Alcorn State University. We are indebted to our collaborators, including employees of the U.S. Department of Agriculture, for their commitment to and support of our agricultural research program at Alcorn State University.

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GOAL ONE - FY 2004: An agricultural system that is highly competitive in the global economy

Overview

Executive Summary

During 2003-2004, the 1890 formula funded research at Alcorn State University, relative to the national USDA Goal One cited above, focused on six projects which are of particular importance to limited resource farmers and farm families, the primary clientele of the university's formula funded research activities. The research activities which were initiated in previous years and continued during 2003-2004 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 2003-2004 fiscal year continued its focus 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 2003-2004 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 2003-2004, 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. Two studies were completed and published evaluating the effects of exogenous progesterone (CIDR's) on the survival of embryos transferred to Angus recipient cows. Furthermore, research outcomes were published on the effects of GnRH in combination PGF₂α on the dynamic of follicular and luteal cells in post pubertal Holstein heifers. These studies will improve production efficiency in the livestock industry and positively affect economic well being and quality of life of rural families involved in livestock production.

2. Field experiments conducted with sweet potato on Dexter silt loam continued in this reporting period. Previous findings 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. Results of these studies have been published or submitted for publication in appropriate professional journals.
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 was continued in this reporting period. The outcome of this research is allowing small farmers and landowners to grow adapted varieties of 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 empirical knowledge of consumer awareness and marketing systems for new alternative vegetable crops and their potential impact as niche market.

Key Themes

1. Research in Animal Production

A project entitled “Effects of Nutrition and Suckling on the Release of Reproductive Hormones in Cattle” is under the umbrella of the key theme area above. The objectives of this project was to develop and provide management practices to small farmers that can be used to improve efficiency in livestock operations. Five research studies were implemented or completed under this project. Data from a study implemented to evaluate the effects of injecting GnRH 48 hours after PGF₂α was completed and 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 being 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 has 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; data from this study has

also been published by the Journal of Animal Science. 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. Funding for this project for this period was \$94,172.

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 with-in 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 over-winter 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,” has been accepted for publication in the *Journal of Vegetable Science*, manuscripts on lemongrass and feverfew have been prepared for publication in the *Journal of Herbs, Spices and Medicinal Plants*, and a Thesis entitled “Effect of Plant Spacing on the Yield and Quality of Lemon grass” was completed. 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 was conducted during this growing season (June through October 2004), and results will be reported later. 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.

During the year 2004 the most important activity carried on was the maintenance of fruit trees in healthy condition by applying recommended cultural practices of pruning and pesticide spray program. Experiments were laid out to study low-input of fertilizers (organic and inorganic) and mulching. Due to inclement weather (freezing temperatures and excessive rainfall at the flowering stage) there was very low fruit set and excessive rotting of fruit, therefore no yield data could be recorded. Interested fruit growers can learn more about low-input fruit production practices in future years. For future years, orchard established for this project can also be used for viewing by public and interested growers. Also this orchard can be used for demonstration and field work for students enrolled in horticultural classes.

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. This project was funded over four years and during that 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.

- An analysis to determine the impact of technological and market changes on farm management practices was completed this past period. In terms of farm management practices, crop enterprise selection depends on personal preferences, market price, and availability of financial resources; farmers usually follow recommended fertilizer and seed rates, maintain income and expense records, use soil conservation practices and monitor input price levels; have excellent to average knowledge of financial tools, such as balance sheet, cash flow budget, income statement, and enterprise budgets; have excellent to average knowledge about the benefits and costs of leasing versus purchasing equipment; most farmers set goals for farm business that are measurable and attainable; and most are dependent on Cooperative Extension agents for technical assistance in making financial management plans. In terms of marketing practices, produces are generally sold through wholesale markets, pick-your-own operations, and farmers' markets; factors that farmers consider important in marketing their produce are quantity, price, and time; livestock producers are more concerned with maintaining livestock records and animal health; and majority of the farmers have excellent to average knowledge of crop insurance and marketing information as marketing strategies.

- Additional analysis was conducted to determine the effect of socio-economic variables on farm management, financial management, and marketing practices among small producers in the study area. Farm management practices such as filing soil conservation plan, maintaining farm expense records, herbicide and insecticide application, and keeping track of annual production expenses were significantly associated with gender, age, education level, tenure status, non-farm income level, and farm size. The relationship between these practices and socio-economic variables were in the expected direction. For instance, "keeping track of annual total production expenses" was positively correlated to gender, education level, farm size, and farm status. In other words, farmers who carried out this practice were male, had better education, operated large farms, and farmed full-time. Financial management practices such as

developing annual total production costs, knowing prices paid for crops, using partial budgeting technique, having a written farm plan, setting business goals, and setting measurable goals were also significantly correlated to the socio-economic variables. More male than female operators, more of the better educated than less educated operators, more of the large farm than small farm operators, and more full-time than part-time operators develop annual production cost estimates. With regard to the use of partial budgeting techniques, the results showed that more of the younger than older operators, more of the better educated than less educated operators, and more of the lower non-farm income than higher non-farm income operators determine the economic feasibility of potential new farm enterprises on the basis of partial budgets. Only two marketing strategies were significantly correlated to the socio-economic variables. More part-time farmers marketed their own products while fewer of them utilized market information compared to their full-time counterparts.

□ Additional analysis of the field data is continuing even though the project has been terminated last year. Results of these analyses will be reported when completed. 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. \$70,282.00 from Evans-Allen funds were allocated in support of this research.

5. Small Farm Viability

In this area, researchers continued work on a project entitled “*Analysis of the Economic Performance of Small Scale Marketing Strategies*”, and work on a capacity building project which activities complemented efforts of the Evans Allen project. Outlined below are some of the notable results from the efforts in the research unit for this reporting period.

Data from the 2002 Census of Agriculture were incorporated into previously accumulated data for the empirical comparison of the long run trends of the number of black farms and the number of all farms in selected regions of the state of Mississippi. Results indicated a reversal of the long run declining trend for all farms and black and minority owned farms.

The research staff of this Evans Allen project was involved in a capacity building project

investigating marketing systems for new/alternative vegetable crops. Survey instruments were developed to collect primary consumers' perception and market data. The survey instruments were administered to random samples of households, supermarkets, wholesalers, and ethnic stores located in Alabama, Arkansas, Louisiana, Mississippi, Tennessee and Texas. Relevant data were collected for assessing consumers' awareness, willingness to buy/consume, current marketing levels, and potential demand for products.

Results indicated that out of the 750 households participating in the survey, 78% have consumed seedless watermelon, 62% have consumed culinary herbs, 47% organic vegetables in general, 35% Chinese peas and shiitake mushroom respectively, 26% asparagus beans, 25% coriander, 19% Japanese eggplant, 15% Chinese okra, 14% Indian cucumber, 9% Malabar spinach, 5% Guar, and 4% for Tindora. Indian Cucumbers, Chinese okra and Japanese eggplant were the products consumers were more likely to try, if they had not already consumed these vegetables. These three products also topped the list of new products most likely to be stocked by supermarkets, wholesalers and ethnic stores. Family and friends, health benefits, store sample and availability of recipes were chosen by the consuming households as the strongest motivators for trial of new vegetables.

In total, 200 supermarkets, 44 food wholesalers, and 40 ethnic stores operating the Southern states listed above participated in the decision makers' survey portion of the study. Timely delivery, grading/standards, and price were the most rated procurement parameters by supermarkets, ethnic stores, and wholesalers. Current marketing levels were relatively low or in-existent along the supply chain for many of the products. Out-of-state distributors were the primary source of produce for the establishments responding to the decision makers' survey. However, only 26% of these establishments use the services of a broker, while 22% would be interested in production contracts with farmers. Data analysis is on-going and additional results will be reported at a later date. The scope of this research is regional. \$82,623 of Evans Allen funds were expended to support personnel, travel, materials and supplies, and \$25,000 of Capacity Building funds were spent to conduct telephone surveys.

GOAL TWO - FY 2004: A Safe and Secure Food and Fiber System (**None in this reporting period**)

GOAL THREE - FY 2004: 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 was 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*" was 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 - FY 2004: 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 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, no project was specifically dedicated to this theme with Evans-Allen funds in this reporting period.

GOAL FIVE - FY 2004: 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 2003-2004 as compared to the previous reporting period. 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 were planned and are beginning to be implemented 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. Previously established linkages were continued and nurtured in this reporting period. 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 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.