

Louisiana State University Agricultural Center

Annual Report, FY 2004

October 1, 2003-September 30, 2004

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Louisiana State University Agricultural Center

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Overview

The mission of the LSU Agricultural Center is to enhance the quality of life for the people of Louisiana through research and education programs that develop the best use of natural resources, conserve and protect the environment, enhance the development of existing and new agricultural and related enterprises, develop human and community resources, and fulfill the acts of authorization and mandates of state and federal legislative bodies.

In realizing this mission, the LSU Agricultural Center's Plan of Work, FY 2000-2004, directed research and education programs under five goals established by USDA-CSREES in pursuance of the mandate of the Agricultural Research, Education, and Extension Reform Act of 1998 (AREERA). Annual reports of research projects and extension programs conducted during FY 2000, FY 2001, FY 2002, and FY 2003 have been submitted. This is the fifth report against the strategic plan, covering the fiscal year 2004 (October 1, 2003 – September 30, 2004). It updates information about several of the ongoing programs which were included in previous year's reports, and provides information on new initiatives and projects undertaken during FY 2004. Summaries of research projects and extension reports are included under each goal, followed by the full research and extension reports. These reports are followed by information about the processes used for stakeholder input and merit review of programs, and allocations of federal appropriations to multi-state and multi-function activities.

The five federal goals under which accomplishments are reported are as follows:

Goal 1 – An organized agricultural system that is highly competitive in the global economy

Goal 2 – A safe and secure food and fiber system

Goal 3 – A healthy, well-nourished population

Goal 4 – Greater harmony between agriculture and the environment

Goal 5 – Enhanced economic opportunity and quality of life for Americans

Research Project Summaries

Louisiana Agricultural Experiment Station scientists, located on the Louisiana State University and Agricultural and Mechanical College campus and at branch Research Stations located across the state, continue to serve stakeholders by conducting research relevant to Louisiana agriculture. Research results are disseminated to producers, consultants, agribusiness, government agencies and other stakeholders, both directly and through extension educators. Five new research publications were released by the LSU AgCenter for distribution to farmers and other stakeholders. With a considerable number of Louisiana producers now using a computer as an essential part of their farming operation, in FY 2004 2,901,895 visits were made to the LSU AgCenter web site.

Louisiana Agricultural Experiment Station scientists conducted research in all five of the federal goals. Following are summaries of research reports. These summaries are also included under each separate goal.

Goal 1 – Research Project Summaries

- Domestic agricultural policies and multinational and regional trade agreements continue to have a significant impact on the competitiveness of U.S. agriculture. The goal of this project is to determine the economic consequences of trade impacts stemming from changes in domestic agricultural and economic policies and continued reforms in trade treaties, as well as to assess alternative strategies to improve the competitiveness of Louisiana agriculture. The expected benefits from the outcome of this research will accrue to farmers, agribusinesses, and government policy/decision makers through improved understanding of trade agreements and economic policy impacts on Louisiana agriculture. An important component of this project and end goal of this work is to provide to all of Louisiana agriculture road maps of policy options and consequences.
- With catfish farmers struggling with continuing low prices, automation that simultaneously reduces labor costs, improves environmental impact, and increases production can be the difference between success and failure. One research project of promise has been the design, development and initial testing of an autonomous boat, solar powered, battery operated, controlled by a micro-controller, actuated by a motion-sensing device to drive predatory birds from aquaculture ponds in an environmentally-friendly and non-fatal way. Initial tests indicated some success, and further development is ongoing.
- Dermo disease caused by a protozoan parasite results in extensive mortality of eastern oysters and has prevented development of intensive aquaculture of this species along the Gulf Coast. This research identified defense proteins which can be used as selection markers for breeding disease resistance to the primary parasite in eastern oysters. Alternatively, these oyster host defenses can provide endogenous genes for developing disease-resistant oysters by increasing their expression through genetic manipulation.

- There is considerable interest among Gulf Coast beef cattle producers in short-duration, rotational, or management-intensive grazing systems as a way of managing their abundant forage resources and improving cow-calf production efficiency. A study was conducted to evaluate the effects of pasture stocking rate (low, medium, or high) and method (continuous or rotational) on cow-calf production. Stocking rate had a larger impact on cow-calf production than stocking method, and additional inputs associated with rotational grazing do not appear to be warranted.
- Calf weaning weight is greatly influenced by genetic potential for growth, therefore verification of reliability of sire weaning weight expected progeny differences (EPDs) when mated to crossbred cows needed to be studied. The mating of cows to bulls that differed by 20 pounds for weaning weight EPDs resulted in actual calf weaning weight difference of 28 pounds, indicating that EPDs are fairly reliable. Use of sires with high weaning weight EPDs did not result in increased calving difficulty and did not adversely affect subsequent pregnancy rates.
- Arthropod pests are responsible for a 4 - 6% loss in U.S. cotton value annually, with these losses occurring in spite of management strategies that range from \$50 to \$60 per acre. In this research, the efficacy and value of spatially variable insecticide (SVI) applications were compared to whole-field broadcast treatments against cotton arthropod pests. SVI technology reduced input costs for arthropod pest management, but did not significantly impact yield. The reduction in acreage treated with insecticides supported better stewardship of the environment. These data supported the use of SVI technologies to moderate pest management costs and contributed to the integration of precision agricultural technologies into current Integrated Pest Management (IPM) strategies.
- Cotton diseases are a yearly production problem, with diseases annually reducing cotton yield and quality by 12 - 35 % from 1994 to 2004. Field tests were conducted to evaluate fungicides for managing seedling disease. Cotton producers can reduce input costs based on results from this study. Research demonstrated that in-furrow fungicides are not always needed, and farmers can capitalize on existing environmental conditions to determine if additional fungicides are needed at planting. Eliminating in-furrow application can save producers up to \$25 per acre and reduce time in the field. Additionally, defining the impact of tillage systems and cover crops on seedling disease has provided farmers with information to make better informed decisions concerning fungicide use.
- Seedling disease is one of the major constraints to establishing a healthy, uniform stand of cotton, with losses across the Cotton Belt from seedling diseases estimated at 2.5%. Results of this research showed that soil temperature and moisture have an impact on seedling disease severity. As soil temperature increased, severity of seedling disease decreased. With a minimum soil temperature below 60 degrees, in-furrow fungicide increased seedling survival. No rainfall, or rainfall greater than 2 inches after planting increased the likelihood of in-furrow fungicides improving seedling survival.

Completion of this research will increase the cotton farmer's knowledge of timing of in-furrow fungicide application to reduce seedling disease.

- Cotton is the third most important plant commodity in Louisiana, with a total value of about \$350 million. The future of profitable cotton production depends upon identifying new genes and gene sources for yield, fiber quality, and pest resistance. The increasing importance of precision breeding, via an improved understanding of the molecular basis of traits, offers additional routes for increasing crop productivity and quality. Several new sources of desirable genes have been identified, and their utilization should help broaden the genetic base of cotton, reducing its vulnerability due to a limited genetic base.
- Emphasis on management of replacement heifers is becoming increasingly more important as the dairy industry continues to promote rapid growth to decrease time before first calving while still maintaining optimal production levels. Producers desire the replacement heifers to fully develop their lactation potential at the preferred age with minimal expense. In this study, eight Holstein steers were assigned to one of four dietary treatments, with feed intake, body weight, and height monitored. Research results showed that feeding diets greater than 16% crude protein with or without fish meal does not improve performance in weaned dairy calves. This information provided evidence that higher priced diets are not necessary for optimum performance in weaned dairy calves.
- Mastitis in dairy heifers is a major economic problem for dairy producers in Louisiana and across the nation. The National Mastitis Council estimates the overall loss to animal agriculture from this disease at \$2 billion (about \$180 per cow). Information on efficient methods for treatment and prevention of mastitis in heifers can dramatically improve herd health and productivity. Results from this multi-state study showed that heifer mastitis can be treated effectively with prepartum therapy and herd somatic cell counts reduced. Postpartum milk production was equivalent in both treated and control heifers.
- The Mexican rice borer (MRB) has been the major economic pest in Texas sugarcane since its establishment in 1980, causing such severe infestations that fields could not be profitably harvested. Studies show that the insect has the potential to cause far greater yield devastation in current Louisiana cultivated varieties. Research by Texas A & M and LSU AgCenter scientists (proactive, at least from the perspective of Louisiana agriculture) has identified the availability of biological resistance to MRB on sugarcane and rice. It was shown that MRB cannot be adequately controlled in sugarcane with insecticides alone, but can be better managed with insecticides in rice. For Louisiana, the anticipated problems with MRB will continue to demand a multi-discipline approach, to develop and implement management practices that will protect the host crops and also reduce pest populations.

- The Formosan subterranean termite (FST) is an invasive, wood-destroying pest species which causes billions of dollars in damage in the Southeast, especially in Louisiana. By investigating the ecology of such an exotic ecosystem as the termite gut, scientists have discovered several novel bacteria species, including bacteria which can survive only in the termite gut. Being able to isolate and culture termite specific bacteria sets the stage for using them as a “Trojan Horse” to introduce detrimental genes into termite colonies. Thus, bacteria in the future may serve as self-perpetuating, self-replicating biological agents for termite control, reducing the cost of control for Louisianans.
- The rice water weevil, the rice stink bug, and the sugarcane borer are the most economically important insect pests of rice in Louisiana. The three goals of this research are (1) to increase the effectiveness of insecticide applications by refining current economic thresholds and developing improved methods of monitoring pests; (2) to evaluate alternative insecticides for weevils and (3) the diversification of insect management programs via the integration of cultural practices and host plant resistance into the program. Yield losses from the rice water weevil alone regularly exceed 10% in small-plot tests. Economic losses from a 10% yield loss (if no effective management practices for insect controls were in place) would exceed \$20 million (assuming 500,000 acres of rice in the state, 6,000 lb. per acre yield, and a price of \$8.00/cwt).
- Most of the large greenhouse tomato producers in the U.S. replace the root media once a year to avoid serious crop losses. Smaller producers cannot afford this expense, but tainted perlite, the most widely used growing media, can impair the root system and lead to a weak and less productive plant. Researchers developed a cost-effective and labor-friendly technique to recycle perlite at a fraction of the cost to replace the growing media each year. Tomato plants raised in the recycled perlite produced comparable yields to those raised in new perlite, and the process can be repeated as needed. Cleaning and disinfecting old perlite using the researcher-developed process can save the small producer considerable expense, helping the grower to survive in a competitive market.
- Several experiments were completed assessing management options for potentially useful cool-season perennial forage plants. Texas bluegrass was identified as a highly persistent cool-season perennial grass on well-drained Coastal Plain upland sites. An adapted sod-forming cool-season perennial grass such as Texas Bluegrass provides potential as an economic source of permanent pasture to enhance profit potential of farm enterprises based on grazing livestock. It also provides an option for erosion control and permanent winter food plots for wildlife.
- Cattle production systems in the Southeast use warm-season perennial grasses as the primary forage source through six-to-seven months of the year, with stored hay as the primary feed in the winter. Hay is a relatively high direct cost to the cattle producer. Climatic conditions in the winter months can be conducive to forage production from cool-season species. Studies were conducted to evaluate several species, including tall fescues, arrowleaf clover, and white clover. Results showed that tall fescue has the

potential for acceptable animal performance, but indicate that some special care in management would be necessary to establish and maintain a vigorous stand. Improving dependability of clover production offers potential for its use. The study results generated from work with white clover provided information to assist plant breeders in selecting appropriate material to use in breeding programs.

- Sheath blight disease in rice is a major constraint to high yields and grain quality in Louisiana. All commercial cultivars are susceptible to sheath blight, with no known genetic sources that provide complete resistance to the disease. However, there are various lines that produce partial resistance which the researcher is using in an active crossing program. Scientists have conducted extensive crossing efforts using multiple sources of sheath blight resistance, producing numerous germplasm lines for use by the AgCenter breeding program. Researchers have cooperated in the evaluation and public release of a population of doubled haploids for sheath blight tolerance that will benefit overall rice research in the development of new, disease-resistant varieties.
- Poor seedling vigor (slow emergence, low plant population, and short seedling height) in semi-dwarf varieties is a management problem in rice production. Improving seedling vigor reduces seed costs and water use and management, and in situations where plant population is decreased can increase yield. Research scientists found that seed and foliar treatments with gibberellic acid improved seedling vigor in commercial rice varieties and several experimental lines. This improved seedling vigor translates into increase in production.
- Recent advancements in molecular marker technology provide a tremendous opportunity to accelerate genetic improvement in a number of traits that are important to the rice industry. Molecular markers allow direct identification of the genes, and thus can be used to increase selection gain. Ongoing research is focused on development of a simple, cost-effective, and relatively high throughput marker detection system for routine use, which will allow successful and widespread adoption of marker technology in various rice breeding programs.
- Rice farmers are faced with significant yield reductions every year due to rice diseases, which can cause reductions in yield as high as 80%. Producers rely on fungicides and bactericides to control diseases. Currently, a new class of fungicides is being evaluated that are environmentally safer and more effective than current fungicides. Since timing and rate are very important for these fungicides, studies are being conducted to define the best spray program for individual varieties/disease situations. These fungicides have the advantage of controlling both sheath blight and blast, which helps to reduce some of the guesswork in choosing a fungicide, and increases farm income.
- Ninety percent of the rice acreage in the state has been planted with LSU AgCenter developed varieties. These varieties combine high yield, premium quality, disease resistance, good agronomic characteristics, and enhanced seedling vigor, helping to raise

Louisiana's rice yield by 15% in the last five years. Research has been conducted on an on-going basis to develop superior long-grain varieties by improving major agronomic traits of current varieties, which include disease resistance, yield components, and grain quality. Harnessing biotechnology and conventional approaches should expedite the development of high yielding varieties.

- Although the advancement of rice production technology has played an important role in recent yield increases, the majority of these yield increases can be attributed to varieties developed by AgCenter researchers, such as Bengal. Variety research is an ongoing effort, with rice farmers facing challenges such as low prices, conservation issues, and increased regulation of pesticide use. Improved medium-grain varieties with high yield potential and pest resistance can help rice growers to increase production while reducing cost of production and meeting conservation requirements.
- Soybeans have thin seed coats and high oil content, making them particularly susceptible to deterioration by late-season rainfall after crops reach maturity. Louisiana lost an estimated \$40 million due to weathering in 2002. Results of this study showed that soybean germplasm with superior weathering-resistance bred in the LSU AgCenter produced higher yields than all but one conventional commercial variety in the Maturity Group V. Superior conventional and glyphosate-resistant commercial varieties were identified for production. Data were used to recommend superior varieties to producers. If recommended varieties were produced on 40% of the soybean acreage in the state and resulted in a 5-bushel increase, there would be a gain of about \$12 million in gross profit (@ \$6 per bushel).
- Most of Louisiana's sugar mills require more steam than can be provided from the available fuel and thus burn natural gas as an auxiliary fuel. Data were gathered on the operating conditions of multiple effect evaporators at several sugar mills throughout the operating cycle. The data is currently being analyzed to determine the factors that affect the heat transfer coefficient. Better data on evaporator performance and factors affecting the heat transfer coefficient will allow for more cost effective evaporator designs and energy savings. Natural gas usage typically costs the Louisiana sugar industry about \$6 million per year. Most of this gas usage can be eliminated by appropriate evaporator designs.
- Sugar is a major component of Louisiana agriculture, with the direct value of the crop, not including value-added, in excess of \$640 million. This research concentrated on defining problems of microbial origin that affect the production of raw cane sugar, and then developing practical solutions. Laboratory developments were on new, cheaper methods for dextran monitoring and biosafety through use of a new biocide. A trial of the biocide was conducted for controlling slime in a cooling tower in a commercial sugar mill. Control of microbial losses can improve operating costs. The primary source of dextran is stale cane, and the ability to rapidly detect stale cane as it reaches the sugar mill would be of great economic value.

- Cleaning evaporators and the downtime associated with the process reduces sugar mill capacity and thus is costly to the industry. Valuable research information was obtained at a local commercial mill, in assessing the performance of individual evaporator vessels. This data enabled a reduction in cleaning frequency, saving chemical cleaning costs and downtime expenses. The data were also used to evaluate the effect of the modified liquid feed arrangements on each vessel. The data generated will be applied to other evaporator arrangements in South Louisiana sugar mills.
- Improving the efficiency of sugar mills involves reducing the losses of sugar which occur in processing. The accurate survey by the LSU AgCenter of molasses produced in the state has continued. The survey provides information to the processors on the degree to which molasses has been exhausted, and shows what room for improvement exists. Efforts to improve factory efficiencies through the use of more instrumentation culminated in an all-day producer symposium conducted by AgCenter faculty. The loss of sugar in nearly all Louisiana mills has been reduced over the last four years as processors have gained understanding of the molasses survey's ability to represent true losses of sugar.
- Crystallization is a major unit operation in sugar processing and improvements translate to significant benefits for processors. Due to a move to another facility, crystallization work by AgCenter scientists was put on hold for most of the year. The larger of the two pilot plant vacuum pan crystallizers was re-connected, and the automatic control system re-installed. The opportunity was taken to improve the installation with some new control elements. Experience gained on the pilot plant system was used in the design of some automatic control schemes in some Louisiana sugar mills.
- The direct production of white sugar at Louisiana mills can lead to significant added-value in producing a product that attracts a higher price than raw sugar. The results of this study—product characteristics and product schemes—will show the value to the industry or individual mills of direct production of direct consumption sugars. The production of edible sugars directly in sugar mills is an opportunity to diversify mill production with high value-added products. For a mill producing a million tons of cane per year, potential benefit is considered to be 3 cents/pound, or \$6 million/year.
- With 88% of Louisiana's sugarcane acreage devoted to a single variety, problems associated with a monoculture are a grave concern—problems such as vulnerability to disease and insects. Although resistant when first released, the dominant variety in the state began showing increasing signs of susceptibility to sugarcane rust disease. The most recent variety released by the LSU AgCenter is resistant to sugarcane rust disease, thus giving growers a variety alternative in areas where the disease is prevalent. The latest variety also features early maturity and high sucrose content, giving farmers an early season choice for harvest.

- The development of improved sugarcane varieties has been a major factor in sustaining a competitive sugarcane industry in Louisiana. With stagnant sugar prices, new sugarcane varieties have offered higher yields, reduced production costs through insect and disease resistance, and improved stubble longevity. Successful variety development programs require the cooperation of several disciplines, including agronomy, plant pathology, entomology, and genetics. With this team in place over the past 25 years, the LSU AgCenter has had a positive impact on keeping Louisiana in the sugar business. With its latest variety grown on about 88% of the state's acreage, the estimated economic impact is \$250 million.
- The development of biobased products provides the opportunity for value-added income from sugarcane. This study focused on producing bagasse-based, non-woven composites for auto interior applications. A lightweight, bagasse-based composite was developed in cooperation with the Louisiana Department of Economic Development. The research accomplishments impact the sugar industry, the auto industry, and advanced material manufacture that is categorized in the state strategies for economic development.
- Understanding markets is critical to the viability of the secondary forest products industry. This study was a comparison of the Louisiana Forest Stewardship Program (LFSP) and the National Forest Certification Programs. The research compared the LFSP with guidelines of four sustainable forest management/certification approaches: management plans, certification, home builder attitudes about treated wood, and eBusiness use in the forest products industry. Results of this study will aid the forest sector companies and other stakeholders to make strategic and tactical decisions in these important areas/issues regarding marketing of secondary forest products.
- Experiments were conducted to investigate strip thickness and strip numbers effects on flexural properties and shear stress of wood composite poles. Investigations have also been carried out to find glue-line effects on the stress and deflection analyses of composite poles. This research will help reduce the demand for pole-sized timber and decrease the amount of preservative-treated wood waste in landfills. There is also potential for applying this technology to wood products producers for value-added production of composite poles and other engineered wood products.
- Rice compares unfavorably with corn and soybeans regarding value-added ingredients. Rice production in the state has suffered from low prices the last few years, and rice farmers and the overall economy in Southwest Louisiana would greatly benefit from any value-added to their commodity. The purpose of this research was to develop value-added rice starch ingredients. The information from the study could be utilized to produce value-added food ingredients from rice starch and flour. There could also be an increase in the value and use of broken rice kernels, which make up about 15% of milled rice in the U.S., through their use in production of starched-based food ingredients.

- New, environmentally friendly wood preservatives are needed by the wood products industry. Research was conducted to examine the effects of powder zinc borate (ZB) and calcium borate (CB) on resin gel time, strength, swelling, leaching, termites, decay, and mold-resistance properties of oriented strandboard (OSB). The information on various properties of borate-modified OSB is of significant value for developing durable structural panels from southern wood species. This research provided information to give OSB manufacturers, which are not included in the license agreements for using zinc borate, to manufacture chemically modified OSB using calcium borate.
- New forest products are needed to improve Louisiana's economy. In this research, a laminated model based on continuum theory combined with finite-element analysis (FEA) was used to predict the influence of voids on engineering constants of oriented strandboard (OSB). Wood composite properties are critical in the search for value-added uses of the state's forest land. This study provided important information on how flake property and its orientation distribution affect the panel engineering and durability performance for oriented strandboard.
- Foresters have to make management decisions on forest stands, some of which are site preparation, fertilization, control of undesirable species, and harvest age. These decisions are based on information from growth and yield models. Inaccurate models can thus lead to poor management decisions that might result in substantial losses to forest landowners and timber companies. The purpose of this ongoing study is to produce superior growth and yield models that should help forest managers to identify and select management strategies to optimize economic returns. Preliminary research involved attempts to link an individual tree model with a diameter distribution model.
- Application of selective herbicide within managed pine forests generally improved vegetative characteristics for northern bobwhite quail. This improvement came through reduction in woody vegetation, reduction in height of vegetation, and overall increase in abundance of quail food plants. Further research indicated that the greatest net improvement to habitat following herbicide application occurred after a renovating prescribed fire during the second growing season following application. Results of this study provided land managers the opportunity to utilize both prescribed fire and herbicides to benefit both the plantation pines and quail habitat.
- Understanding molecular genetics is critical to understanding tree breeding. This research project developed genetic markers for use in genetic analyses. The project developed populations of longleaf pine, slash pine, their hybrids, and eastern cottonwood. A cottonwood clones bank, representing elite clones from throughout the Southeast, was established at the LSU AgCenter and will be used for future cottonwood breeding programs. This study will enable tree breeders to select for important traits at an earlier age and will help to diversify the species currently grown in Louisiana.

Goal 2 – Research Project Summaries

- Each summer, the Louisiana oyster industry is threatened by a recall of oysters due to contamination of *vibrio* which are bacteria widely distributed in the estuarine and marine environments. Bacteriophages have been found in seawater and oysters, and could be used to control such pathogens in oysters. Research results showed bacteriophages active against the virulent *vibrio vulnificus* are naturally found in oysters and could possibly be used as a processing aid to control the pathogen in live oysters. By destroying these human pathogens in shell stock oysters it will reduce the economic loss due to recalls, and protect the oyster industries' reputation along with the welfare of consumers.
- With the recurring recalls of ready-to-eat meat and poultry products due to contamination from food-borne infections, research results showed that acidified sodium chlorine is effective in inhibiting growth of pathogens when the pathogen was grown on the surface of ready-to-eat meat products. This could help to prevent economic loss and possible deaths from food-borne infections and will benefit Louisiana based ready-to-eat meat processing companies as well as the general public.
- There is considerable need for the reduction of *E. coli* and other pathogens in livestock prior to slaughter. Currently there is a focus on development of best management practices (BMPs) to control food-borne pathogens prior to slaughter. This study investigated the growth of *E. coli* and other pathogens collected from cattle water troughs on various surfaces to better understand the ability of these pathogens to survive, and to develop methods to control them in the environment of small cattle farms. The research showed that biofilms from cattle water troughs can support growth of pathogens, and that copper could possibly be used to control these food-borne pathogens in cattle water trough biofilms.
- Pathogens found in the environment of ready-to-eat processing plants have been linked to contamination of these products. Research by LSU AgCenter scientists could provide ready-to-eat meat processors a method to control these pathogens within the food processing environment by using copper-based alloys. Study results indicated that copper or brass metal could be used to control some pathogens in hard to clean areas, such as drains or air vents, of the ready-to-eat processing environment.
- Aflatoxin has been a costly disease of grains in Louisiana, especially with both the high temperature and humidity normal to the state. Many detoxification techniques have been applied with some success. This study found that ozonation reduced aflatoxin levels by 92% and no reversion to the parent compound was observed. Chemical inactivation by ammoniation has wide-spread acceptance and use, however the cost is about \$20 per ton. Compared to ammoniation treatment, decontamination with ozonation is estimated to cost about \$4 per ton. If ozone is proven to be effective and does not cause harm to grains, it will result in farmers getting a higher return on their grain, a safer food, and less harm to the environment.

- Maintaining the quality and safety of fresh-cut produce is a major challenge to the food industry. Many techniques, including edible coatings, have been studied to overcome these problems and extend the shelf-life of fresh produce. This study found that crawfish chitosan edible coating with added microbiocides is anticipated to extend shelf-life and assure desirable quality of fresh-cut produce. Chitosan also may serve as an antimicrobial cleaning agent for food contact surfaces in food processing plants. With consumer demand increasing for minimally processed foods, crawfish chitosan may offer the food industry a viable means of better meeting this demand.
- Improved rice varieties with higher yield potential and quality can greatly improve economic returns to the farmer, while providing to the consumer a safe and healthy diet selection. The Rice Breeding Project is continually striving to develop new, improved varieties with improvement not only in yield but in other important characteristics as well. Cheniere, a new variety, is expected to account for a substantial portion of Louisiana's rice acreage. Cheniere has comparable yield potential to the widely used variety Cocodrie, but superior milling characteristics and grain appearance. This newly developed variety not only will potentially improve farm income, but will also provide the public with a safe and economical diet staple.
- Vaccinating cattle against brucellosis, tuberculosis, and Johne's Disease with a multivalent vaccine that is safe and efficacious, which additionally will assist in the protection of the animal from a potential agroterrorist attack using these pathogens is imperative to the well-being of all people. In this research, all animals were challenged with various virulent organisms, and all animals remained negative on all routine diagnostic tests. All three of the regulatory diseases addressed in this study deleteriously impact the economics of cattle production, which in turn affects all consumers.

Goal 3 – Research Project Summaries

- Louisiana has one of the highest rates of coronary artery disease in the U.S. However, the state is one of the leading rice producers, and rice bran appears to have potential to reduce coronary artery disease. Yet rice bran is discarded as a by-product of milling because it is considered unpalatable. This research has focused on identifying components of rice bran that reduce coronary artery diseases so that they could be successfully extracted and incorporated into viable food products. If the study is successful, this could positively affect not only the rice farmers but also the entire rice industry, plus contributing to the health of the people of Louisiana.
- Identifying by-product components of agricultural commodities that could be incorporated into consumer food products as health-promoting ingredients could greatly increase the value of the agricultural products to farmers and could promote the health of the people of Louisiana. This study evaluated soybean and rice bran for their ability to inhibit enzymes associated with carcinogenesis. Collagen from blackdrum and alligator were studied for possible usefulness associated with angiogenesis. Lutein was isolated

from aflatoxin-contaminated corn and was free of aflatoxin. The process allows recovery of lutein for food application. Using these by-products could increase profitability of agriculture in Louisiana.

- With the rise in obesity and obesity-related health problems, there is a need to consider modifications in the American diet that may benefit health by reducing body fat. In this AgCenter research, diets were developed to increase the amount of undigested starch residue entering the large intestine. Inclusion of resistant starch in the diet increased the release of two satiety peptides. It is proposed that these satiety factors are released in the blood stream, go to the brain, and alter the expression of neuropeptides involved in hunger. Including resistant starch in the diet could lead to decreased incidence of obesity and thus reduce health care costs involving the treatment of 30 diseases linked to obesity.
- Much of the cost associated with producing protein-based drugs is the expense associated with the manufacturing facility and the low levels of output from the cell culture expression system. Scientists are using the white leghorn chicken, in combination with state-of-the-art biotechnology, to engineer an animal that can produce pharmaceutical proteins in the white of their eggs. The technology produces transgenic chickens at rates not previously possible and expresses proteins in eggs at commercially viable rates. By integrating into the state layer industry, the LSU AgCenter may provide the base industry that will provide fill and finish on pharmaceutical compounds.
- Prostatic cancer is the second leading cause of cancer deaths in men, and breast cancer represents the most common cause of cancer deaths in women. LSU AgCenter researchers have discovered and tested novel treatments for both prostatic and breast cancers. These are compounds composed of ligands linked to membrane-disrupting peptides. The ligands are small protein hormones which direct the membrane-disrupting peptide to cancer cells. The compounds hold great promise for both early and advanced stages of prostatic and breast cancer. Importantly, even metastatic cancer cells are selectively destroyed by the compounds. The only side effect of the compounds is loss of fertility.
- Although dairy fat imparts some desirable qualities such as improved flavor, texture, and appearance to dairy foods, it is high in fat content and saturated fatty acids, making it unappealing. Researchers proposed that dairy fat be used in conjunction with a fat absorbing fiber or be replaced by health beneficial lipids. Incorporating these ingredients in cheddar cheese could make it healthier. Use of health beneficial lipids can be recommended as a partial substitute for milk fat because as a partial substitute they do not adversely affect most of the microbiological aspects. Increase in amount of lipids in cheddar cheese should be done with caution, because it results in a harder product. In addition to healthier cheese, using these ingredients could increase consumer demand, thus increasing income for dairy farmers and benefiting the dairy industry as a whole.

- Recent studies have indicated that agricultural plant products provide not only many essential nutrients for the human body, but also some health functional chemicals that could reduce the risk of various diseases, such as cardiovascular diseases and cancers. Phytochemicals are a major group of these chemicals. This study demonstrated that crude soybean and rice bran oils may contain high levels of phytochemicals that reduce cholesterol. The study provided information that may aid consumers in selecting vegetable oil for cooking cholesterol-rich foods. With Americans increasingly health conscious, Louisiana's substantial acreage of rice and soybeans gives the state potential value-added for these commodities.
- To develop new crops in Louisiana for medicinal use, the medical functions of the plants and the extracts obtained from them must be clearly established. Research focused on: the bark of the *Eucommia* tree as a dietary supplement for healthy blood pressure; *Camptotheca* as an anti-cancer extract for animal use; and *Rubus* leaf extract for its anti-inflammatory effects. The research results have technology transfer potential and can lead to commercialization of health care products and demand in Louisiana for raw plant materials, creating new agricultural opportunities.
- The development of new technology for the production of biopolymers from sucrose offers direct benefits to the Louisiana sugar industry, with a market potential as functional foods estimated as high as \$250 billion. It appears that there could be a specific use as a health food, with the possibility also of use as a poultry feed additive to help replace antibiotics in raising "safe" poultry. This is of extreme interest with the reported rise in antibiotic resistant microbial infections. The effects of variation in oligomer structure on functionality is still to be investigated, as well as animal safety and functionality studies.

Goal 4 – Research Project Summaries

- This research addresses the suppression of two major Louisiana destructive insect pests, the red imported fire ant and the Formosan subterranean termite. The study investigated potential biological suppression of the red imported fire ant with a microsporidium, a type of insect pathogen. The state-wide survey and field trials are the first steps in weakening populations of red imported fire ants throughout the state. The microsporidium is intended to become a natural mortality agent of this costly pest, not requiring further public funding after it spreads and is permanently established. The termite research is in an early stage, but its impact will be to either improve the efficacy of safe microbial insecticides or to provide a natural repellent against the Formosan subterranean termite.
- Loblolly pine plantations are widely planted and managed by private landowners and industry. Research in such management practices as fertilization and weed control increase knowledge on the effects of site preparation and harvesting on the soil properties and growth rate. This knowledge helps stakeholders to comply with various stewardship

programs. As the intensity of forest management increases, knowledge of the impact of practices allows landowners, industry, and other stakeholders to assess the economic and environmental impact of various site preparation and harvesting management practices, and thus more wisely consider alternatives for profitability and sustainability.

- Insufficient data exist on the genetics of this economically and ecologically important tree—the longleaf pine. Ten randomly selected trees were felled, and chemical and anatomical data have been initiated. The research project will determine relationships between genetic parameters, growth patterns, and wood properties. Understanding the relationships between these traits will assist LSU AgCenter geneticists in future tree improvement programs and could lead to increased use of longleaf pine in commercial forest plantations in the state.
- Information on ecology and management of bottomland and wetland forests is insufficient for decision-making and policy formulation. A study was implemented to test site preparation methods and artificial regeneration of three oak species on four agricultural fields in the Lower Mississippi Alluvial Valley of Louisiana. Results showed that some degree of site preparation is needed to establish oak seedlings, but few differences were found between site preparation treatments. Research findings indicated that bottomland oaks can be regenerated using natural and planted seedlings. Given past difficulties, an opportunity exists to promote regeneration during thinning operations where growth of desired over-story crop trees is the primary objective.
- Understanding the total aquatic system is essential to development of management techniques. The Atchafalaya Rive Basin (ARB) is the largest bottomland hardwood swamp in North America and represents a poorly understood ecosystem. This area is highly productive, with a high fish species diversity, often sought by recreational fishermen. Historic water quality data indicate that hypoxic area are now much larger than during extensive surveys conducted in the 1970s. Due to these apparent changes, AgCenter researchers have designed a series of short-term studies to examine potential impacts on the ARB biota. Additionally, long-term management plans have been developed in conjunction with several government agencies to restore historic connections between the Atchafalaya River and the extensive floodplain, and to improve circulation patterns in the ARB.
- The Atchafalaya Basin is heavily used by South Louisiana fishermen. Research was completed on the effects of hydrilla (an exotic, submerged plant) on the growth and food habits of young-of-the-year largemouth bass in the Basin. Bass inhabiting high-density hydrilla beds exhibited a delayed switch to fish prey and reduced growth relative to individuals collected in areas of sparse hydrilla cover. Successful draw-down strongly inhibited hydrilla re-growth and resulted in earlier switch to fish prey, with equivocal growth effects. Data from this and related studies are critical to the understanding of effective, sustainable management of Louisiana’s aquatic resources.

- Input of nutrients such as carbon, nitrogen, and phosphorus from agricultural lands to surface waters may overly enrich the receiving water bodies with these nutrients, stimulating excessive growth of aquatic plants, algae and other microorganisms, with the overall result of deteriorating water quality. Phosphorus has received the greatest attention because it is typically the most limiting nutrient in freshwater. From this study, it is thought that for streams monitored in Southwest Louisiana, use of best management practices (BMPs) by producers of rice, soybeans, crawfish and beef cattle (pasture) will remedy the impaired water quality problem. However, this must be demonstrated at the field and watershed scales. The scope of this research (watershed scale) provides new approaches to addressing water quality problems, with farmers highly affected by water quality policy and regulations.
- Swine and poultry diets are formulated to achieve optimum economic returns for the producer. Also, land application of swine and poultry wastes leads to accumulation and potential run-off of phosphorus in soils, which can lead to eutrofication of water sources. Research was conducted to evaluate the effect of dietary phytase supplementation in swine and poultry diets on animal productivity and nutrient loss to the environment. In areas of concentrated animal production where phosphorous levels in the soils are an important consideration for land application of animal waste, the use of phytase will increase the amount of waste that can be applied without exceeding the phosphorous standard. Swine and poultry diets also may be more economical because of the reduction in calcium, phosphorus, amino acids, and energy supplementation that is required.
- Cotton production systems have traditionally involved intensive tillage practices for seedbed preparation and weed control. High costs of labor, equipment, and fuel are becoming an ever-greater concern to farmers. Field studies were performed to evaluate effects of tillage practices, cover crops, crop sequences, and fertilizer nitrogen rates on cotton growth and yield. Results from the research have increased the acceptance and implementation of sustainable and economic best management practices (BMPs) that are highly protective of water quality. Optimal fertilizer nitrogen rates for cotton under several cropping systems were identified, which will help to ensure that producers have the knowledge necessary to optimize nutrient efficiency and minimize nutrient leaching and runoff losses.
- This project was designed to address rice production problems, including improving agronomic practices by efficient utilization of inputs and mitigating concerns regarding soil erosion and water quality. Proper timing of inputs improved yield, decreased cost of production, and minimized any negative effects of nutrient management in rice on the environment. Reduced tillage practices have potential to decrease input costs and at the same time sustain production at profitable levels and mitigate environmental concerns. Ratoon-crop production increased resource use efficiency per unit of time and per unit of land area. Rice producers can benefit considerably from the results of this research.

- Louisiana sugarcane farmers need information and knowledge on management practices which will improve the quality of run-off water flowing from their fields. The purpose of this study is to evaluate the effects of post-harvest residue (mulch cover) on the field with respect to surface water quality. Three management strategies were evaluated with focus on mulch residue and its effect on soil erosion, surface water quality, and crop yield. Management practices studied included (1) burning mulch after harvest and cultivating in the spring; (2) sweeping mulch off the top of the row after harvest and cultivating in the spring; and (3) leaving the mulch on the field after harvest and cultivating in the spring. Results of this study will provide sugarcane farmers with research-based information on selection of best management practices.
- Understanding the effects of best management practices (BMPs) is critical to resource management. Researchers investigated the differences in stream macro invertebrate communities, water quality parameters, channel characteristics, woody debris, and microbial community dynamics in three West Louisiana streams of differing land uses. With increasing intensity of land use, some preliminary findings indicated increasing amounts of woody debris, decreasing complexity of channel characteristics, and decreasing water quality. Unexpectedly, microbial fecal coliform and heterotrophic plate counts did not appear to be related to land use, but instead appeared to be influenced most by point sources along the stream continuum and by wildlife activities. Demonstration of forestry and wildlife BMP effectiveness will have significant positive impacts on the Louisiana forestry industry by minimizing mandatory regulations.
- Understanding biology of ducks is essential to managing populations. One of the most critical aspects of waterfowl management involves harvest regulation. Age ratios are one of the key inputs (along with habitat conditions, population size, and survival rates) to the adaptive harvest models that are used by the U.S. Fish & Wildlife Service to set annual regulations. The researcher initiated work to test the accuracy of the age ratios generated from samples of wings provided by hunters. The LSU AgCenter study indicated a 20% bias in age ratios, with these biased data inputs having led to conservative harvest regulations. Research results leading to the discovery of biased age ratios have allowed the U.S. Fish & Wildlife Service to establish harvest regulations that were less restrictive.
- Field management zones differing in soil attributes useful for variable rate fertilizer application (VRT) have been helpful in minimizing environmental insult of excess nutrients entering ground water and for lowering the farmers' fertilizer expense. Apparent soil electrical conductivity can articulate such management zones. The need exists for a close examination of the interrelationship of soil attributes when application prescriptions are developed for site specific work. Research is scheduled to continue, with VRT being an environmentally friendly, economical approach to fertilizer management.
- The Louisiana black bear is a threatened species of critical importance to natural resource management in the state. LSU AgCenter research indicated that relocating females with

newborn cubs is a successful technique to ensure colonization of the site by the female. The willingness of the female to leave the release site appears to be limited by the presence of cubs, thereby ensuring her acclimation to the release site. A follow-up study has begun to expand this work and is examining ecology of female black bears relocated during the restoration efforts. Natural resources scientists also are conducting a project on effects of forest management on wild turkey habitat use in bottomland hardwood systems. The relationship between wildlife management and forest management is not well understood, and the study will be of much interest to Louisiana outdoor enthusiasts.

Goal 5 – Research Project Summaries

- Processors have shown an increasing interest in using solid processing waste as potential useful raw materials for development of value-added functional food ingredients. Adding value to crawfish shell waste would minimize pollution problems and offset costs involved in disposal of processing by-products or waste, and additionally maximize the processors' profits. Chitosan is a biopolymer that can be produced from crawfish shell waste. Chitosan's inherent antimicrobial and film-forming properties make it ideal for use as a biodegradable coating material that can improve weight retention, lower vapor transmission, and prolong shelf life of foods. Researchers evaluated physicochemical properties of crawfish chitosan edible films, and attempted to develop antimicrobial films that are less sensitive to humidity from crawfish chitosans. Development of new value-added functional ingredients from processing will enhance the competitiveness of the Louisiana crawfish industry. Results of this research will be useful for crawfish processors seeking knowledge of the technology for developing value-added functional ingredients.

- The purpose of this research is to develop defensible parameter estimates for empirical models that can be used in explaining changes in the behavior of shrimp fisherman in relation to economic stimulus and/or potential management measure. Expected benefits will accrue to stakeholders, peers, policy/decision makers, and government through improved understanding of the economic information that management agencies can use in the regulatory process to help identify benefits and costs of alternative management scenarios and to identify changes in shrimp harvesting behavior that can be expected in response to economic stimuli. To the extent that knowledge developed in this study is incorporated into the management process, benefits to the Louisiana gulf coast fishery can be enhanced.

Extension Programs

Education programs of the Louisiana Cooperative Extension Service were conducted in all five federal goals. In FY 2004, professional Extension Full Time Equivalents (FTEs) totaled 379, and 4,577,775 educational contacts were made. The distribution of professional FTEs and educational contacts by federal goal was as follows:

Federal Goal	Number of Extension FTEs	Educational contacts
1	124.35	1,198,174
2	6.13	89,497
3	63.66	722,760
4	19.36	136,057
5	165.84	2,431,305
Total	379	4,577,775

Printed publications on a range of topics were issued for dissemination to adult and youth stakeholders in support of extension education programs. Seven new publications were developed, 30 publications were reprinted, and 16 publications were revised.

The LSU AgCenter's technology initiative has led to increased use of its home page to supplement the traditional print method of educational information dissemination. A number of printed publications have been placed on-line for extension stakeholders to access, download, and/or print copies to meet their needs. Currently, there are 311 publications covering a wide variety of agricultural and family & consumer science topics available on-line. A monitoring system to record stakeholder use of this information has been developed, and in FY 2004 2,901,895 visits were made to the AgCenter web site. These visits are in addition to the educational contacts noted in the table above.

Following are summaries of extension reports. These summaries are also included under each goal.

Goal 1 – Extension Program Summaries

- Licensed nursery and industry professionals received information annually from the extension commercial nursery and landscape systems program, with 40% - 50% of growers participating on a regular or occasional basis. Adoption of current recommended practices is primarily in the areas of irrigation, fertilizer management, and selling new plant material. Landscapers are adopting improved pest management strategies and learning to improve horticultural services provided to their clientele. Stakeholder input was requested by extension educators quarterly at meetings attended by representatives of the Louisiana nursery and landscape industry.

- The Louisiana commercial vegetable industry includes about 3,000 growers located in 51 of the state's 64 parishes, with various vegetable crops produced on approximately 9,000 acres. The impact of the extension commercial vegetable education program has been to increase vegetable yields and profits by growers using research-based information provided by extension faculty. These increases in both yield and profit are due to better selection of new varieties, employment of improved production techniques, and increased usage of direct marketing techniques.
- The extension cotton education program included 40 producers meetings, nine on-farm research projects with faculty from the AgCenter experiment station, 50 on-farm demonstrations, three field days, a weekly newsletter, and a cotton web page updated weekly. Additionally, e-mail updates on the current production situation were sent weekly to farmers and agribusiness representatives. Over 2,000 farmers, consultants, and industry personnel attended these educational programs. Advisory groups and a state-wide survey were used to identify direction for cotton extension programs. Five training sessions were held for extension parish faculty having cotton responsibility.
- Cotton producers, parish extension faculty, and agricultural consultants are educated by state extension faculty as an integral part of the IPM (integrated pest management) program, including training 15 parish agents and making 31 presentations at producer meetings throughout the state. Over 2,500 people from the cotton industry were educated by extension faculty at various producers' meetings and field days. With about 95% of Louisiana cotton now being produced using IPM techniques and practices, educational programs in this area continue to provide up-to-date research-based information. This educational material is vital for cotton production at a profitable level.
- In meetings with stakeholders, including dairy farmers, veterinarians, feed company representatives, and other agency representatives, problems with udder health, interpretation and use of dairy herd records, nutrition, waste management, heat stress abatement, and other management factors were identified. Dairy herd record training has continued for farmers and field men, with field days, seminars, conferences, producer meetings, farm visits, on-farm demonstrations, and research verification trials also conducted on a state-wide basis. As a result of these educational efforts, herds on the Dairy Herd Improvement (DHI) program produced 4,200 pounds more milk annually. Due to collaborative efforts between extension and other producer groups and agencies, a mycoplasma mastitis monitoring program was developed and implemented on all Louisiana dairy farms.
- Approximately 5,000 samples are diagnosed annually by the extension disease, weed, and insect diagnostic lab. To greatly decrease the turnaround time, a digital distance diagnostic network was developed in cooperation with the University of Georgia. Extension parish agricultural agents have been trained to use the system. To-date, about 1,900 digital image samples have been processed, with savings to producers over the last five years estimated at \$1 million.

- The Master Horseman education program has trained 210 people in 12 multi-session seminars across the state, with the curriculum including both classroom and hands-on components. Nine additional Master Horseman programs will be conducted by extension in the coming year. Additionally, race horse seminars have drawn 200 people. Verification farms have reported improved profits from horse production. The verification program was initiated to establish model farms, which would then be utilized to educate additional horsemen. Graduates of the Master Horseman program have conducted five camps for youth.
- In order to keep the agricultural community aware of the market, production, and governmental issues that have the greatest potential for changing the landscape of agriculture in Louisiana, a state-wide Agricultural Outlook Conference was held, with over 200 people from the agricultural community attending. Additionally, five meetings were held throughout the state to introduce producers to marketing alternatives and strategies. Approximately 100 farmers attended these educational forums.
- In order to increase the general public's understanding and appreciation of forestry, a three-day forestry AgExpo display provided information to 11,200 students, vocational agriculture teachers, and the general public. This program was conducted by extension faculty in conjunction with the Louisiana Forestry Association and Louisiana Tech University, as part of an overall state-wide educational effort to promote public awareness of the importance of the forest industry to the state, and to provide general knowledge of the environmental aspects of forest management.
- Fruit and pecan education programs focused on providing growers information on variety selection, pest control, and marketing through producer meetings, field days, and newsletters. Though still a fledging industry, mayhaw orchard production has in 20 years progressed from wild fruit to a \$100,000 per year business. The Mayhaw Growers' Association has worked closely with extension during these years to make this industry a reality. Fruit and pecan educational meetings and training sessions included over 850 people. Over 80% of commercial growers said that they have adopted extension recommended management practices.
- In the past year, extension faculty conducted 25 educational meetings throughout the state, providing to producers information on various marketing strategies, with roughly 1,250 attending. Additionally, information on hunting lease enterprises was obtained from 10 producers from the Louisiana coastal area. From these data, a preliminary document was developed by extension that describes these enterprises in general terms, and gives examples of the costs for developing this type of enterprise. There is considerable interest by farmers across the state in using this type of enterprise to supplement farm income.

- Invasive plant species are of great concern in Louisiana, including cogongrass, tallow, parasol, and aquatic plants. A state-wide conference with an attendance of 117 people, including stakeholders from forestry, wildlife and fisheries, universities, and government agencies, provided ecological, biological, and management information. The conference was held as a part of the overall education program to teach stakeholders to identify and control invasive species.
- Agricultural producers face many risks each production year, and the ability to manage those risks effectively and efficiently often spells the difference in financial success and financial ruin. Producer meetings have been conducted by LSU AgCenter faculty to teach both row crop and livestock producers various marketing alternatives that can help manage market risk. The Marketing Agricultural Commodities (MAC) program continues to be offered state-wide, consisting of a curriculum of eight 3-hour seminars. Additionally, an Agricultural Outlook conference was attended by 200 people, with focus on marketing strategies, production, and governmental issues of importance to Louisiana agriculture. Eighteen catfish producers and one salmon producer received technical assistance training in conjunction with the Trade Adjustment Assistance (TAA) program, with completion of this training making the producers eligible for up to \$190,000 in federal assistance.
- The extension Master Cattle Producer Program was developed as an educational program which provides to cattle producers a broad and practical knowledge of environmental stewardship, sustainable livestock production, farm management and marketing—with particular emphasis on how these various management practices are interrelated. The curriculum consists of eight lecture topics delivered in 10 three-hour sessions. The program was the result of collaboration between the LSU AgCenter, the Louisiana Cattlemen’s Association, and the Louisiana National Resource Conservation Service. To-date, 311 cattle producers have participated in this relatively new education program. The program is currently being conducted in three parishes, with about 100 producers on schedule to graduate in FY 2005. Three additional parishes have been scheduled to receive this intense educational offering.
- Through 13 forage demonstration plots located throughout the state, producers were able to observe pasture weed control. Control measures discussed included both chemical and mechanical options, with particular emphasis on how to read and follow herbicide labels properly. Additionally, eight demonstration plots involving forage varieties were conducted. Producers used the information from both the pasture weed control and the variety selection demonstrations to help them be more cost-effective and efficient in their pasture management.
- Pecan is a specialty crop in Louisiana, Arkansas, Mississippi, Texas, and Oklahoma. Of the land-grant universities, the LSU AgCenter is the only one with a complete research and extension program—including horticulture, pathology, and entomology—to support the commercial pecan industry. The idea of it becoming a regional station was

developed, and three meetings have been held by extension and research faculty to further investigate this concept, with an attendance of 180 faculty from the five states involved. This effort is on-going, with its purpose to serve pecan producers in the five-state region.

- The Louisiana Rice Research Verification program has demonstrated to producers the most cost-efficient production practices from following completely research-based extension recommendations. Additionally, the program increased the confidence of rice growers, and extension faculty in these recommendations. Also, after extension faculty and industry leaders realized that precise data were not available, a five-year study was funded in conjunction with the verification program to collect information on water use. Use of the verification fields to educate extension parish faculty has been an immediate benefit of the state-wide verification program.
- Educational programs in soybeans and feed grains provided to farmers information on variety/hybrid selection, tillage practices, irrigation, plant population, fertility, and pest management. Fifteen on-farm research projects were conducted jointly with the AgCenter Experiment Station, and 62 on-farm demonstrations were conducted by extension faculty in the major feed grain production parishes. A monthly newsletter was distributed electronically to over 500 producers, consultants, extension faculty, and others involved in production agriculture.
- Spatially Variable Treatment (SVP) offers producers significantly reduced insecticide costs using historical yield patterns, without substantially affecting crop yields. Extension cotton pest management faculty conducted 24 field demonstrations that showcased spatially variable insecticide, plant growth regulator, and defoliation treatments. Over 500 cotton producers were introduced to SVP at producer meetings and demonstrations, and 150 agricultural consultants were trained to make recommendations using SVP.
- Sweet Potato growers attended two field days which included 17 weed control trials and over 20 insect control farm demonstrations. As a result of collaborative efforts of the LSU AgCenter and the Louisiana State Department of Agriculture and Forestry petitions were approved for the use of both herbicides and insecticides which have been valuable new tools for sweet potato growers. Extension faculty responded to numerous inquiries regarding proper use of newly labeled herbicides.
- With weeds and grasses continuing to be a considerable expense to producers, a comprehensive program provided education to producers on weed identification and herbicide selection for control. In addition to 2,000 farmers, consultants, and industry personnel attending six on-farm demonstration field days, over 6,400 people visited the “2004 Suggested Weed Control Guidelines” web site for weed control guidance. The diverse weed spectrum in Louisiana makes proper weed management imperative to farmers for profitability in row crop production.

- Producer surveys in rice, cotton, soybeans, sugarcane, forestry and other agricultural commodities, conducted on a four-year rotation, consistently have shown the average adoption rate of BMPs in these Louisiana staple agricultural commodities to be around 70%.

Goal 2 – Extension Program Summaries

- A total of 74 participants from seafood processing plants received training in HACCP (Hazardous Analysis of Critical Control Points) and SCP (Sanitation Control Procedures). As a result, seafood processors learned the requirements of HACCP regulations and food safety management principles. Twenty-five Walmart distribution center employees from Louisiana and other states were also HACCP certified. Participants learned the HACCP record-keeping system, as well as preparation of HACCP plans. Round table sessions, held quarterly, with poultry and red meat processors, USDA FSIS regulatory officials, and academia helped participants to understand and thus better comply with HACCP regulations.
- People who are at-risk from a food safety standpoint include the very young, the elderly, and those with a compromised immune system. Many of these at-risk citizens live in the Lower Mississippi Delta (LMD). Many of these individuals depend on reclaimed or rescued food, either from soup kitchens or shelters. In conjunction with three other universities in the region, a train-the-trainer curriculum, “Serving Food Safely,” was developed by extension faculty. The curriculum includes 10 lessons, complete with lesson plans, fact sheets, and presentations. Approximately 500 food recovery agency personnel and volunteers have completed the 10-lesson course.
- Targeted at-risk consumers and health care providers were provided with Oyster Food Safety education information, including presentations at meetings and printed materials, focused on reducing *Vibrio vulnificus* illnesses state-wide. In addition to food safety workshops conducted across the state, education meetings were held by extension faculty with the Louisiana Restaurant Association and Louisiana Pharmacy Association. Louisiana supplies about one-third of the nation’s oysters, and Louisianans consume more oysters than any other state, with a large percentage eaten raw. The program participants were made aware of the dangers of *Vibrio vulnificus* to at-risk consumers, and the measures to follow for food safety.

Goal 3 – Extension Program Summaries

- In the Family Nutrition Program (FNP), extension faculty in 44 parishes and the Expanded Food and Nutrition Education Program (EFNEP) paraprofessional educators reached 185, 597 people with information on nutrition, diet & health, and food buying, with 97,752 direct contacts and 117,269 indirect contacts. After participating in the program, the majority of attendees indicated that they learned about several nutritional concepts. Over 75% of those surveyed said that they had learned to read food labels to make healthy food choices, and about 80% learned to choose a diet abundant in fruits and vegetables. Seventy-three percent said that they would start an exercise program. In accordance with the FNP youth program, extension faculty hosted a state-wide Childhood Obesity Seminar via distance education. Extension faculty throughout the state attended the training at 15 sites. At a later event, the 4-H Food & Fitness Fair, a total of 80 4-H members attended, with close to 30% of the youth coming from schools with FNP programs.
- The Portions Healthy Weight Program, a nine-lesson curriculum emphasizing healthy lifestyles, was developed to address Louisiana's acute obesity problem. With one in three Louisiana adults and almost one in three school children considered obese, the seriousness of this problem prompted the formation of a team of extension faculty, who conducted Portions educational workshops in 12 Louisiana parishes. Since the program's inception, the workshops have been held in 25 parishes, with approximately 900 people attending. Participants have reported that the program helped them to break habits that led to overeating and not being physically active.
- The LSU AgCenter is spearheading a public-private partnership initiative to create Louisiana House – Home and Landscape Resource Center (LaHouse). With project planning and partnership development initiated in 2000, in FY 2004 grant funding was secured, new partnerships were initiated, technical details were refined, and construction began. Educational activities to promote LaHouse over the past year have included presentations to consumers, home builders, health professionals, and college students, plus use of internet, mass media and printed publications. Future impact on stakeholder practices will include such areas as energy and resource conservation, environmental protection, disaster mitigation, family economic stability, and improved environmental health (asthma, allergies, etc.).

Goal 4 – Extension Program Summaries

- The extension education program Regeneration Alternatives was developed in conjunction with Best Management Practices (BMPs) in the growing and harvesting of timber. Regeneration Alternatives documents the financial contributions of forestry to the state, and as such is included in the BMPs curriculum for the Master Logger program. One hundred eight professional loggers, contractors, and natural resources professionals received educational credit for attending a workshop on BMPs.

- In five workshops held throughout the state, 226 participants attended presentations and received educational material on such topics as timber taxation, prescribed fire use, and forestry best management practices. Conducted by extension faculty with the Continuing Education in Natural Resources (CENR) program, the workshops were evaluated through use of an on-site survey. The survey was completed by 217 of the 226 attendees, with almost 70% of respondents stating that their knowledge was enhanced, and 74% indicating that previous knowledge was reinforced.
- With the Formosan subterranean termite continuing to be a serious pest problem in Louisiana, selected properties in New Orleans have been treated for this insect as a pilot test and an education program. Initially, meetings conducted by extension specialists were held for property owners describing the educational program, with additional meetings conducted for pest management professionals. The area treated has gradually widened, with 52 blocks, located in the French Quarter, now in the program. Property owners are adopting the technology, with numbers of termites reduced by 50% as compared with non-treated areas, saving money for stakeholders through a decrease in repairs and amount of insecticide required for treatment.
- The Louisiana Forest Products Development Center (LFPDC) worked to increase awareness and adoption of extension forest products programs to promote economic activity in the state. Extension faculty directing the program made 20 presentations to forest-sector development groups, including regional economic development meetings, association meetings, and legislator sessions. The key theme of the education program was opportunity for industry development and value-added manufacturing.
- Approximately 1,500 farmers, representing 1.5 million acres of land, are currently enrolled in the LSU AgCenter Master Farmer program. The educational program consists of three required phases: eight hours of environmental lecture, tour of a “model farm,” and development and implementation of a comprehensive farm conservation plan. The development of the program stemmed from serious concern that Louisiana agriculture’s pollution contribution was leading to increased water quality problems. The Master Farmer program has become widely recognized throughout the South, with initiation of a similar program in Texas, Arkansas, and Mississippi. Beginning this year, the Natural Resource Conservation Service has stated that it will award Master Farmer graduates who are applying for cost share an additional two points in their ranking system.
- Master Tree Farmer was a seven-week short course education program broadcast via satellite across the Southeastern U.S., with the program originating from Clemson University. Extension state faculty and their counterparts from across the South collaborated on curriculum development. The program curriculum included wildlife management, environmental impact minimization, record-keeping, and both basic and advanced information on forest management. Evaluations received from the 80

Louisiana participants indicated that they expected to save approximately \$20,600, and earn an additional \$30,657, as a result of attending the program.

- 4-H Wildwoods Wandering Camp was developed to expose 4-H teens to characteristics of bottomland hardwood forested wetland ecosystems and the subsequent challenges related to their management within an agriculture-based economy. It was attended by 46 4-H teens, two science teachers, two adult volunteers, and two 4-H extension faculty. Educational sessions included classroom work and hands-on activities. The most popular activities were map and compass skills, and night maneuvers in the wildlife refuge.
- In meetings with poultry stakeholders, problems with broiler litter management, EPA regulations, and general management practices were identified. Additionally, in light of acts of terrorism toward the U.S. and the outbreaks of Exotic Newcastle Disease and Avian Influenza in this country, the need for poultry farm bio-security was identified by extension faculty and stakeholders. These management problems were addressed through on-farm demonstrations, producer meetings, and farm visits. These are continuing problems, which need frequent educational up-dates by extension faculty. The terrorism threat gives particular cause for the critical need for stakeholder education in this area.
- Extension faculty worked as a team to plan and implement state-wide educational forums for forest landowners, with the curriculum including forest management, governmental policy, tax regulation, and environmental requirement information. Forum subject-matter was identified through close contact and use of a stakeholder advisory committee, composed of private landowners, Louisiana Forestry Association, Louisiana Department of Agriculture and Forestry, and other conservation groups. Program participants, who were surveyed on-site, indicated a per-person dollar value of the educational forum at approximately \$2,800.
- Agricultural burning as a management practice has been approached as a two-prong policy: (1) to allow the use of fire as an accepted management practice consistent with good science, to maintain agricultural production on agricultural land, and (2) to protect public health by mitigating the effects of air pollution emissions on air quality and visibility. Extension faculty collaborated with other agencies and organizations to develop a training curriculum entitled “Louisiana Smoke Management Guidelines for Sugarcane Harvesting.” About 2,000 producers attended the 2004 field day, which was a follow-up to the certification program begun in 2000. A total of 1,422 sugarcane farmers have attended the certification program since its inception.
- A state-wide educational program was designed to reach the target audience of all forest landowners—regardless of race, gender, or age—who previously have been under-represented or under-served in extension forest management programs. Particular emphasis was made on the inclusion of African Americans women and men and Caucasian women. These groups represent significant landholdings; thus providing

education in forest management led to increased income as well as sustainable economic development for Louisiana. Problem areas identified by surveying participants included legal aspects of forestland, basic management information, and timber marketing. About 80% of the participants said that the program would help them make more money, and a majority said that they would use professional forestry assistance in the future.

- Due to the critical need to promote environmental stewardship in Louisiana, several extension faculty have served as watershed educators, each of whom conducts a comprehensive and focused educational approach that targets specific priority areas and groups within a specific watershed. Over 250 stream segments and many of the state's lakes do not meet certain quality standards. As a result, Louisiana is establishing Total Maximum Daily Loads (TMDLs) that will set a maximum amount of pollutant a stream can carry and still meet the water quality standards. Thus, the primary charge of the watershed educators is to deliver educational programs on non-point water quality issues. Another huge issue that will warrant increased water quality attention is the deteriorating situation of Louisiana's coastline. Watershed extension educators worked closely with the Master Farmer and Master Cattle Producer programs, providing classroom environmental training to over 1500 farmers.
- Two endangered species workshops were presented to 120 loggers in conjunction with Best Management Practices required by the Sustainable Forestry Initiative. Additional wildlife management programs included a Louisiana black bear habitat seminar and a symposium dealing with the habitat needs of the Eastern wild turkey. Eight education programs were conducted for 241 people on control and management implications of rodents nuisance wildlife. 4-H wildlife programming included the Outdoor Skills Shooting Sports Program and forestry 4-H youth activities associated with the Future Farmers of America Career Development Program, involving a total of about 5,000 youth.
- More than 7,000 people received wood products educational information by several means of program delivery, including workshop presentations, quarterly newsletter, on-site visits, e-mail, and telephone. About 120,000 people visited the extension natural resources website. Educational programs and materials are provided to a wide range of audiences, including producers and marketers of wood products, homeowners regarding wood-related issues, and wood craft hobbyists.

Goal 5 – Extension Program Summaries

- Producer meetings and workshops were held throughout the state on various farm and financial management issues. Fifteen meetings were held, with about 450 farmers attending. Over 150 enterprise budgets were developed for the major agricultural commodities in the state. These budgets are some of the most widely requested and utilized publications in the area of farm financial management. The budgets are made available through parish extension offices as well as the LSU AgCenter web page.

Additionally, about 25 farmers were provided one-on-one assistance in developing individual farm plans.

- After the Louisiana Department of Social Services determined the need for public awareness of the need for quality child care, extension faculty responded by developing a multi-media public awareness campaign called Be Child Care Aware. It included weekly news articles, weekly radio public service announcements, brochures, displays, and an information internet site. The child care awareness material has been used by 68 local newspapers and 63 radio stations.
- Extension faculty designed the Louisiana Child Care Provider Training program for child care providers in center-based and family-based settings, to assist them in obtaining required hours of continuing education. Based on stakeholder input, extension faculty conducted 375 training sessions and awarded 8,950 three-hour child care training certificates. Results from an external program performance audit revealed that 98% of respondents said that the training was relevant and they were satisfied with the program. The educational sessions were conducted in 45 of Louisiana's 64 parishes.
- Extension faculty developed three state-wide programs which are currently addressing parenting education skills for at-risk audiences. The Parents on Probation or Parole program delivered information on skills in parenting and financial management to 427 prisoners and parents on parole. Four-hour workshops, entitled Children in the Middle, were developed to help parents avoid putting their children in the middle of conflict. Extension faculty collaborated with the Louisiana Department of Social Services to develop the Parents Preparing for Success program, teaching parenting skills to work-eligible families. The five-lesson, 15-hour program reached 2,500 parents with children under the age of 12.
- The character education program provided educational materials, guest speakers, and train-the-trainer sessions for 4-H clubs, schools, workplaces, sports programs, prison & probation programs, and governmental agencies. Each of Louisiana's 64 parishes has an extension faculty member who is the character education coordinator. Public school districts, as well as some private and parochial schools, used the 4-H character education materials. Adults and youth were trained by extension faculty to teach the character education curriculum. Through the school initiative, more than 2,200 students and 3,450 adults received training preparing them to teach; they, in turn, taught 230,000 students in school settings and 12,300 in settings outside of school.
- As a part of the Collaboration for After-School Education program, extension faculty provided after-school assistance either through training of paid after-school staff or direct educational delivery to 1,843 youth in grades K-12. The school enrichment initiative was developed as the result of extension parish focus forum stakeholder groups identifying the need for safe and educational programs for youth during the after-school hours. The program is a collaborative effort between the LSU AgCenter and Southern University.

Surveys conducted with trained after-school staff indicated that youth are demonstrating increased knowledge of the material presented, including food safety, health, nutrition, and etiquette. Additionally, 70% reported positive change in youth attitudes since inception of the after-school program.

- Results of programs in economic development included (1) Louisiana residents increased their understanding of economic development alternatives and implementing community development plans, and initiated local capacity-building and development of their communities; (2) community leaders and volunteers developed leadership skills, resulting in community projects, such as a retirement center and a community playground; (3) entrepreneurship workshops promoted business efforts, with participants learning time management and how to write a business plan. (4) tourism continued to be a strategy for rural areas, with about 2,000 people in 12 parishes taught the importance of infrastructure in attracting tourism, retirees, and new business; (5) with many rural employers having difficulty finding qualified employees, extension faculty held workforce preparation workshops, resulting in about 1,400 adult & youth participants learning such skills as workplace ethics and communications.
- Free Enterprise is now a required course for high school graduation, with extension collaborating with several other agencies instrumental in the legislative mandate to require the course. To equip Free Enterprise teachers with the knowledge to teach the material, extension faculty conducted 18 six-hour training sessions that reached 207 high school teachers. The Free Enterprise teachers received instruction in money management, spending and credit, and saving and investing. Additionally, over 20,000 individuals and families were influenced by face-to-face extension programs on budgeting, identity theft, and other aspects of financial management. Ninety-eight percent of participants said that they would make a plan on when and how to use credit.
- Forest taxation workshops, held on a state-wide basis, focused on the major tax laws that affect private forest landowners. The program provided to about 155 forest landowners, land management professionals, and certified public accountants knowledge of recent tax law changes, changes in tax forms, and benefits of using tax laws to reduce tax payment on forest lands. Two nationally known forest taxation professionals conducted the workshops, and participants surveyed indicated that the value of the workshop was \$2,694 per person. A considerable majority said that the workshop met or exceeded their expectations.
- Several extension faculty across the state reported that up to 75% of telephone calls in the growing season are related to home horticulture questions and problems. To help more effectively disseminate this educational information, an LSU AgCenter lawn and garden web site was developed and up-dated regularly. Another extremely valuable means of educating the public are graduates of the Louisiana Master Gardener (LMG) program. The program trained 407 new volunteers and retained 802 senior members. These

volunteers donated 38,304 hours of service to their parish home horticulture program, valued at \$658,446.

- The Louisiana Arborist Continuing Education Program is an on-going educational initiative that meets state licensing requirements for professional tree care workers in the state. This extension program, conducted in collaboration with the LSU Department of Horticulture and the licensing agency, the Louisiana Department of Agriculture and Forestry, included six workshops, with 651 participants. Local and nationally-known speakers covered topics related to on-the-job safety and professionalism.
- More than 2,100 youth were enrolled in 4-H leadership projects, which focused on improving leadership skills, developing their ability to facilitate group decision-making processes, and learning to feel more confidence in their leadership roles. Leadership training also equipped 7,658 adult volunteers with the leadership tools to work successfully with 4-H youth in cooperation with extension faculty. Community service projects are closely interwoven with youth leadership, as evidenced by the Mend a Heart With 4-H project. Louisiana 4-H members collected and delivered to hospitals 2,000 teddy bears for children who are victims of tragedies such as automobile accidents and house fires.
- A 16-member state-wide youth workforce preparation team was developed to guide the educational effort directed at youth work readiness skills. The group coordinated the distribution of teaching resources used to guide youth in developing positive behaviors such as punctuality, regular attendance, honesty, dependability, neat appearance, and follow-through on task completion. Extension faculty across the state delivered workforce preparation programs, workshops, and clinics to over 20,000 youth.

GOAL 1

LSU AgCenter Goal 1 is to achieve an agricultural production system that is highly competitive in a global economy.

Goal 1 - Research Project Summaries

- Domestic agricultural policies and multinational and regional trade agreements continue to have a significant impact on the competitiveness of U.S. agriculture. The goal of this project is to determine the economic consequences of trade impacts stemming from changes in domestic agricultural and economic policies and continued reforms in trade treaties, as well as to assess alternative strategies to improve the competitiveness of Louisiana agriculture. The expected benefits from the outcome of this research will accrue to farmers, agribusinesses, and government policy/decision makers through improved understanding of trade agreements and economic policy impacts on Louisiana agriculture. An important component of this project and end goal of this work is to provide to all of Louisiana agriculture road maps of policy options and consequences.
- With catfish farmers struggling with continuing low prices, automation that simultaneously reduces labor costs, improves environmental impact, and increases production can be the difference between success and failure. One research project of promise has been the design, development and initial testing of an autonomous boat, solar powered, battery operated, controlled by a micro-controller, actuated by a motion-sensing device to drive predatory birds from aquaculture ponds in an environmentally-friendly and non-fatal way. Initial tests indicated some success, and further development is ongoing.
- Dermo disease caused by a protozoan parasite results in extensive mortality of eastern oysters and has prevented development of intensive aquaculture of this species along the Gulf Coast. This research identified defense proteins which can be used as selection markers for breeding disease resistance to the primary parasite in eastern oysters. Alternatively, these oyster host defenses can provide endogenous genes for developing disease-resistant oysters by increasing their expression through genetic manipulation.
- There is considerable interest among Gulf Coast beef cattle producers in short-duration, rotational, or management-intensive grazing systems as a way of managing their abundant forage resources and improving cow-calf production efficiency. A study was conducted to evaluate the effects of pasture stocking rate (low, medium, or high) and method (continuous or rotational) on cow-calf production. Stocking rate had a larger impact on cow-calf production than stocking method, and additional inputs associated with rotational grazing do not appear to be warranted.
- Calf weaning weight is greatly influenced by genetic potential for growth, therefore verification of reliability of sire weaning weight expected progeny differences (EPDs) when mated to crossbred cows needed to be studied. The mating of cows to bulls that differed by 20 pounds for weaning weight EPDs resulted in actual calf weaning weight difference of 28 pounds, indicating that EPDs are fairly reliable. Use of sires with high weaning weight EPDs did not result in increased calving difficulty and did not adversely affect subsequent pregnancy rates.

- Arthropod pests are responsible for a 4 - 6% loss in U.S. cotton value annually, with these losses occurring in spite of management strategies that range from \$50 to \$60 per acre. In this research, the efficacy and value of spatially variable insecticide (SVI) applications were compared to whole-field broadcast treatments against cotton arthropod pests. SVI technology reduced input costs for arthropod pest management, but did not significantly impact yield. The reduction in acreage treated with insecticides supported better stewardship of the environment. These data supported the use of SVI technologies to moderate pest management costs and contributed to the integration of precision agricultural technologies into current Integrated Pest Management (IPM) strategies.
- Cotton diseases are a yearly production problem, with diseases annually reducing cotton yield and quality by 12 - 35 % from 1994 to 2004. Field tests were conducted to evaluate fungicides for managing seedling disease. Cotton producers can reduce input costs based on results from this study. Research demonstrated that in-furrow fungicides are not always needed, and farmers can capitalize on existing environmental conditions to determine if additional fungicides are needed at planting. Eliminating in-furrow application can save producers up to \$25 per acre and reduce time in the field. Additionally, defining the impact of tillage systems and cover crops on seedling disease has provided farmers with information to make better informed decisions concerning fungicide use.
- Seedling disease is one of the major constraints to establishing a healthy, uniform stand of cotton, with losses across the Cotton Belt from seedling diseases estimated at 2.5%. Results of this research showed that soil temperature and moisture have an impact on seedling disease severity. As soil temperature increased, severity of seedling disease decreased. With a minimum soil temperature below 60 degrees, in-furrow fungicide increased seedling survival. No rainfall, or rainfall greater than 2 inches after planting increased the likelihood of in-furrow fungicides improving seedling survival. Completion of this research will increase the cotton farmer's knowledge of timing of in-furrow fungicide application to reduce seedling disease.
- Cotton is the third most important plant commodity in Louisiana, with a total value of about \$350 million. The future of profitable cotton production depends upon identifying new genes and gene sources for yield, fiber quality, and pest resistance. The increasing importance of precision breeding, via an improved understanding of the molecular basis of traits, offers additional routes for increasing crop productivity and quality. Several new sources of desirable genes have been identified, and their utilization should help broaden the genetic base of cotton, reducing its vulnerability due to a limited genetic base.
- Emphasis on management of replacement heifers is becoming increasingly more important as the dairy industry continues to promote rapid growth to decrease time before first calving while still maintaining optimal production levels. Producers desire the replacement heifers to fully develop their lactation potential at the preferred age with

minimal expense. In this study, eight Holstein steers were assigned to one of four dietary treatments, with feed intake, body weight, and height monitored. Research results showed that feeding diets greater than 16% crude protein with or without fish meal does not improve performance in weaned dairy calves. This information provided evidence that higher priced diets are not necessary for optimum performance in weaned dairy calves.

- Mastitis in dairy heifers is a major economic problem for dairy producers in Louisiana and across the nation. The National Mastitis Council estimates the overall loss to animal agriculture from this disease at \$2 billion (about \$180 per cow). Information on efficient methods for treatment and prevention of mastitis in heifers can dramatically improve herd health and productivity. Results from this multi-state study showed that heifer mastitis can be treated effectively with prepartum therapy and herd somatic cell counts reduced. Postpartum milk production was equivalent in both treated and control heifers.
- The Mexican rice borer (MRB) has been the major economic pest in Texas sugarcane since its establishment in 1980, causing such severe infestations that fields could not be profitably harvested. Studies show that the insect has the potential to cause far greater yield devastation in current Louisiana cultivated varieties. Research by Texas A & M and LSU AgCenter scientists (proactive, at least from the perspective of Louisiana agriculture) has identified the availability of biological resistance to MRB on sugarcane and rice. It was shown that MRB cannot be adequately controlled in sugarcane with insecticides alone, but can be better managed with insecticides in rice. For Louisiana, the anticipated problems with MRB will continue to demand a multi-discipline approach, to develop and implement management practices that will protect the host crops and also reduce pest populations.
- The Formosan subterranean termite (FST) is an invasive, wood-destroying pest species which causes billions of dollars in damage in the Southeast, especially in Louisiana. By investigating the ecology of such an exotic ecosystem as the termite gut, scientists have discovered several novel bacteria species, including bacteria which can survive only in the termite gut. Being able to isolate and culture termite specific bacteria sets the stage for using them as a “Trojan Horse” to introduce detrimental genes into termite colonies. Thus, bacteria in the future may serve as self-perpetuating, self-replicating biological agents for termite control, reducing the cost of control for Louisianans.
- The rice water weevil, the rice stink bug, and the sugarcane borer are the most economically important insect pests of rice in Louisiana. The three goals of this research are (1) to increase the effectiveness of insecticide applications by refining current economic thresholds and developing improved methods of monitoring pests; (2) to evaluate alternative insecticides for weevils and (3) the diversification of insect management programs via the integration of cultural practices and host plant resistance into the program. Yield losses from the rice water weevil alone regularly exceed 10% in small-plot tests. Economic losses from a 10% yield loss (if no effective management

practices for insect controls were in place) would exceed \$20 million (assuming 500,000 acres of rice in the state, 6,000 lb. per acre yield, and a price of \$8.00/cwt).

- Most of the large greenhouse tomato producers in the U.S. replace the root media once a year to avoid serious crop losses. Smaller producers cannot afford this expense, but tainted perlite, the most widely used growing media, can impair the root system and lead to a weak and less productive plant. Researchers developed a cost-effective and labor-friendly technique to recycle perlite at a fraction of the cost to replace the growing media each year. Tomato plants raised in the recycled perlite produced comparable yields to those raised in new perlite, and the process can be repeated as needed. Cleaning and disinfecting old perlite using the researcher-developed process can save the small producer considerable expense, helping the grower to survive in a competitive market.
- Several experiments were completed assessing management options for potentially useful cool-season perennial forage plants. Texas bluegrass was identified as a highly persistent cool-season perennial grass on well-drained Coastal Plain upland sites. An adapted sod-forming cool-season perennial grass such as Texas Bluegrass provides potential as an economic source of permanent pasture to enhance profit potential of farm enterprises based on grazing livestock. It also provides an option for erosion control and permanent winter food plots for wildlife.
- Cattle production systems in the Southeast use warm-season perennial grasses as the primary forage source through six-to-seven months of the year, with stored hay as the primary feed in the winter. Hay is a relatively high direct cost to the cattle producer. Climatic conditions in the winter months can be conducive to forage production from cool-season species. Studies were conducted to evaluate several species, including tall fescues, arrowleaf clover, and white clover. Results showed that tall fescue has the potential for acceptable animal performance, but indicate that some special care in management would be necessary to establish and maintain a vigorous stand. Improving dependability of clover production offers potential for its use. The study results generated from work with white clover provided information to assist plant breeders in selecting appropriate material to use in breeding programs.
- Sheath blight disease in rice is a major constraint to high yields and grain quality in Louisiana. All commercial cultivars are susceptible to sheath blight, with no known genetic sources that provide complete resistance to the disease. However, there are various lines that produce partial resistance which the researcher is using in an active crossing program. Scientists have conducted extensive crossing efforts using multiple sources of sheath blight resistance, producing numerous germplasm lines for use by the AgCenter breeding program. Researchers have cooperated in the evaluation and public release of a population of doubled haploids for sheath blight tolerance that will benefit overall rice research in the development of new, disease-resistant varieties.

- Poor seedling vigor (slow emergence, low plant population, and short seedling height) in semi-dwarf varieties is a management problem in rice production. Improving seedling vigor reduces seed costs and water use and management, and in situations where plant population is decreased can increase yield. Research scientists found that seed and foliar treatments with gibberellic acid improved seedling vigor in commercial rice varieties and several experimental lines. This improved seedling vigor translates into increase in production.
- Recent advancements in molecular marker technology provide a tremendous opportunity to accelerate genetic improvement in a number of traits that are important to the rice industry. Molecular markers allow direct identification of the genes, and thus can be used to increase selection gain. Ongoing research is focused on development of a simple, cost-effective, and relatively high throughput marker detection system for routine use, which will allow successful and widespread adoption of marker technology in various rice breeding programs.
- Rice farmers are faced with significant yield reductions every year due to rice diseases, which can cause reductions in yield as high as 80%. Producers rely on fungicides and bactericides to control diseases. Currently, a new class of fungicides is being evaluated that are environmentally safer and more effective than current fungicides. Since timing and rate are very important for these fungicides, studies are being conducted to define the best spray program for individual varieties/disease situations. These fungicides have the advantage of controlling both sheath blight and blast, which helps to reduce some of the guesswork in choosing a fungicide, and increases farm income.
- Ninety percent of the rice acreage in the state has been planted with LSU AgCenter developed varieties. These varieties combine high yield, premium quality, disease resistance, good agronomic characteristics, and enhanced seedling vigor, helping to raise Louisiana's rice yield by 15% in the last five years. Research has been conducted on an on-going basis to develop superior long-grain varieties by improving major agronomic traits of current varieties, which include disease resistance, yield components, and grain quality. Harnessing biotechnology and conventional approaches should expedite the development of high yielding varieties.
- Although the advancement of rice production technology has played an important role in recent yield increases, the majority of these yield increases can be attributed to varieties developed by AgCenter researchers, such as Bengal. Variety research is an ongoing effort, with rice farmers facing challenges such as low prices, conservation issues, and increased regulation of pesticide use. Improved medium-grain varieties with high yield potential and pest resistance can help rice growers to increase production while reducing cost of production and meeting conservation requirements.
- Soybeans have thin seed coats and high oil content, making them particularly susceptible to deterioration by late-season rainfall after crops reach maturity. Louisiana lost an

estimated \$40 million due to weathering in 2002. Results of this study showed that soybean germplasm with superior weathering-resistance bred in the LSU AgCenter produced higher yields than all but one conventional commercial variety in the Maturity Group V. Superior conventional and glyphosate-resistant commercial varieties were identified for production. Data were used to recommend superior varieties to producers. If recommended varieties were produced on 40% of the soybean acreage in the state and resulted in a 5-bushel increase, there would be a gain of about \$12 million in gross profit (@ \$6 per bushel).

- Most of Louisiana's sugar mills require more steam than can be provided from the available fuel and thus burn natural gas as an auxiliary fuel. Data were gathered on the operating conditions of multiple effect evaporators at several sugar mills throughout the operating cycle. The data is currently being analyzed to determine the factors that affect the heat transfer coefficient. Better data on evaporator performance and factors affecting the heat transfer coefficient will allow for more cost effective evaporator designs and energy savings. Natural gas usage typically costs the Louisiana sugar industry about \$6 million per year. Most of this gas usage can be eliminated by appropriate evaporator designs.
- Sugar is a major component of Louisiana agriculture, with the direct value of the crop, not including value-added, in excess of \$640 million. This research concentrated on defining problems of microbial origin that affect the production of raw cane sugar, and then developing practical solutions. Laboratory developments were on new, cheaper methods for dextran monitoring and biosafety through use of a new biocide. A trial of the biocide was conducted for controlling slime in a cooling tower in a commercial sugar mill. Control of microbial losses can improve operating costs. The primary source of dextran is stale cane, and the ability to rapidly detect stale cane as it reaches the sugar mill would be of great economic value.
- Cleaning evaporators and the downtime associated with the process reduces sugar mill capacity and thus is costly to the industry. Valuable research information was obtained at a local commercial mill, in assessing the performance of individual evaporator vessels. This data enabled a reduction in cleaning frequency, saving chemical cleaning costs and downtime expenses. The data were also used to evaluate the effect of the modified liquid feed arrangements on each vessel. The data generated will be applied to other evaporator arrangements in South Louisiana sugar mills.
- Improving the efficiency of sugar mills involves reducing the losses of sugar which occur in processing. The accurate survey by the LSU AgCenter of molasses produced in the state has continued. The survey provides information to the processors on the degree to which molasses has been exhausted, and shows what room for improvement exists. Efforts to improve factory efficiencies through the use of more instrumentation culminated in an all-day producer symposium conducted by AgCenter faculty. The loss of sugar in nearly all Louisiana mills has been reduced over the last four years as

processors have gained understanding of the molasses survey's ability to represent true losses of sugar.

- Crystallization is a major unit operation in sugar processing and improvements translate to significant benefits for processors. Due to a move to another facility, crystallization work by AgCenter scientists was put on hold for most of the year. The larger of the two pilot plant vacuum pan crystallizers was re-connected, and the automatic control system re-installed. The opportunity was taken to improve the installation with some new control elements. Experience gained on the pilot plant system was used in the design of some automatic control schemes in some Louisiana sugar mills.
- The direct production of white sugar at Louisiana mills can lead to significant added-value in producing a product that attracts a higher price than raw sugar. The results of this study—product characteristics and product schemes—will show the value to the industry or individual mills of direct production of direct consumption sugars. The production of edible sugars directly in sugar mills is an opportunity to diversify mill production with high value-added products. For a mill producing a million tons of cane per year, potential benefit is considered to be 3 cents/pound, or \$6 million/year.
- With 88% of Louisiana's sugarcane acreage devoted to a single variety, problems associated with a monoculture are a grave concern—problems such as vulnerability to disease and insects. Although resistant when first released, the dominant variety in the state began showing increasing signs of susceptibility to sugarcane rust disease. The most recent variety released by the LSU AgCenter is resistant to sugarcane rust disease, thus giving growers a variety alternative in areas where the disease is prevalent. The latest variety also features early maturity and high sucrose content, giving farmers an early season choice for harvest.
- The development of improved sugarcane varieties has been a major factor in sustaining a competitive sugarcane industry in Louisiana. With stagnant sugar prices, new sugarcane varieties have offered higher yields, reduced production costs through insect and disease resistance, and improved stubble longevity. Successful variety development programs require the cooperation of several disciplines, including agronomy, plant pathology, entomology, and genetics. With this team in place over the past 25 years, the LSU AgCenter has had a positive impact on keeping Louisiana in the sugar business. With its latest variety grown on about 88% of the state's acreage, the estimated economic impact is \$250 million.
- The development of biobased products provides the opportunity for value-added income from sugarcane. This study focused on producing bagasse-based, non-woven composites for auto interior applications. A lightweight, bagasse-based composite was developed in cooperation with the Louisiana Department of Economic Development. The research accomplishments impact the sugar industry, the auto industry, and advanced material manufacture that is categorized in the state strategies for economic development.

- Understanding markets is critical to the viability of the secondary forest products industry. This study was a comparison of the Louisiana Forest Stewardship Program (LFSP) and the National Forest Certification Programs. The research compared the LFSP with guidelines of four sustainable forest management/certification approaches: management plans, certification, home builder attitudes about treated wood, and eBusiness use in the forest products industry. Results of this study will aid the forest sector companies and other stakeholders to make strategic and tactical decisions in these important areas/issues regarding marketing of secondary forest products.
- Experiments were conducted to investigate strip thickness and strip numbers effects on flexural properties and shear stress of wood composite poles. Investigations have also been carried out to find glue-line effects on the stress and deflection analyses of composite poles. This research will help reduce the demand for pole-sized timber and decrease the amount of preservative-treated wood waste in landfills. There is also potential for applying this technology to wood products producers for value-added production of composite poles and other engineered wood products.
- Rice compares unfavorably with corn and soybeans regarding value-added ingredients. Rice production in the state has suffered from low prices the last few years, and rice farmers and the overall economy in Southwest Louisiana would greatly benefit from any value-added to their commodity. The purpose of this research was to develop value-added rice starch ingredients. The information from the study could be utilized to produce value-added food ingredients from rice starch and flour. There could also be an increase in the value and use of broken rice kernels, which make up about 15% of milled rice in the U.S., through their use in production of starched-based food ingredients.
- New, environmentally friendly wood preservatives are needed by the wood products industry. Research was conducted to examine the effects of powder zinc borate (ZB) and calcium borate (CB) on resin gel time, strength, swelling, leaching, termites, decay, and mold-resistance properties of oriented strandboard (OSB). The information on various properties of borate-modified OSB is of significant value for developing durable structural panels from southern wood species. This research provided information to give OSB manufacturers, which are not included in the license agreements for using zinc borate, to manufacture chemically modified OSB using calcium borate.
- New forest products are needed to improve Louisiana's economy. In this research, a laminated model based on continuum theory combined with finite-element analysis (FEA) was used to predict the influence of voids on engineering constants of oriented strandboard (OSB). Wood composite properties are critical in the search for value-added uses of the state's forest land. This study provided important information on how flake property and its orientation distribution affect the panel engineering and durability performance for oriented strandboard.

- Foresters have to make management decisions on forest stands, some of which are site preparation, fertilization, control of undesirable species, and harvest age. These decisions are based on information from growth and yield models. Inaccurate models can thus lead to poor management decisions that might result in substantial losses to forest landowners and timber companies. The purpose of this ongoing study is to produce superior growth and yield models that should help forest managers to identify and select management strategies to optimize economic returns. Preliminary research involved attempts to link an individual tree model with a diameter distribution model.
- Application of selective herbicide within managed pine forests generally improved vegetative characteristics for northern bobwhite quail. This improvement came through reduction in woody vegetation, reduction in height of vegetation, and overall increase in abundance of quail food plants. Further research indicated that the greatest net improvement to habitat following herbicide application occurred after a renovating prescribed fire during the second growing season following application. Results of this study provided land managers the opportunity to utilize both prescribed fire and herbicides to benefit both the plantation pines and quail habitat.
- Understanding molecular genetics is critical to understanding tree breeding. This research project developed genetic markers for use in genetic analyses. The project developed populations of longleaf pine, slash pine, their hybrids, and eastern cottonwood. A cottonwood clones bank, representing elite clones from throughout the Southeast, was established at the LSU AgCenter and will be used for future cottonwood breeding programs. This study will enable tree breeders to select for important traits at an earlier age and will help to diversify the species currently grown in Louisiana.

Goal 1 - Research Project Reports

Federal Goal 1

Title of Research Project: Impacts of Domestic and International Policy Reform

Key Theme: (Agricultural Competitiveness) Domestic Policy and International Trade

P. Lynn Kennedy, Professor, Department of Agricultural Economics and Agribusiness, LSU AgCenter

Issue: The international environment in which the U.S. agricultural industry competes has changed dramatically and continues to change as multinational trade agreements (the World Trade Organization) and regional trade agreements (the North American Free Trade Agreement, the Free Trade Area of the Americas, and others) continue to change through ongoing discussions and negotiations. At the same time, domestic agricultural policies continue to have a significant impact on the competitiveness of U.S. agriculture. Given this, the goal of this project is to determine the economic consequences of trade impacts stemming from changes in domestic agricultural and economic policies and to assess alternative strategies to improve the competitiveness of Louisiana agriculture. In addition, this project seeks to determine the economic impacts of continued reforms in trade treaties and agreements and to assess alternative strategies to improve the competitiveness of Louisiana agriculture.

What was done: Several sub-goals designed to achieve the objectives of this project were accomplished during this time period. These include the following:

- Initial research analyzing the impact of increasing the U.S. sugar import quota was completed and is currently being disseminated. Results provide information to help producers and policy-makers to determine the impacts of various domestic and trade policy options. Further research is being conducted with investigators from the University of Florida and Texas A&M University to analyze potential policy options given increased market access.
- A bulletin entitled “International Trade Agreements: Implications for U.S. Sugar,” (CNAS Issue Brief IB2004-01, Center for North American Studies, College Station, Texas, December 2004) by P. Lynn Kennedy and E. D. Roule was completed and is currently online at www.cnas.tamu.edu. This bulletin discusses various multilateral and regional trade agreements and their implications for sugar trade and U.S. domestic sugar policy.

Presentations were made concerning the implications of new trade agreements for the U.S. sugar industry. These include:

- “New Trade Agreements: Implications for U.S. Sugar,” National Public Policy Education Conference, St. Louis, MO, September 2004.
- “Potential Impacts on Sugar from New Trade Agreements,” American Association of Agricultural Economics Annual Meetings, Denver, Colorado, August 2004.

Research is being conducted in conjunction with Texas A&M University, Texas Tech University, and New Mexico State University under the auspices of the Center for North American Studies to analyze commodity specific competitiveness among countries in the North American Free Trade Agreement. Results provide information to help policy-makers, producers, and researchers determine the feasibility and impacts of various policy options.

Research analyzing catfish, crawfish, and shrimp imports was conducted to determine their impact on domestic prices. This research was conducted in cooperation with the USDA Economic Research Service. Results provide information to help producers and policy-makers to identify policies to enhance the competitiveness of the U.S. aquaculture industry.

Impact: The expected benefits from the outcomes of this research project will accrue to stakeholders, peers, agribusinesses, policy/decision makers, and government through improved understanding of trade agreements and economic policy impacts on Louisiana agriculture. This project will provide information on the expected impacts of freer trade and alternative domestic policy regimes on Louisiana agriculture. Assessment of strategies will enhance the performance of Louisiana producers and entities in assessing opportunities for developing competitive advantages as well as developing strategies for improving the competitive advantage for Louisiana agricultural commodities and products. An important component of this project and end goal of this work is to provide road maps of policy options and consequences.

Sources of funding: State, Hatch, Multi-State

Federal Goal 1

Title of Research Project: Instrumentation and Control Engineering to Improve Productivity and Environmental Sustainability of Aquacultural and Aquatic Biosystems

Key Theme: Goal 1: Aquaculture; Goal 4: Water Quality, Wetlands Restoration

Steven Hall, Assistant Professor, Biological and Agricultural Engineering, LSU AgCenter

Issue: The use of instrumentation and control engineering in aquatic ecosystems can assist in improving productivity in aquaculture systems. Other applications include use of engineered reefs for reduction of coastal erosion, environmentally friendly methods to reduce pest pressures in aquaculture, and more effective ways to improve water quality.

What was done: During 2004, continued development of autonomous boats and automated fixed systems was pursued. Automation of geothermal heat was used to study and encourage early season spawning of channel catfish *Ictalurus punctatus*. Autonomous vehicles were used to reduce predatory birds on catfish ponds. Tests of autonomous small scale airplanes were conducted for pest reduction and assessment via low altitude photography. Artificial reef technology was developed, wavetank testing was done and conclusions are presented in publications including the thesis of M. Campbell at <http://etd.lsu.edu/docs/available/etd-11052004-152838>.

Impact: Catfish farmers are struggling with continuing low prices. Automation that simultaneously reduces labor costs, improves environmental impact and increases production can be the difference between success and failure. Better understanding and improved production systems can also assist in success in this industry. Improved production of oysters and reduced or reversed coastal erosion is critical in Louisiana and other low lying coastal areas. Oyster farmers, and the many small and large scale fishermen, shrimpers and recreational fishers all benefit from improved coastal health. In addition, the millions of people living near the coast benefit by improved coastal stability.

Perhaps the most popular part of this project to date has been design, development and initial testing of **autonomous boats**, solar powered (15-75W, 12 V panels), battery operated (rechargeable Pb-acid or NiCd) boats driven by independent dual paddlewheels, and controlled by microcontrollers (including Parallax BS-2, BS-2E; Lego MotorMind; and portable computer control), and actuated by flexible shore feelers, and/or by Near Infrared (NIR) or motion sensing devices to drive predatory birds from aquaculture ponds in an environmentally friendly and non-fatal way. Water cannons and other devices have been used to assist in this process. Initial tests indicate some success and further development, particularly commercial-scale applications, is ongoing. A **patent is still pending** on this device (patent submitted December 2001). Support from the LSU College of Agriculture and other funds have helped in these developments.

Using autonomous vehicles to capture data on water quality is the focus of research for two current master's students. This requires capturing GPS data, dissolved oxygen and temperature measurements at different depths, latitudes, and longitudes across time. Peer reviewed publications are in process.

Image recognition to find and deter predatory birds from feeding on ponds is the focus of one master's student. That work is ongoing.

Engineering artificial reefs for erosion control is the focus of a recent master's graduate (fall 2004), and was supported by a \$5000 student grant from Johnston Science Foundation. This work is now moving toward commercial applications to reduce coastal erosion and improve these ecosystems.

Sources of funding: USDA funds; private funds (Johnston Science Foundation), Sea Grant and Hatch funds, as well as funding from LSU and the LSU AgCenter were used in various endeavors during this period.

Federal Goal 1

Title of Research Project: Identification of host defense factors against the protozoan parasite *Perkinsus marinus* in eastern oysters (*Crassostrea virginica*)

Key Theme: Animal Health/Aquaculture

Jerome F. La Peyre, Assistant Professor, LSU Veterinary Science, LSU AgCenter

Issue: Dermo disease caused by the protozoan parasite *P. marinus* causes extensive mortality of eastern oysters and has prevented the development of intensive aquaculture of this species along the Atlantic and Gulf of Mexico coasts. Elimination of *P. marinus* from oysters and ultimately the development of disease resistant oysters would offer direct economic gain to the oyster industry as well as help restore ecologically beneficial oyster reefs.

What was done: Two lysozymes with molecular weights of 18 and 13 kDa were purified from eastern oysters. The lysozymes differed in biochemical and antibacterial properties. At least one lysozyme (18 kDa) inhibited the growth of *P. marinus* at physiologically relevant concentrations. A 7.6 kDa peptide, designated Cvs-1, with strong inhibitory activity towards subtilisin and *P. marinus* proteases, was purified from oyster plasma. Cvs-1 is a slow tight binding inhibitor of serine proteases and may represent a new family of serine protease inhibitor. Genes for these proteins are currently being isolated and their expressions under various experimental conditions will be characterized to evaluate their functions in the eastern oyster host defense against *P. marinus*.

Impact: The identified defense proteins can be used as selection markers for breeding disease resistance to *P. marinus* in eastern oysters. Alternatively, these oyster host defenses can provide endogenous genes for developing disease resistant oysters by increasing their expression through genetic manipulation.

Source of funding: National Sea Grant, Louisiana Sea Grant, NMFS, Hatch

Federal Goal 1

Title of Research Project: Effects of stocking rate and method on cow-calf production

Key Theme: Agricultural Profitability

Wayne E. Wyatt, Professor, Iberia Research Station; Jeffrey M. Gillespie, Associate Professor, Department of Agriculture Economics and Agribusiness; David C. Blouin, Professor, Department of Experimental Statistics; LSU AgCenter

Issue: There is considerable interest among Gulf Coast beef cattle producers in short-duration, rotational, or management-intensive grazing systems as a way of managing their abundant forage resources and improving cow-calf production efficiency. Most of those beef producers have a cow-calf system of production that relies heavily on pasture forages. For grazing animals, optimum liveweight growth is achieved through a balanced consumption of both forage quality and quantity. How close and how often a pasture is grazed affects both the amount and quality of the forage diet. Stated another way, the frequency and height of defoliation are affected by management in terms of 1) stocking rate (number of cow-calf pairs on a specific pasture acreage) and 2) the movement or rotation of animals among two or more pastures over time. It is important to base comparisons of continuous- and rotational-grazing schemes on these criteria: 1) on cow-calf production, 2) on a year-around basis and 3) across an array of fixed stocking rates. Also, comparisons of continuous and rotational grazing schemes should be made at identical stocking rates.

What was done: A study was initiated at the Iberia Research Station that was designed to evaluate the effects of pasture stocking rate (low, medium, and high) and method (continuous, rotational) on cow-calf production. The first phase of this long-term research project (three years) had the following grazing (stocking method-stockings rate) treatments: continuous-low (.5 cows/acre; CL), continuous-medium (.8 cows/acre; CM), continuous-high (1.1 cows/acre; CH), and rotational-high (8 paddock; 1.1 cows/acre; RH). Forage mass and quality data were obtained on a monthly basis throughout the 3-year period. Periodic weights (approximately quarterly) of cows and their suckling calves were also obtained throughout the 3 year period. Detailed production inputs (labor, supplies, equipment; etc.) and outputs (weaned calves) were recorded throughout the study.

Impact: While there are some important caveats to consider in the comparison of continuous and rotational stocking methods (compared at a high stocking rate), stocking rate had a larger impact on cow-calf production than stocking method and additional inputs associated with rotational grazing do not appear to be warranted.

Sources of funding: State

Federal Goal 1

Title of Research Project: Impact of Sire Weaning Weight EPDs on Cow Productivity

Key Theme: Agricultural Profitability, Animal Genomics

Sidney M. DeRouen, Professor, Hill Farm Research Station, LSU AgCenter

Issue: Expected progeny differences (EPDs) for growth traits are well documented and utilized by a large segment of the beef cattle industry. Calf weaning weight is greatly influenced by genetic potential for growth, therefore verification of how reliable sire weaning weight EPDs are when mated to crossbred cows needs to be studied.

It is conceivable that calves with above average weaning growth may actually stress their dams to the point where subsequent reproduction or rebreeding performance could be impacted. Therefore, information needs to be developed on the possible influence high-growth calves, as mediated through sire selection, have on reproductive performance of beef cows, particularly in the stressful environments of the southern United States including Louisiana.

What was done: Researchers at the University of Kentucky likewise addressed this issue as part of a multi-state regional project. Maternal and reproductive performances were evaluated over 5 years involving crossbred cows at the Hill Farm Research Station. Cows were mated by artificial insemination to Simmental sires that varied by 20.4 lbs in weaning weight EPDs. Four moderate bulls were used and had an average weaning weight EPD of 21.4 lbs. Three high bulls were used and had an average weaning weight EPD of 41.8 lbs. A total of 120 calves were born. Pregnancy rates of cows were evaluated resulting from the breeding season while nursing moderate- or high-growth calves and also the following breeding season after weaning moderate- or high-growth calves.

Impact: The mating of cows to bulls that differed by 20 pounds for weaning weight EPDs resulted in actual calf weaning weight differences of 28 pounds indicating that EPDs are fairly reliable. Use of sires with high weaning weight EPDs did not result in increased calving difficulty and did not adversely affect subsequent pregnancy rates. Similar results were found with the study conducted at the University of Kentucky.

Sources of funding: USDA-CSREES (Southern Regional Project S-277), State

Federal Goal 1

Title of Research Project: Adapting and Validating Precision Technologies for Cotton Production in the Mid-Southern United States

Key Theme: Precision Agriculture, Agricultural Profitability

B. Roger Leonard, Professor, Macon Ridge Research Station; Randy Price, Assistant Professor, Department of Biological and Agricultural Engineering; Ken Paxton, Professor, Department of Agricultural Economics, and Ralph Bagwell, Scott Research and Extension Center, LSU AgCenter

Issue: Arthropod pests are responsible for a four to six percent loss in U.S. cotton value annually. These losses occur in spite of management strategies that range from \$50 to \$60 per acre. Total economic losses due to cotton arthropod pests exceeded \$1 billion during 2003. Cotton arthropod pest management still represents one of the greatest variable production expenses incurred by producers. A promising technology that has the potential to reduce arthropod pest control expenses is based upon site-specific management practices. Precision agriculture and site-specific management refers to the differential application of inputs to cropping systems or tillage operations across a management unit (field or zone). Researchers and producers have long recognized that pest infestations, yield, nutrient levels, and soil type vary spatially. New technologies allow producers to quantify yield variability in small areas of the field, characterize areas with similar productivity potential, and apply spatially variable inputs such as pesticides, fertilizers, and seeding rates based on this variability. These research efforts comprise a multidisciplinary approach to the development of a spatially variable insecticide (SVI) application system.

What was done: The efficacy and value of spatially variable insecticide (SVI) applications were compared to whole-field broadcast treatments against cotton arthropod pests. Yield and profit maps were created from previous cotton yield/production data and were used to develop site-specific prescriptions for SVI applications. Treatments included whole-field broadcast sprays (producer standard), yield-based SVI sprays, and profit-based SVI sprays. The prescription for pesticide application in the SVI-yield and SVI-profit treatments only included those management zones that yielded in the upper 80 percentile or produced profitable yields as determined with economic analyses. Six successful aerial applications using SVI were made to the test field during the 2004 production season. Surveys of arthropod pests were done pre-and post-treatment. Treatments were evaluated for differences in yield using GPS equipped cotton harvesters with yield monitors. Mean yield was calculated using measurements from >4000 individual points per treated plot. Initial post-treatment samples of selected arthropod insect pests indicated infestations were detected in the non-sprayed zones of the SVI-treated plots but were less common in the sprayed zones of the whole-field broadcast and SVI-treated plots. Lint yields occurred in a narrow range of 724 lb/acre to 740 lb/acre with no significant differences among treatments. The total costs of foliar sprays were consistently lower in the SVI treatments compared to that in the whole-field broad cast treatments. Insecticide costs among treatments

ranged from \$33/acre to \$41/acre. There was a 16%-18% reduction in acreage treated in the SVI plots compared to the whole-field broadcast plots. These data show that management zones for reducing crop inputs (insecticides) can be developed from yield and profit maps and can be effectively used to improve production efficiency.

Impact: SVI technology reduced input costs for arthropod pest management, but did not significantly impact yield. The reduction in acreage treated with insecticides supports better stewardship of the environment and the general principles of IPM by temporally and spatially restricting pesticide use strategies. These data support the use of SVI technologies to moderate arthropod pest management costs and contribute to the integration of precision agricultural technologies into current IPM strategies.

Sources of funding: Hatch, State, NASA AG 2020 Program, Cotton Incorporated

Federal Goal 1

Title of Research Project: Cotton Disease Management in Northeast Louisiana

Key Theme: Plant Health

G.B. Padgett, Associate Professor, Northeast Research Station, LSU AgCenter

Issue: Cotton is a major row crop grown in Northeast Louisiana and important to the economic health of this area's economy. Cotton diseases are an annual problem that directly impact production. From 1994 to 2004, diseases annually reduced cotton yield and quality by 12 to 35%. Seedling disease and nematodes are the major diseases producers have to manage and changing tillage practices have the potential to impact these problems. The use of conservation tillage practices has increased dramatically in recent years and with the introduction of herbicide tolerant or resistant cultivars, these systems are becoming even more attractive and feasible. Therefore, it is necessary to evaluate the pathosystems associated with various tillage systems and their impact on cotton production.

Nematodes are cotton pathogens that have received more attention over the past several years. Root-knot, *Meloidogyne incognita* (Kofoid & White) Chitwood and reniform, *Rotylenchulus reniformis* Linford & Oliveira are the major nematodes affecting cotton in Northeast Louisiana. The reniform nematode is more difficult to control than the root-knot nematode, and, as a result, populations are spreading and are more widespread than root-knot. In recent years, attention to reniform nematode distribution and management strategies associated with this pest has increased. Therefore, management strategies must be refined and/or developed to reduce nematode populations, prevent them from spreading, and to preserve cotton yield and quality.

With increased EPA scrutiny, the fate of commercially available nematicides for use in cotton is uncertain, and new products are limited. Commercial nematicides are expensive and highly toxic to mammals, which spawns concern about their effect on the environment (water and wildlife).

Research is necessary to explore alternative methods that complement or reduce dependency on nematicides for managing nematodes.

Seedling diseases, caused primarily by *Rhizoctonia solani* Kuhn and *Fusarium spp.*, are second in importance to nematodes (Blasingame 1999). Seedling diseases are currently managed using cultural practices and/or fungicides. Fungicides are an effective means for managing seedling diseases. New fungicides being developed by the agricultural chemical industry must be evaluated and approved by LSU AgCenter personnel before recommendation by the Louisiana Cooperative Extension Service. This information, in addition to providing a basis for recommendations, also serves as a non-biased source of information for those involved in the cotton industry. Therefore, it is imperative these products be evaluated for efficacy against seedling diseases to determine their effects on cotton growth and development (vigor and maturity) in Louisiana.

Fungicides used for managing seedling diseases are applied directly to the seed or in-furrow at planting and cost from \$6.75-22.00/A. In-furrow treatments are effective, but expensive and are not always needed. Hopper-box treatments are cheaper than in-furrow treatments, but do not offer the protection provided by in-furrow treatment. Therefore, to maximize the effectiveness of these treatments it is imperative to determine when these treatments are most likely to benefit producers. It is important know how environmental factors affect seedling disease, and how to utilize this information to dictate fungicide use. Soil temperatures usually increase from mid-April to mid-May. This increase in soil temperature can be more conducive for seed germination and seedling emergence, but soil moisture may decrease during this time. Inadequate moisture for seed germination can result in poor stands and the need to replant. It is necessary to exploit these environmental factors and plant at a time that reduces the impact of seedling disease on plant development and yield.

In addition to the recognized cotton diseases, there have been several disease or disease-like conditions (Bronze wilt, phomopsis, black root, hardlock) reported in cotton. The specific nature and impact of bronze wilt, hardlock, and phomopsis on cotton production has not been fully defined. The occurrence of these conditions and their effects on cotton production is variable from year to year. It is necessary to determine the cause of these maladies and their impact on cotton production. If production is negatively affected by these conditions, further steps will be necessary minimize their impact.

What was done: Field tests were conducted to evaluate fungicides for managing seedling disease. Tests were conducted at the Northeast Research Station (St. Joseph, LA) and the Macon Ridge Branch of the Northeast Research Station (Winnsboro, LA). Treatments evaluated included commercial seed treatments, on-farm seed treatments, and in-furrow applied fungicides. From 2000 to 2003 cotton treated with additional fungicides had higher plant populations and higher yields than non-treated cotton in 65% and 27% of the field tests, respectively. In recent studies new fungicide seed treatments have performed better than existing seed treatments.

An experiment was initiated in 2000 to assess the impact of tillage systems (conventional and reduced tillage), cover crops (none, wheat, Austrian winter pea), and in-furrow fungicides on seedling disease. Cover crops were seeded in late October or early November, and terminated with a herbicide application during early spring. Field plots incorporating conventional tillage practices were disked in early spring and rows were formed by hipping and dragged prior to planting. In reduced tillage systems, cotton was seeded into existing rows of winter cover crop residue. Cotton pests other than seedling diseases were managed using practices recommended by the Louisiana Cooperative Extension Service. Seedling disease epidemics were monitored by assessing plant densities two, four, and six weeks after planting. To determine the impact of these systems on pathogen populations, soil was assayed for *Rhizoctonia* at-planting and at-harvest. These at-plant and at-harvest populations reflect static populations and shifts during the growing season.

Results for plant density and yield varied within treatments and among years. Yields in systems utilizing reduced tillage practices were either no different or greater than yields obtained in systems incorporating conventional tillage practices. This variable response of yield to tillage practice was probably related to soil moisture availability. In-furrow fungicide applications preserved plant density, but had a minimal impact on yield. From 2000 to 2003, fungicides increased stand and yield over non-treated cotton an average 0.5 plant per foot and 20 pounds, respectively. Cotton yields were consistently greater in systems including a wheat cover crop than in systems using Austrian winter pea or native vegetation as a cover. In general, cotton produced using reduced tillage practices, an in-furrow fungicide, and a wheat cover crop produced the greatest yields. At-plant populations of *Rhizoctonia* were lower than at-harvest populations most of the time. Tillage practices, cover crop, and fungicide had variable effects on overall populations of *Rhizoctonia*, but the highest populations were observed in production systems using reduced tillage practices.

Seed treatments to manage root-knot nematode have been evaluated since 2003. Six tests were conducted at the Northeast Research Station during this two year period. Seed treatments were compared to the grower standard (Temik 15G 3.5 lb/acre). The seed treatment has limited activity against root-knot, but is not as efficacious as Temik 15G. More research is needed for a conclusive decision concerning this product.

In studies evaluating phomopsis boll dangle it has been determine this condition doesn't adversely impact cotton yields in Northeast Louisiana. In studies evaluating bronze wilt, seed quality doesn't appear to be related to incidence and severity. The condition appears to be randomly distributed in the field. There are some indications that certain environmental stresses may initiate bronze wilt, but no conclusive data has been collected as of yet.

Impact: Producers can reduce input costs based on results from this research. Studies have demonstrated that in-furrow fungicides are not always needed and producers can capitalize on existing environmental conditions to determine if additional fungicides are needed at planting. Eliminating an in-furrow application can save producers up to \$25.00 per acre and reduce the time in the field. New seed treatment fungicides are more efficacious than existing standard seed

treatments in some cases. This increased efficacy will allow producers to further avoid the need for expensive in-furrow or hopper-box treatments at planting.

Defining the impact of tillage systems and cover crops on seedling disease has provided producers with information to make better informed decisions concerning fungicide use. Knowing reduced-tillage practices may increase the incidence of seedling disease can alert producers to potential problems. Therefore, necessary management practices can be implemented.

A new nematicide seed treatment has the potential to reduce costs to the producer and limit the pesticide load to the environment. Less pesticide is associated with seed applied products relative to in-furrow applied granules. The full impact of this treatment has not been defined because more research is needed.

Eliminating phomopsis as a threat to cotton production will prevent unnecessary treatments to manage this condition. Bronze wilt epidemiology remains a mystery. The condition can be avoided through variety selection based on evaluations from LSU AgCenter variety tests.

Sources of funding: Hatch, Private industry, Commodity grants

Federal Goal 1

Title of Research Project: Development of a Decision Aid for the Application of In-furrow Fungicides in Cotton

Key Theme: Plant Health

Patrick D. Colyer, Professor, Red River Research Station, LSU AgCenter

Issue: Seedling diseases are one of the major constraints to the establishment of a healthy, uniform stand of cotton. Seedling disease losses across the Cotton Belt for 2004 were estimated to be 2.5%. Most commercial cottonseed is treated with fungicides to protect the seed and seedling from fungal pathogens. In some situations these seed treatment fungicides are not sufficient to protect the seed, so producers must decide whether to spend additional money for hopper-box and in-furrow fungicides to provide additional protection. This decision is balanced against the risk of replanting costs and yield reductions. Because of increasing production costs and declining profits, the development of a decision-aid could advise producers on the efficient use of in-furrow fungicides, and save them money, while ensuring healthy, uniform stands.

What was done: Data from over 100 seedling disease trials in Louisiana and Arkansas has been incorporated into a database. The database compares in-furrow and hopper-box fungicide treatments to fungicide-treated seed. The database includes plant population, stand uniformity, and yield data for each study. In addition, soil temperatures and rainfall at planting and seedling

emergence were collected. This database was used to develop a model to identify conditions that limit stand establishment and increase the probability of in-furrow fungicides improving stands.

Impact: The results of this research indicate that soil temperature and moisture have an impact on the seedling disease severity. As soil temperatures increased, the severity of seedling diseases decreased. At minimum soil temperatures below 60⁰ C, in-furrow fungicides increased seedling survival. No rainfall or rainfall greater than 2 inches after planting increased the likelihood of in-furrow fungicides improving seedling survival. Additional analysis is being conducted to finalize the decision-aid. When it is completed, the decision-aid will help producers decide when to apply in-furrow fungicides to reduce seedling disease losses, and provide for more efficient use of fungicide inputs.

Sources of funding: State, Louisiana Cotton State Support Committee

Federal Goal 1

Title of Research Project: Cotton Germplasm Improvement and Genetics Research

Key Theme: Plant Germplasm, Agricultural profitability, Biotechnology

Gerald O. Myers, Associate Professor, Department of Agronomy, LSU AgCenter

Issue: Cotton is the third most important plant commodity in Louisiana with a total value of nearly \$350 million. Harvested from 490,000 acres in 2004, it is likely to remain a key component of Louisiana farm industries for years to come. Historical progress via conventional plant breeding had been increasing cotton yields at a rate of 10.2 pounds per acre per year across the U.S. until the mid 1990's. More recently, cotton production in Louisiana and the U.S. in general, however, has been characterized as increasingly variable and unstable. Three main causes for this include a decrease in useful genetic variability, the rise of new pests, and the demise of many public plant breeding programs devoted to cotton. Cotton fiber quality demands have also increased as new spinning technologies have been developed and as a result of the shift of U.S. cotton being domestically consumed versus competing in the global market. Simultaneously, while the adoption of genetically engineered cotton at the farm level has been high there exists a paucity of molecular genetics research in cotton compared to most other major U.S. agricultural crops. The future competitiveness of U.S. cotton depends upon increasing yields and quality using both traditional plant breeding and modern biotechnological tools.

What was done: In 2004 we completed two germplasm evaluation studies in an effort to identify new sources of improved yield and fiber quality characteristics. Three hundred and fifty five previously uncharacterized accessions from the Cotton Germplasm Collection were screened. Eight potentially new sources of root-knot nematode resistance/tolerance were identified and several lines with excellent fiber quality were found. The accessions with high fiber quality have already been utilized in crosses to move these genes into adapted, high yielding germplasm lines. Efforts to develop high yielding and high quality cotton varieties were

undertaken at five locations in Louisiana. 2004 field tests included the generation of 151 new populations, over 1500 F2 to F5 progeny rows, and 152 replicated entries. An additional eleven F2:3 populations were screened in the field for root-knot resistance and one Louisiana entry tested in the Louisiana Root-Knot Strains Test in Bossier City was found to be as resistant as the best commercially available resistant check. In 2004 we also completed the first intraspecific *G. hirsutum* amplified fragment length polymorphism (AFLP) linkage map which covered just over 31% of the cotton genome. Quantitative trait loci (QTL) markers for yield components and fiber quality traits were identified.

Impact: The future of cotton production and profitability in the U.S. depends upon identifying new genes and gene sources for yield, fiber quality, and pest resistance. Several new sources for desirable genes have been identified and their utilization should help broaden the genetic base of cotton, reducing its vulnerability due to a limited genetic base and provide new recombinations for basing future improvement efforts upon. The increasing importance of precision breeding, via an improved understanding of the molecular basis of traits and its application, offers additional routes for increasing crop productivity and quality.

Sources of funding: State, Louisiana Cotton Cotton State Support Committee

Federal Goal 1

Title of Research Project: Effects of dietary protein level and fish meal on growth and hormonal status of weaned dairy calves

Key Theme: Growth and Development of Dairy Cattle

Cathleen C. Williams, Associate Professor, Department of Dairy Science, LSU AgCenter

Issue: Emphasis on management of replacement heifers is becoming increasingly more important as the dairy industry continues to promote rapid growth to decrease time before first calving while still maintaining optimum production levels. Producers desire the replacement heifers to fully develop their lactation potential at the preferred age with minimal expense. Growth is a multifaceted and highly integrated process. It entails many interactions between the genotype of the animal, the environment, the nutrition of the animal, and the hormonal status of the animal. Although maximum body size is genetically determined, the rate and extent of growth is impacted by nutritional and hormonal factors with the majority of control being through the actions of the endocrine system. The main hormone regulating growth is the adenohipophysial hormone, growth hormone (GH). Many of the anabolic effects of GH however are modified by thyroxine (T₄) and insulin (INS), and mediated by insulin-like growth factor-1 (IGF-1).

Previous research has shown increases in anabolic hormone status in ruminants fed increased dietary crude protein levels. Post ruminal supply of amino acids has also resulted in increased INS, GH, and IGF-1 in growing ruminants. Determining the effects of level and source of

supplemental protein on growth and anabolic hormone status of weaned, growing Holstein calves would provide useful information for improving nutritional management strategies for optimum growth and development.

What was done: Eight Holstein steers, approximately 4 to 6 months of age, were used in a double replicated 4 x 4 Latin square. Steers were assigned to one of four dietary treatments consisting of two grain supplements containing either 16 or 20% crude protein with or without fish meal. Feed intake, body weight and height were monitored. Steers were housed in metabolism crates for collection of feces and urine for nitrogen balance determination as well as total tract diet, organic matter, and fiber digestibility. Anabolic hormone (growth hormone, IGF-I, insulin) status was assessed in order to determine whether increasing levels of protein and/or post-ruminal supply of amino acids will improve growth through possibly increasing the concentrations of these hormones.

Impact: Feeding diets greater than 16% CP with or without fish meal does not improve performance in weaned dairy calves. This information provides evidence that higher priced diets are not necessary for optimum performance of weaned dairy calves.

Source of funding: State

Federal Goal 1

Title of Research Project: NE 1009 Multistate project : Mastitis Resistance to Enhance Dairy Food Safety

Key Theme: Animal health and animal production efficiency

William E. Owens, Professor, Hill Farm Research Station, LSU AgCenter

Issue: Mastitis is inflammation of the mammary gland, and represents the leading economic disease loss to dairy cattle. The National Mastitis Council estimates the monetary loss in discarded milk to be \$ 1.0 billion, with an overall loss to animal agriculture of \$2 billion (approximately \$180.00 per cow) due to mastitis. The ability to cooperate on a regional and national basis allows the integration of resources and knowledge to address this problem. Recognition of the necessity for a coordinated effort to study resistance of the dairy cow to mastitis resulted in the design and initiation of Multistate Research Project NE-1009, Mastitis Resistance to Enhance Dairy Food Safety. The goal of this project is to continue the unique research efforts designed to a) understand and exploit both specific and nonspecific mechanisms involved in resistance to intramammary infections, b) identify and understand virulence factors of mammary gland pathogens and the mechanisms which permit microorganisms to enter the mammary gland and cause mastitis, c) develop and evaluate techniques for the modulation of host responses to mastitis pathogens, and d) characterize dairy food safety issues relevant to bovine mastitis. Results of this project will provide better methods for evaluating antimicrobial therapies and enhance our ability to identify nonantibiotic prevention and therapeutic modalities.

What was done: A multi site research project on the efficacy of prepartum intramammary lactating cow antibiotics in dairy heifers was completed. This project was initiated under the NE 1009 multistate project in 2002 and involved research groups from Louisiana, Tennessee, Washington, Connecticut, Guelph, (Canada), Cornell, Ohio State and University of Kentucky.

The objective was to study the effect of prepartum intramammary antibiotic therapy on udder health, milk production, and reproductive performance in dairy heifers. A greater number of intramammary infections were cured by treatment during the peripartum period. Louisiana data showed an 88% cure rate for heifer IMI which compared favorably to data for the multistate study. Data from all the sites were combined for publication. Results indicated that treated cows had less IMI at calving, and also less new IMI at calving. IMI were reduced in all herds by treatment and CNS were the pathogens accounting for the vast majority of treatable IMI. Postpartum milk production was equivalent in treated and control heifers, and milk somatic cell count slightly lower in treated heifers.

Impact: Mastitis in dairy heifers is a major problem for dairy producers in Louisiana and across the nation. Information on efficient methods for treatment and prevention of mastitis in heifers can dramatically improve herd health and productivity. Results from this multistate project show that heifer mastitis can be treated effectively with prepartum therapy and herd somatic cell counts reduced.

Sources of funding: State

Federal Goal 1

Title of Research Project: Integrated Pest Management of the Mexican Rice Borer in Louisiana and Texas Sugarcane and Rice

Key Theme: Proactive IPM Research of a Major Invasive Pest Species

T.E. Reagan, Professor, Department of Entomology; M.O. Way, Associate Professor of Entomology, Texas A&M Research and Extension center- Beaumont; Cooperators: Ben Legendre, Professor, St. Gabriel Research Station L. Ted Wilson, Professor and Center Director, Texas A&M Research and Extension center- Beaumont José Amador, Professor and Center Director, Texas A&M Research and Extension center- Weslaco; LAES Grad. Asst: Francis Reay-Jones

Issue: The Mexican rice borer (MRB) *Eoreuma loftini* (Lepidoptera Crambidae) has been the major economic pest in Texas sugarcane since it became established in 1980, causing such severe infestations that some fields could not be profitably harvested. As a key economic pest in Texas rice, it sometimes causes greater than 50% yield loss, especially in ratoon rice fields. Studies at the Ganado research site show that the insect has the potential to cause far greater yield devastation in the current Louisiana sugarcane cultivated varieties than the average

\$478/acre loss recently sustained in commercial Texas fields. During the late Summer and Fall of 2004, two new counties in east Texas (Chambers and Liberty) were infested causing initiation of quarantines by regulatory agencies restricting interstate transport of some Beaumont area sugarcane from processing facilities in Louisiana. Even with an average natural movement of MRB (currently about 15 miles/year), invasion of these major Louisiana field crops is expected within the next two years. With the support of three national competitive grant projects from the USDA (Cooperative State Research, Education and Extension Service), major progress has been achieved to develop and implement effective IPM management procedures that will help mitigate these potential pest problems for the sugarcane and rice industries of Texas and Louisiana.

What was done: This project involves joint research and extension activities of the LSU AgCenter and Texas A&M, with both programs interacting extensively with sugarcane and rice growers, ag consultants and state departments of agriculture. The northward and eastward movement of MRB monitored with pheromone traps shows an average movement of approximately 15 miles per year, now adjacent to sugarcane and rice in the Winnie and Beaumont area, triggering imposition of a previously agreed to interstate quarantine. No MRB have yet been found in the heavily monitored Louisiana parishes (Calcasieu, Jefferson Davis, Iberia, St-Mary), or in the extreme east Texas counties adjacent to Louisiana (Orange, Hardin, Jefferson). We have identified biological resistance to MRB among sugarcane and rice breeding lines and potential cultivars. However, the domestic sugarcane and rice breeding programs have not taken full advantage of this germplasm in developing high yielding varieties resistant to MRB and the sugarcane borer. Host plant preference studies involving different varieties and stages of rice and sugarcane at Weslaco (TX) show that sugarcane is more attractive than rice, and LCP85-384, which represents 90% of the Louisiana sugarcane acreage is the most attractive variety. On sugarcane, eggs are only laid on brown leaves, and drought stressed sugarcane is more attractive because of increased numbers of dry leaves. Free amino acid studies show that 99% of the MRB oviposition is explained by valine and threonine levels in rice.

A two-year field study also assessed the role that irrigation, when used in combination with variety selection and insecticide application, plays on reducing sugarcane stress for effective management of MRB. In the absence of irrigation and insecticidal suppression, LCP85-384 had greater than 70% MRB bored internodes compared to nearly 40% under heavy insecticide pressure (7 appl. Confirm@8oz/A rate) and no irrigation. With decreased attractiveness for oviposition in non-stressed sugarcane, irrigation reduced injury in both resistant and susceptible varieties. Only when all management tactics were used was injury suppressed below 10% (LCP85-384) and 5% (HoCP85-845). Field studies are also showing that modifying rice planting dates also may help to avoid the critical periods when yield loss from stem borers is most severe.

Impact: This proactive research (at least from the perspective of Louisiana agricultural needs) has identified the availability of biological resistance to MRB on sugarcane and rice. It was shown that MRB can not be adequately controlled in sugarcane with insecticides alone, but can

be better managed with insecticides in rice. Plant physiology chemicals (free amino acids) are shown to be less important for varietal resistance in sugarcane than in rice.

Studies in the Mexican rice borer program collectively have emphasized the importance of employing multiple tactics used in combination to manage insect pest infestations. If the crop plants can be made less attractive to the pest through resistant varieties or healthier management, the use of insecticides, when they work, can be more efficient. *Based on the 70% MRB bored internode level on sugarcane in the untreated, non-irrigated plots of our study, an economic loss of \$1673 per acre may be expected using actual yield loss data from the Lower Rio Grande Valley of Texas.* Reducing damage to 10% would reduce this loss to \$240 per acre. Another factor which enhances the permanency of an integrated pest management program is the importance of achieving a balance among the use of diverse control tactics. If an over emphasis on any tactic (especially insecticides) can be reduced, the selection pressure on the pest population is also reduced, enhancing the permanency of the IPM system.

Because of the significance and urgency of the problems (all work had to be conducted in Texas where the pest occurs), site visit field days for sugarcane and rice consultants, and county extension agents were conducted at a field study location near Ganado, TX, during September of each of the last 3 years. For Louisiana, the anticipated problems with the Mexican rice borer will continue to demand a multi-disciplinary area wide team approach both in sugarcane and rice. We want to develop and implement practices that not only protect the host crops, but also reduce pest populations.

Sources of funding: This research was funded primarily by competitive grants to the LSU AgCenter with sub-contracts to Texas A&M from the USDA (CSREES) Critical Issues and Southern Region IPM and Crops at Risk IPM Programs. Additional funding for this work was received from the American Sugar Cane League, the Texas Rice Research Foundation, and Hatch Projects.

Federal Goal 1

Title of Research Project: Microbial diversity in the termite gut

Key Theme: Biotechnology

Claudia Husseneder, Assistant Professor, Entomology Department, LSU AgCenter

Issue: The Formosan subterranean termite (FST) is an invasive wood-destroying pest species, which causes billions of dollars in economical damage in the southeastern U.S., especially in the State of Louisiana. For digestion of wood termite workers are dependent on their gut flora. The gut flora consists of three species of protozoa and an undetermined number of bacteria, which provide nutrition and energy for the termite colony. The knowledge gained from the study of microbial diversity in the termite gut is expected to spark new ideas and products for termite management employing the termites' gut flora.

The study combines culture independent approaches (16S rDNA sequencing) to estimate and compare the total microbial diversity in regard to the host's origin and living conditions as well as culturing live bacteria from the termite gut to investigate their physiology, ecology and their contribution to the termite host's survival. The ultimate goal is to identify novel bacteria, which are found exclusively in the termite gut, and genetically engineer them to spread detrimental genes throughout a termite colony.

What was done: To describe the microbial diversity of the gut flora of FST, we collected termite workers from two colonies in New Orleans, Louisiana. The total bacterial DNA from was extracted, cloned and the 16S rDNA region was sequenced. Bacteria were classified according to the closest match of their 16S sequences in GenBank. To date, we have sequenced 65 bacterial strains from the first termite colony and 25 strains from the second colony. We found 11 different strains of bacteria from three different groups (Bacteroides, Spirochaeta, and Treponema) and a strain that is currently described as "unidentified bacterium" but most closely resembles Bacteroides (determined by sequence analysis). Bacteroides was the dominant group among the gut flora (over 70%).

The dominant gut community found in the two colonies from New Orleans was very similar to each other. This suggests - together with the fact that all of the identified taxa are only known in termites - that the conserved dominant flora is necessary for termite survival. Also, no difference was found between the bacteria communities described from fresh termites and those from alcohol material of the same colony. This makes it possible to compare in the future the gut flora of native FST from China to introduced populations all over the world to identify adaptations of the gut flora due to new introduction and change of habitat.

So far, we were able to culture over 20 different bacterial strains from the termite gut, including species belonging to the Enterobacteriaceae, Bacteroidales and lactic acid bacteria. Most of the cultured strains were novel species found exclusively in the termite gut.

Being able to culture indigenous strains from the termite provides the possibility to use genetically engineered bacteria as "Trojan Horses" to deliver and express foreign genes in the termite gut. Previously, Enterobacteriaceae were genetically engineered to express Green Fluorescent Protein in termites. We are now in the process of constructing a vector to express protozoicidal genes using novel bacteria, which are again found only in the termite gut.

Impact: By investigating the ecology of such an exotic ecosystem as the termite gut, we have discovered several novel bacteria species, including bacteria, which are able to survive only in the termite host. Identifying the most dominant bacteria in the termite gut helps to identify obligate symbionts, which are necessary for the termite survival. Being able to isolate and culture termite specific bacteria sets the stage for using them as "Trojan Horses" to introduce detrimental genes into termite colonies. Bacteria can in the future serve as self perpetuating, self replicating biological agents for termite control. A fast and cost effective product with a minimum of pesticide application that is easily introduced and transferred in a termite colony and specifically

eliminates termite colonies will reduce the cost for termite control and damage repair for homeowners, taxpayer and the State of Louisiana.

Sources of funding: Funds for this study were provided by the Louisiana Board of Regents and the State of Louisiana.

Federal Goal 1

Title of Research Project: Integrated Management Strategies for Insect Pests of Rice in Louisiana

Key Theme: Integrated Pest Management

M.J. Stout, Department of Entomology, LSU AgCenter

Issue: Rice is one of the most important plant commodities in the state of Louisiana and is a particularly key commodity in the southwestern part of the state. Insects are an important constraint on rice yields in Louisiana. The rice water weevil, the rice stink bug, and the sugarcane borer are the most important insect pests of rice in Louisiana. In addition, the Mexican rice borer, an exotic pest now present in Texas, is expected to make a significant impact on the Louisiana rice industry in the near future. The current management programs for these pests rely heavily on applications of insecticides. Management of the rice water weevil in particular will be impacted considerably in 2005 and in subsequent years by the loss of one of the insecticides currently used to control it. Thus, two goals of this project are 1) to increase the effectiveness of insecticide applications against insect pests of rice by refining current economic thresholds and developing improved methods of monitoring pests and 2) to evaluate alternative insecticides for weevils. Furthermore, reduced reliance on insecticides and increased reliance on alternative strategies are needed to reduce the environmental impacts and increase the affordability and sustainability of the management programs for these pests. Thus, a third goal of this project is the diversification of the management programs for water weevils, stink bugs, and stem borers via the integration of cultural practices and host plant resistance into the programs.

Rice fields in Louisiana also provide important habitats for several species of larval mosquitoes, some of which are potential vectors of diseases of humans and domesticated animals. A fourth goal of this project is to investigate the impact of agricultural pest management on mosquitoes in rice fields.

What was done:

Evaluation of insecticides

Evaluating insecticides for efficacy against the rice water weevil continues to be a priority of the Entomology program for three reasons: 1) the impending loss of Icon from the rice market after 2005; 2) continuing problems with drift of liquid formulations of pyrethroids into crawfish ponds; and 3) the fact that all of the insecticides that will likely receive heavy use in 2005 are

pyrethroids, which raises concern about insecticide resistance. Several alternative insecticides (and alternative formulations of currently registered insecticides) were tested in eight small-plot tests in 2004. The major findings from these tests were as follows:

- The efficacy of Prolex (gamm-cyhalothrin), a newly-registered liquid formulation of a pyrethroid insecticide, was comparable to that of the other two pyrethroids.
- The efficacy of a seed treatment of Avermectin was as good as, or better than, the efficacy of Icon in two evaluations of seed treatments.
- Fertilizer impregnations of the pyrethroids Mustang Max and Karate were also evaluated. The efficacies of the fertilizer impregnations were similar to the efficacies of foliar applications of these insecticides when applications were made at the same rates and timings. Interestingly, both fertilizer impregnations also reduced larval populations when applied two weeks after flooding, indicating some “curative” properties.
- Two granular insecticides, Etofenprox (Trebon®) and Dinotefuran, were evaluated in 2004. Each was evaluated in a drill-seeded and a water-seeded experiment. The company that manufactures Etofenprox (Mitsui Chemicals) intends on pursuing a registration for this product in rice. Etofenprox performed as well as Karate in the drill-seeded test and gave about 65% control of weevil larvae at the target rate in both the water-seeded and drill-seeded test. This insecticide is pyrethroid-like, has been used extensively for weevil control in Japan for over 15 years, and worked well in 2004 in California tests. The application timing for etofenprox is shortly after the establishment of permanent flood. The second granular product, dinotefuran, provided control similar to that provided by carbofuran in the drill-seeded test at the highest test rate. This product is a neonicotinoid and would be used in a manner similar to carbofuran (application two to three weeks after permanent flood). The company that markets dinotefuran in the United States (Valent) has not indicated whether they will pursue registration.
- Field and greenhouse experiments were conducted to determine the relationship between adult and larval densities of weevils. These experiments will be continued next year. Data from these experiments, once fully analyzed, will permit the development of preliminary action/economic thresholds for application of foliar adulticides. In field experiments, direct monitoring of adults proved to be a better monitoring method than use of aquatic barrier traps.

Thus, significant progress was made in finding replacements for Icon and alternatives to currently-registered liquid formulations of pyrethroids.

The highlights of tests of foliar insecticides against other pests of rice were as follows:

- Prolex was found to be as effective as Mustang Max and Karate for control of stink bugs in small-plot tests and demonstration trials. Malathion was ineffective. Orthene (unregistered) was the most effective insecticide tested.
- One application of a pyrethroid at panicle initiation was found to give adequate control of sugarcane borers in a small-plot test.

Host-plant resistance

Rice lines that showed greater resistance or susceptibility to the rice water weevil in greenhouse studies in 2002 and field studies in 2003 were again compared with respect to a) their susceptibility to infestation by weevils (i.e., egg and larval densities were compared) and b) their tolerance of larval feeding (i.e., the extent to which infested plots suffered losses in yield was evaluated). The performance of these lines in the field was generally consistent with their performance in previous studies.

Cultural practices

A third year of a planting date study was completed. In all three years, early planting was associated with benefits with respect to insect management. In 2004, densities of weevil larvae approximately four weeks after flooding were very low in plots planted on 15 March (the earliest planting date in this experiment). In addition, stinkbug populations were lower in early-planted plots than in late-planted plots. In previous years, losses due to insect feeding were greater for later planting dates than for the early planting date. Data from this three year study will be analyzed and planting date recommendations made.

Integration of pest management practices

The impact of management practices for rice stink bugs on populations of mosquito larvae in rice plots was assessed. High populations of mosquitoes (adults and larvae) in rice fields coincided with movement of stink bugs into rice at the heading stage. The broad-spectrum insecticides used for control of stink bugs were shown to reduce mosquito populations in a small-plot study.

Biological studies

Detailed knowledge of pest biology is needed to construct effective management programs. Methods for monitoring flights of adult weevils (flight intercept traps, malaise traps, sticky traps) were compared. The hypothesis that rice stink bugs are attracted to volatile chemicals emanating from rice panicles was tested and provisionally accepted.

Impact: Yield losses from the rice water weevil alone regularly exceed 10% in small-plot tests, and the rice stink bug and stem borers can also cause heavy losses in some locations. Economic losses resulting from a 10% yield loss (if no effective management practices for insects were in place) would exceed 20 million dollars (assuming 500,000 acres of rice in the state, a 6,000 lb/A average yield, and a price of \$8.00/cwt). Assuming that insecticides give approximately 75% control of insect pests, the impact of this project on the rice industry is at least 15 million dollars.

Federal Goal 1

Title of Research Project: Assisting Small Greenhouse Tomato Growers to Compete in a Market Dominated by Big Producers

Key Themes: Small Farm Viability

H.Y. Hanna, Professor, Red River Research Station, LSU AgCenter

Issue: The greenhouse tomato industry has experienced unprecedented growth worldwide over the past 10 years. Most of the fresh market tomatoes in Europe are now produced in greenhouses and the market share in the U.S. has increased from six percent five years ago to more than 20 percent now.

The U.S. greenhouse tomato industry is a mix of many relatively small, family-operated businesses and a small number of larger ones. Smaller producers have an excellent opportunity to do well because they do not have to ship the produce to distant markets and absorb the rising cost of transportation. They can harvest the fruit at peak quality and deliver the tomato to the consumer during the same day of harvest. However, they have to reduce production cost and increase plant yield to compete in a market dominated by more efficient larger producers.

Published research has indicated that tomato plants grown in perlite have consistently out yielded those grown in other media. Replacing the media every year is costly and yield reduction of the crop planted in used perlite without cleaning and disinfecting is a serious problem because of media compaction, salt buildup, and pest contamination. Tainted perlite can impair the root system and lead to a weak and less productive plant.

What was done: We developed a labor friendly and cost effective technique to recycle perlite at a fraction of the cost to replace the media every year. The highlights of the technique include using a 24-inch auger mounted on a half inch electric drill to bore into the perlite in the grow bag without lifting or changing bag location. This process was necessary to restore perlite original loose structure, shred the fine roots, and break the crown root/perlite aggregates for easy root removal and efficient washing off excess salt.

To prevent the perlite from dispersing out of the bag, a 5-gal bottomless bucket was placed over the media in the bag and the drill was operated inside the bucket. The auger was moved up and down and sideways into the media without hitting the poly-bag to break the root/perlite clods for easy removal. The perlite was then treated with hot water at temperatures reaching 200 F. A hot water pressure washer available locally at rental shops was used after replacing the pressure nozzle with a water breaker to leach out excess salt and disinfect the media. Each bag was drenched with approximately 3.5 gal of near boiling hot water until the runoff was clear.

Information generated from drilling and disinfecting used perlite in 1880 bags of size 5-gallon each indicated that this technique would cost the grower approximately \$162 to drill, clean, and

disinfect the media in a 30 x 96-foot greenhouse. Replacing the media would cost the grower \$540 to buy new perlite, \$56 to dispose of the used perlite, and \$157 to fill the bags with the new perlite, for a total of \$753. These data indicate that the described technique can save the grower approximately 78% of the annual replacing cost.

Treating perlite with hot water raised media temperature to above limits necessary to kill harmful pests and reduced media salt to within acceptable range for raising container grown plants.

Tomato plants raised in the recycled perlite produced comparable yields to those raised in new perlite. Used perlite can be cleaned and disinfected repeatedly because it is not organic in nature and physically and chemically stable. Most processing expense is labor related and smaller producers can save more money by doing the job themselves. The hot water pressure washer rent and buying an auger and a drill can be the only out-of-pocket expense to complete the job. Many home owners have electric drills anyway and the \$20 auger is a popular household tool to plant bulbs in flower beds.

Impact: Small growers have to reduce production cost and increase plant yield to compete well in a market dominated by more efficient larger corporations. Using the same media year after year without processing to raise a tomato crop can lead to yield reduction or a crop failure. Most of the large greenhouse tomato producers replace the root media once a year to avoid serious crop losses but the smaller grower can not afford to do the same.

In conclusion, cleaning and disinfecting used perlite for recycling using the technique developed can save the smaller producer a significant amount of money, does not reduce tomato yield, and can be repeated as needed. Efficient management of limited space greenhouse tomato operations should help smaller producer to survive a very competitive market.

Sources of funding: State

Federal Goal 1

Title of Research Project: Management of Cool-Season Perennial Forages for Louisiana Coastal Plain Pastures

Key Theme: Pasture Management

Buddy Pitman, Professor, Rosepine Research Station, LSU AgCenter

Issue: Pasture-based livestock production in Louisiana is developed around perennial, warm-season grasses. Forage during the cool season is provided by stored excess growth from the warm-season grasses and cool-season annual forages. Both of these options are rather expensive and involve considerable weather-related risk. An adapted, cool-season perennial pasture plant could complement the warm-season perennial grasses to extend the period of economical forage supply.

What was done: Several experiments assessing management options for potentially useful cool-season perennial forage plants were completed. Texas bluegrass was identified as a highly persistent cool-season perennial grass on well-drained Coastal Plain upland sites. No other species were found to provide long-term persistence. Management concerns identified for Texas bluegrass include unpredictable and slow establishment in this competitive, high-rainfall environment. Opportunities identified include a highly diverse genetic resource in existing populations of Texas bluegrass for potential improvement. Also, excellent response to nitrogen fertilization was obtained in the infertile Coastal Plain soil.

Impact: Predominant uses of the Coastal Plain uplands are pasture and forestry. An adapted, sod-forming, cool-season, perennial grass such as Texas bluegrass provides potential as an economic source of cool-season permanent pasture to enhance profit potential of enterprises based on grazing livestock. It also provides an option for erosion control and permanent winter food plots for wildlife on non-timbered lands associated with forestry enterprises.

Sources of funding: State Funds

Federal Goal 1

Title of Research Project: Management of Forage Crops in Northeast Louisiana

Key Theme: Animal Production Efficiency, Grazing, Rangeland/Pasture Management

M. W. Alison, Associate Professor, Northeast Research Station, LSU AgCenter

Issue: Cattle production systems across the southeast USA use warm-season perennial grasses as the primary forage source. These grasses are well adapted to the area and quite productive through 6 or 7 months of the year. Standing residue or stored hay are the primary feeds used during periods when growth is inadequate. Winter feeding cost is normally considered a relatively high direct cost for cattle production because of costs associated with harvesting, storing and feeding hay. Practices that reduce the reliance on hay should improve profitability and sustainability of cattle operations. Climatic conditions prevalent during times of the year when warm-season grasses are dormant can be conducive to forage production from cool-season forage species. Utilization of these cool-season forages could reduce the winter feeding period and provide higher quality feed during this period. Previous research focused primarily on annual ryegrass (*Lolium multiflorum*) but other species could offer benefits as well. Use of perennial grasses would eliminate the recurring expenses necessary for establishment of annual forage species.

What was done: Studies were conducted to evaluate the potential of several species to provide forage during the cool seasons of the year. Tall fescue (*Festuca arundinacea*) has not been considered readily adapted in the Lower South but some recent developments have potentially increased the area of adaptation as well as improved resulting cattle performance. A study evaluating animal performance and stand persistence from some newer tall fescue cultivars

provided evidence there is potential for using tall fescue in the area and expecting acceptable animal performance. Results from other studies indicate some special care in management would be necessary to establish and maintain a vigorous tall fescue stand in the area. Stands will be short lived if utilized intensively during the establishment year although some utilization in spring following fall planting is possible without adversely affecting subsequent persistence.

Studies evaluating the potential of other tall fescues including summer dormant tall fescue, prairiegrass (*Bromus carinatus*) and bromegrass (*Bromus willdenowii*) were conducted. The *Bromus* species did not survive as perennials and were not as productive as annual ryegrass on an annual basis so did not appear to offer any advantage. Summer dormant tall fescues did not maintain complete stands but one genotype did appear to have enough potential to warrant further investigation. Summer heat and drought in the Lower South are major stresses on conventional tall fescue and limit adaptation to the area so the avoidance of these stresses by true dormancy in the summer is an intriguing concept.

Including clovers in pasture mixtures could potentially reduce dependence on fertilizer nitrogen inputs and also enhance forage quality. Arrowleaf clover (*Trifolium vesiculosum*) has been relatively popular for use in pastures throughout the Southeast but the increased prevalence of a viral disease has reduced its use in many areas. A arrowleaf clover cultivar with tolerance to the infectious virus was recently released. Forage productivity response to soil phosphorous level from this new cultivar was evaluated in cooperation with a forage plant breeder in Texas. White clover (*T. repens*) is probably the most widely used clover throughout the Southeast but it is undependable to perenniate in many areas. Work was done jointly with a scientist in Florida to describe agronomic characteristics of the core collection of white clover in the National Crop Germplasm System. Work continued with red clover (*T. pratense*) genotypes developed in a plant breeding program in Louisiana. Studies comparing these genotypes with commercially available cultivars and other genotypes developed in the Southeast were initiated.

Impact: If the management necessary for establishing and maintaining a vigorous stand of tall fescue can be determined then reliance on stored feeds during the winter could be reduced. This could improve cattle performance during the winter period and reduce costs associated with winter feeding. Improving the dependability of clover production in pastures offers the potential for readily using these high quality forages throughout the southeast USA. Some of the initial work with an arrowleaf clover genotype contributed to the ultimate release as a commercial cultivar. Results generated from the work with white clovers provide information to assist plant breeders in selecting appropriate material to use in breeding programs. The information could possibly be useful in identifying material that would be better adapted in the Southeast. The ultimate result of the work with red clover is to develop a cultivar that is better adapted to conditions in Louisiana and across the Lower South.

Sources of funding: State, Hatch

Federal Goal 1

Title of Research Project: Development of Improved Rice Germplasm using Genomic and Conventional Genetic Approaches

Key Theme: Agricultural Competitiveness

James Oard, Department of Agronomy and Environmental Science, LSU AgCenter

Issue: Successes and challenges for the Louisiana rice industry. Rice is an economically important commodity for Louisiana valued in 2003 ~ \$198 million (<http://www.lsuagcenter.com/agsummary/progressreport.aspx>). Continued success of this important state enterprise will be based on the production of high quality rice that creates maximum value in the world market place. Sheath blight disease caused by the fungus *Rhizoctonia solani* is a major constraint to high yields and grain quality in Louisiana, Texas, and Arkansas. All commercial cultivars are susceptible to sheath blight with no known genetic sources, adapted or exotic, that provide complete resistance to this disease. Nevertheless, there are various lines that produce partial resistance that are being used in an active crossing program by Dr. Oard to combine high levels of resistance with current elite varieties. Dr. Oard has recently cooperated with other LSU AgCenter researchers in the evaluation and public release of an adapted population that exhibits high levels of tolerance to sheath blight that will serve as an invaluable genetic source of future variatal development.

Intense global competition has created a projected 24% drop in U.S. rice exports due to increased production costs relative to foreign competition (Childs, 2003). Moreover, increased demands for aromatic and medium-grain rice varieties not adapted to the U.S. has created record high imports of these specialty types. Although U.S. grain production has enjoyed economic success in the past, yields in Louisiana and neighboring rice-growing states do not equal those of Asia or South America (<http://www.ers.usda.gov/briefing/rice/background.htm>). Moreover, Louisiana farmers produce the lowest grain yields/acre of any state, and therefore, are very dependent on federal subsidies for economic survival (<http://etd.lsu.edu/docs/available/etd-07082004-132027/unrestricted/02chapter1.pdf>). Increased grain yields will reduce production costs per acre and lessen the dependence of Louisiana rice farmers on government support payments that are expected to be phased out over time. Dr. Oard's research will establish a reliable and effective method to identify markers and candidate genes that contribute to high yielding varieties for Louisiana and other U.S. rice growing regions.

Even though U.S. grain yield has improved slowly over the last 10 years, there has been a concomitant decline in grain milling quality that translates into lost market share and revenue due to greater competition on price and quality factors(Childs, 2003). To successfully sustain the Louisiana rice industry, production of high quality rice at reasonable prices must be a research priority. Domestic consumption of rice is expected to increase at a rate that is double the projected US population growth (Childs, 2003). Enhancement of traits critical to processing such as milling will be necessary to exploit this expanded market. Results from Dr. Oard's research

will identify, characterize, and validate new candidate markers and genes for the first time that play a role in enhanced yield and high milling quality of Louisiana rice.

What was done: (1) Extensive crossing efforts using multiple sources of sheath blight resistance over the last five years have produced numerous germplasm lines for use by the LSU Rice Breeding Program. Dr. Oard has recently cooperated with Dr. Chu and other LSU AgCenter rice researchers in the evaluation and public release of a population of doubled haploids for sheath blight tolerance that will benefit all rice researchers in the development of new, disease resistant varieties.

(2) Dr. Oard is a Co-PI in the USDA-NRI Rice CAP Project initiated in 2004. The objective of this multi-state, multi-institutional four year project is to develop and transfer molecular and genetic tools to U.S. rice breeding programs for rapid varietal improvement. Along with LSU AgCenter researchers Linscombe, Groth, Chu, Sha, and Utomo, Dr. Oard will develop and evaluate three genetic populations to identify molecular markers associated with enhanced grain yield, quality and disease resistance. In other work Dr. Oard has identified 27 genomic regions (QTLs) that are associated with grain quality and milling characteristics among progeny from a cross of Asian and African rice. Three new QTLs for percent rice bran were detected and 7 loci for improved grain and milling properties were identified from the African rice. In addition, genetic markers for resistance to sheath blight were identified and confirmed among progeny from the U.S. cross Lemont x Teqing. Dr. Oard's research confirmed the existence of 10 of the 12 previously reported loci for resistance and identified seven new additional loci.

(3) The Discriminant Analysis statistical procedure was used for the first time in rice to rapidly identify markers that are associated with economically important agronomic traits among inbred lines or hybrid material. Genetic lines and markers were classified and selected more efficiently than standard mapping protocols. Selected microsatellite markers were used to correctly assign 218 inbred rice lines to pre-defined groups for plant height, maturity, and tiller number. The selected markers pointed to the same regions on the rice genetic map vs. markers identified by traditional mapping. This novel and user-friendly procedure based on Discriminant Analysis will allow rapid marker identification from inbred or hybrid material associated with agronomic traits in any crop and should prove useful for germplasm improvement. The results have proven successful in two diverse crops such as rice and sweet potato using SSR and AFLP marker systems. Dr. Oard has recently identified markers linked to grain quality and disease resistance via the Discriminant Analysis procedure that will facilitate rapid development of new elite Louisiana rice varieties. This novel procedure has recently been submitted and is currently "in press" in the journal Theoretical and Applied Genetics.

(4) Dr. Oard's laboratory is using 2-D PAGE and LC/MS proteomic techniques to identify candidate proteins in rice involved in response to challenge from the fungal pathogen *Rhizoctonia solani*, causal agent of sheath blight disease in rice. Approximately 1,000 proteins from infected rice were detected in replicated gels. Protein patterns across gels were reproducible that allowed quantification of proteins of interest. A total of 43 protein spots were found to be upregulated in a resistant line when challenged with *R. solani* as compared to the uninoculated

control. This study is the first to evaluate the rice-*R. solani* interaction at the proteomic level. Future research will involve the identification and characterization of selected upregulated proteins that can provide new insights and information on host-parasite interactions.

(5) Molecular and phenotypic data demonstrated in outcrossing studies that glufosinate herbicide resistance was transferred from a transgenic line to a red rice weedy biotype in the field within one year at a low frequency of 0.3%. Compared to parental lines, the transgenic-red rice hybrids were late, tall, and never set seed during the normal field season. Genetic analyses in all F₂ populations from controlled crosses showed that glufosinate resistance behaved in a Mendelian fashion as a single, dominant gene. These studies showed for the first time that that red rice will hybridize with cultivated rice at sufficiently low rates to allow development of an effective management strategy to prolong the usefulness of glufosinate and other herbicide technologies. In subsequent studies over two years, Dr. Oard's laboratory was the first in the United States to demonstrate outcrossing of red rice with the "Clearfield" herbicide resistant variety in Louisiana commercial fields. As shown in previous research with small plots, the outcrossing rates were < 1% detected during the first year of evaluation. These results have important implications for proper management of Clearfield and other herbicide resistance technologies in modern rice varieties.

Impact:

- (1) Development and public release of sheath blight-resistant germplasm in cooperation with LSU AgCenter researchers.
- (2) Participation in multi-state, multi-institutional USDA research program (Rice CAP) to evaluate potential of genomic technology for development of new, high yielding, high grain quality varieties for the U.S. rice industry.
- (3) Development and evaluation of the novel bioinformatic tools for rapid and effective identification of molecular markers associated with grain yield and quality in U.S. rice germplasm.
- (4) Identification of candidate proteins via proteomic methods involved in response to challenge from the fungal pathogen *Rhizoctonia solani*, causal agent of sheath blight disease in rice.
- (5) Dr. Oard's laboratory has determined the "risk assessment" and frequency of outcrossing between the noxious weed red rice and the commercial Clearfield rice varieties. These results have important implications for proper management of Clearfield and other herbicide resistance technologies in modern rice varieties.

Sources of funding: Funds expended were from Hatch, State, and Multi-state, sources.

Federal Goal 1

Title of Research Project: Improvement of Rice Production with Plant Growth Regulators

Key Theme: Tropical Agriculture

Richard T. Dunand, Professor, Rice Research Station, LSU AgCenter

Issue: Poor seedling vigor (slow emergence, low plant population, and short seedling height) in semidwarf varieties, lodging in tall varieties, outcrossing of herbicide resistant rice, and low crop production in ratoon rice are four issues in rice production.

What was done: Seed and foliar treatment with gibberellic acid improved seedling vigor in commercial varieties and several experimental lines. Trinexapac-ethyl reduced plant height in tall varieties imparting lodging resistance. Imazethapyr limited panicle exertion and prevented seed formation in red rice with no impact on herbicide resistant rice. Maleic hydrazide and mefluidide improved evenness, rate, and amount of growth in the ratoon crop.

Impact: Improving seedling vigor reduces seed costs and water use and management and in situations where plant population is decreased can increase yield. With erect (not lodged) rice at harvest, there is optimum harvest efficiency (faster harvest and less straw combined), yield, grain moisture, and milling yield. Reducing reproductive development in red rice minimizes the potential for red rice and herbicide-resistant rice to cross pollinate and will prolong the usefulness of herbicide-resistant technologies for controlling red rice in rice. Consistent, early, and large amounts of ratoon growth can improve harvest, yield, and milling. Rice farmers are the direct recipients.

Sources of Funding: State funds, Louisiana Rice Research Board grants, and Industry grants

Federal Goal 1

Title of Research Project: Application of Marker Approaches to Rice Genetic Improvement and Development of Economical Non-automated Marker Detection for Use in Breeding Programs

Key Theme: Plant Genomics

Herry S. Utomo, Assistant Professor; Steve Linscombe, Professor; Xueyan Sha, Assistant Professor; and Qi Ren Chu, Associate Professor, Rice Research Station, LSU AgCenter

Issue: Recent advancement in molecular marker technology provides a tremendous opportunity to accelerate genetic improvement in a number of traits that are important to the U.S. rice industry. The rice variety development team at the Rice Research Station has been very productive. In the past 5 years, acreage planted with LSU AgCenter developed varieties has

averaged more than 1.7 million acres (62% of the southern U.S. acreage). To maintain its leadership and continue to deliver superior varieties to the industry, it will be necessary to improve its effectiveness by integrating emerging molecular marker technology into the breeding program. Molecular markers allow direct identification of the genes and, therefore, can be used to increase selection gain. Incorporation of marker technology will improve the overall efficiency of the breeding program including developing conventional, Clearfield, and special purpose rice varieties.

What was done: Marker-assisted breeding (MAB) is being conducted to accumulate blast resistance genes, Pi-ta2, Pi-b, and Pi-z, through various multi-way crosses. Accumulation of these three genes will provide protection against nine major blast races causing problems in Louisiana production. In the summer of 2004, marker-assisted selection (MAS) and phenotypic selection for agronomic characters were conducted in about 600 rows of F2 lines derived from multi-way crosses. Hundreds of lines have been selected and they will be advanced and subjected to further selection. The Pi-ta2 marker is being used also to improve the blast tolerance level in Clearfield rice CL161. Line 9302065 carrying Pi-ta2 gene was used as a source for the blast resistance gene. MAS, together with phenotypic selection for agronomic characters, was conducted in about 200 rows of F2 lines last summer. Four hundred lines were selected. They will be advanced and subjected to further evaluation. Anther culture in combination with MAB was used to expedite the development of pure breeding lines in a short period of time. Hundreds of anther-culture derived plants have been obtained. Mapping populations for aroma and water weevil tolerance are being advanced through selfing both in the field and greenhouse. Six mapping populations for water weevil tolerance were derived from crosses between two tolerant parents, cultivar Jefferson and line 321310, and three susceptible parental lines 413958, 321310, and 321264. A mapping population for aroma was derived from a cross between non-aromatic Jodon and aromatic Goolara.

Screening a large number of progenies is needed to identify offspring carrying the gene(s) of interest while considering other agronomic characters, such as yield. Simple and economical microsatellite marker detection is critical for successful and widespread adoption of marker technology in the breeding program. A non-automated marker detection protocol, which is fast, reliable, and cost effective for routine work, has been developed in our lab requiring minimal/standard molecular laboratory equipment. The protocol consists of a leaf sampling method for 96-well plates, tissue grinding using a bead-based grinder, DNA extraction using a modified heating method, and a marker detection using polyacrylamid gel electrophoresis in the MegaGel dual high throughput vertical system. One person can produce at least 200 data points in a single day, including sample preparation, DNA extraction, PCR run, electrophoresis, and data recording. The overall cost for supplies and chemicals for DNA extraction, PCR run, and electrophoresis was approximately U.S. \$0.25 per data point. We will continue refining our method to provide a solid foundation for MAS as a part of the rice breeding program.

Impact: Incorporation of marker technology will improve the overall efficiency of the breeding program in developing conventional, Clearfield, and special purpose rice varieties. Using currently available markers, blast resistance genes can be accumulated and incorporated into

conventional, Clearfield, and special purpose rice varieties. Marker approaches can increase the efficiency of the breeding program and shorten varietal development by 2 years. Development of a simple, cost-effective, and relatively high throughput marker detection system for routine use will allow successful and widespread adoption of marker technology in various breeding programs. Such a simple and inexpensive marker detection could expand the participation of small laboratories that have only minimal/standard equipment. Wider participation from various breeding programs in both developed and developing countries will benefit many crop improvement programs.

Sources of funding: State funds

Federal Goal 1

Title of Research Project: New, More Effective Fungicides for Rice

Key Theme: Plant Health

Donald E. Groth, Professor, Rice Research Station, LSU AgCenter

Issue: Rice farmers are faced with significant yield reductions every year due to rice diseases. The three most important diseases are sheath blight, bacterial panicle blight, and blast. These diseases can cause reductions in yield as high as 80%. Producers do not have resistant varieties available to all of these diseases, and most cultural control practices have a yield penalty associated with them. Because of these difficulties, rice farmers rely on fungicides and bactericides to control diseases. Several fungicides are commercially available, but they are not always as effective as they should be; therefore, new and more effective fungicides are necessary and application technology of existing fungicides need to be improved.

What was done: Fungicide trials have been conducted at the Rice Research Station for the last 21 years. Over 100 candidates have been screened, rate and timing evaluated, and several have been labeled. Currently, a new class of fungicides is being evaluated that are environmentally safer and more effective than current fungicides. This group of fungicides is related to naturally occurring fungicides produced by wood rotting fungi. They are broad spectrum and very effective against several important groups of fungi. Since timing and rate are very important for these fungicides, studies are being conducted to define the best spray program for individual varieties/disease situations.

Impact: The addition of new fungicides to the farmer's arsenal will greatly improve disease control on rice. This includes improvement in yield, milling, harvest ability, and second crop. This will increase the farmer's income and the economic return they receive for their crop. These new fungicides also represent a safer chemistry, using less active ingredient per acre and having low toxicity to other organisms. Farmers used these products on more acres than all other fungicides put together in 2003 and 2004. These fungicides also have the advantage that they

control both sheath blight and blast. This takes some of the guess work out of which fungicide to use. Timing and rate were critical to control rice diseases and maximize yield.

Sources of funding: Louisiana Rice Research Board grants, Private Industry grants, State funds

Federal Goal 1

Title of Research Project: Breeding Long-Grain Rice Varieties by Conventional Methods Supplemented by Doubled Haploid Technology

Key Theme: Adding value to new and old agricultural products; Agricultural competitiveness; Agricultural profitability; Biotechnology; Plant germplasm; Plant health; Plant production efficiency.

Qi Ren Chu, Associate Professor, Rice Research Station, LSU AgCenter

Issue: Rice varieties developed by the Rice Research Station have been grown on an average of 62% of the rice acreage or 1.7 million acres in the southern United States for the last 5 years. In Louisiana, 90% of the rice acreage has been planted with Louisiana developed varieties. These varieties combine high yield, premium quality, disease resistance, good agronomic characteristics, and enhanced seedling vigor into a single package. It has helped raise Louisiana's rice yield 15% in the last 5 years from 5080 lb/A in 1999 to an estimated 5800 lb/A in 2004. This represents an increase of 3.2 million hundred weights of rice each year, worth a conservative 23 million dollars per year to Louisiana rice farmers. This project is complementary to current breeding efforts to develop superior varieties for the southern rice growing area by improving major agronomic traits of current varieties, which include disease resistance, yield components, and grain quality.

What was done: This project has the responsibility to develop long-grain varieties using doubled haploid (DH) technology. In 2004, 219 new crosses were made by using bridging parents, which have high yield, resistance to blast and sheath blight, and high regeneration ability. About 12,474 DH plants were regenerated. Field evaluations consisted of 103 F₂ populations, 20,000 progeny rows, 200 entries in Preliminary Yield (PY) tests, 20 entries in Advanced Yield (AY) tests, and 10 entries in the URRN and Commercial Advanced tests. Dozens of DH lines with various new plant types have been created, selected, and advanced. These lines recombine the genes from various DH parents. Many new types have shown moderately compact plants, with erect leaves that differ from Cocodrie and Cheniere and have more tillers with thick canopy density that differ from Wells and Francis. The panicle sizes of the new lines are comparable with Cocodrie and Francis. Superior breeding lines developed so far have widened the genetic diversity of current cultivars. Among the 784 selected lines that were harvested, 344 lines showed row weights, which surpass 350 grams, while conventional check Cocodrie averages 310 grams per row. PY data for 2004 indicated that 20 out of 100 DH lines showed similar or better yields than Cocodrie (7,797 lb/A). PY797 (CCDR/9770532DH2), PY773 (AC425DH2/AC431DH2), PY848 (CCDR/9770532DH2), PY781

(AC110DH3/0043752), and PY774 (AC425DH2/ AC636DH1) showed yield increases of 9.6, 8.3, 5.7, 5.6, and 2.3%, respectively. The AY data indicated that 3 of 20 DH entries showed better yields than Cocodrie. AY13, AY7, and AY2 showed 4.1, 3.5, and 1.8% yield increases compared with Cocodrie (7,734 lb/A). Five of these lines (AY and PY) will be advanced to the 2005 URRN and Commercial Advanced tests. Preliminary yield data of the URRN trial (LA, AR, MS, and TX) showed that 10 DH lines performed well. LA2011 (9,147 lb/A), LA2128 (8,524 lb/A), LA2071 (8,491 lb/A), LA2062 (8,336 lb/A), and LA2042 (8,204 lb/A) were ranked 1st, 6th, 8th, 16th, and 28th among 200 entries.

Impact: Long-grain rice varieties occupy the majority of U.S. rice production. The market for long-grain rice is both local and international. Global climatic changes signal the demand for U.S. long-grain rice, particularly in international markets, could increase in the future. Harnessing biotechnology and conventional approaches should expedite the development of high yielding rice varieties.

Sources of funding: State Funds, Louisiana Rice Research Board grants

Federal Goal 1

Title of Research Project: Development of Medium-Grain and Special Purpose Rice Varieties for Louisiana

Key Theme: Agricultural Competitiveness; Agricultural Profitability

Xueyan Sha, Assistant Professor, and Steve Linscombe, Professor, Rice Research Station, LSU AgCenter

Issue: Medium-grain rice is the second most popular type of rice grown in Louisiana (with long-grain rice being first). Even though the medium-grain rice acreage has decreased in recent years, an average of 22,000 acres of medium-grain rice was planted in Louisiana from 1999 to 2004. The current predominant medium-grain variety 'Bengal' has been grown for over 12 years. The development of medium-grain varieties with much improved yield potential, as well as disease resistance, will certainly help the rice industry not only in Louisiana but also in the southern rice growing region. The demand for special purpose aromatic rice has increased dramatically over the past two decades. Most of the aromatic Jasmine and elongating Basmati rice in the U.S. market is imported, and the volume of such imports is increasing every year. Special purpose rice varieties that can be economically grown in Louisiana and southern United States will fit that fast growing and high value niche market.

What was done: Field tests in 2004 included 135 transplanted F₁s, 102 space-planted F₂s, and 17,234 progeny rows ranging from F₃ to F₈ generations. Preliminary yield tests included 69 replicated entries and 185 single plot entries. Ten experimental lines were tested in the Uniform Regional Rice Nursery in five southern rice producing states and/or Commercial Advanced tests in 10 locations across Louisiana. A total of 356 new crosses were made. Of these, long-grain,

Clearfield medium-grain, and specialty-purpose crosses accounted for 203, 85, and 68, respectively. Of 17,234 progeny rows planted this year, 818 rows were bulked for next year's yield tests. A medium-grain experimental line LA2183 consistently showed high yield potential and resistance to blast, straighthead, and panicle blight. It was approved for release in December 2004 as 'Jupiter' by LSU Agricultural Center. LA2140, a Jasmine-type specialty line, has continued to show promise both in yield and quality. Increases of this line have been made for a potential varietal release.

Impact: Although the advancement of rice production technology played an important role in recent yield increases, the majority of these yield increases can be attributed to new varieties developed in this program, such as Bengal. Rice growers in Louisiana and other southern states are facing new challenges, such as low prices, conservation issues, and tight regulation of pesticide use. Improved medium-grain varieties with high yield potential and pest resistance can help rice growers to increase production while reducing the cost and meeting conservation goals. Development of improved special purpose rice varieties adapted to Louisiana environmental conditions will help the Louisiana rice industry obtain a sizable portion of this fast growing, high value rice market, both domestically and internationally.

Sources of funding: State funds, Louisiana Rice Research Board grants

Federal Goal 1

Title of Research Project: Improving Yield and Seed Quality of Soybean

Key Theme: Plant Germplasm

Steve Moore, Professor, Dean Lee Research Station, LSU AgCenter

Issue: Reduce weathering damage to soybeans caused by late-season rainfall and identify superior commercial varieties for agronomic performance.

What was done: Soybean germplasm with superior weathering-resistance bred in the LSU-AgCenter produced higher yields than all but one conventional commercial variety in the Maturity Group V test at Alexandria. Superior conventional and glyphosate-resistant commercial varieties were identified for production.

Impact: Weathering-Resistant Cultivars Soybeans have thin seed coats and high oil content, making them particularly susceptible to deterioration by late-season rainfall after crops reach maturity. The State lost an estimated 20 million dollars due to weathering in 2001 and over an estimated 40 million dollars in 2002. Genes exist in the soybean genome that reduce pore number and pore depth, causing the seed coat to be less permeable to water. Seed with impermeable seed coats are called "hardseeded" and have vastly superior resistance to weathering. In an earlier study, hardseeded varieties had germination exceeding 90% when harvest was delayed for two months in central Louisiana while the germination of a parent line

with a normal seed coat was 2%. Soybean cultivars with the impermeable seed coat trait have now been developed in the LSU AgCenter that had highly competitive yields in the commercial Maturity Group 5 conventional variety test at Alexandria in 2005. The top yielding variety was 'DK 5995' which had a yield of 57 bushels per acre. LSU soybean lines 'DL9538-10', 'DL9583-6', and 'DL 9538-46' finished in the next three places at 56 bushels per acre. There is interest by private companies to market hardseeded varieties. An agreement was reached with Monsanto in 2004 and the glyphosate-resistant gene is now being crossed into hardseeded lines in winter nursery. The goal is to market these weathering-resistant cultivars through a Monsanto subsidiary company. It is anticipated that hardseeded soybean varieties will greatly reduce loss of seed quality due to weathering. Commercial variety tests of about 200 commercial soybean varieties were planted at six locations across the State in 2004. Data were used to recommend superior varieties to producers. If recommended varieties were produced on 40% of the soybean acreage in Louisiana and resulted in a 5-bushel increase, there would be a gain of about 12 million dollars in gross profit (@ \$6/bu).

Sources of funding: The weathering-resistant cultivars were developed in the past using funds from the Louisiana Soybean and Feed Grains Research and Promotion Board, although this program was not funded in 2004. Fees are collected from commercial companies for soybean varieties entered in the LSU AgCenter performance trials.

Federal Goal 1

Title of Research Project: Cane Sampling, Yard Losses, and Energy Utilization in Raw Sugar Factories

Key Theme: Agricultural Competitiveness; Agricultural Profitability; Efficiency

Harold Birkett, Associate Professor, Audubon Sugar Institute, LSU AgCenter

Issue: To improve the accuracy of the core sampling method for cane quality analysis, to determine the loss of sugar in the cane yard from receipt of cane to processing, and to determine the most cost effective manner of improving the energy efficiency so that increased quantities of imbibition water can be accommodated.

What was done: In 2004, data was gathered on the operating conditions of multiple effect evaporators at several sugar factories throughout the operating cycle. Using a computer program that was written in 2003 to solve the material and energy balances and calculate the heat transfer coefficients, the data gathered in 2004 along with data gathered in previous years were analyzed to obtain individual evaporator vessel heat transfer coefficients. The data is currently being analyzed to determine the factors that affect the heat transfer coefficient. The factors currently being considered are the concentration (Brix) of the material in the vessel, the temperature of the heating steam used, the evaporation rate, and the time that the unit had been in operation since the previous cleaning. Additional factors may be included depending on the accuracy of the predictions.

Impact: Most of the Louisiana sugar factories require more steam than can be provided from the available fuel and hence burn natural gas as an auxiliary fuel. Better data on evaporator performance and factors affecting the heat transfer coefficient will allow for more cost effective evaporator designs and energy savings. Natural gas usage typically costs the Louisiana sugar industry about \$6,000,000 per year. Most of this gas usage can be eliminated by appropriate evaporator designs.

Sources of funding: State and American Sugar Cane League.

Federal Goal 1

Title of Research Project: Sugar Processing Microbiology

Key Theme: Agricultural Profitability; Efficiency; Food Handling; Food Quality

Donal Day, Professor, Audubon Sugar Institute, LSU AgCenter

Issue: Development of solutions to problems in sugar manufacture that are of microbial origin. The proposed research concentrates on defining problems of microbial origin that effect the production of raw cane sugar and developing practical solutions to those problems.

What was done: Research focused on practical microbial control at the sugar mill, through direct inspection and control advice to the operating staff at each mill in Louisiana. Laboratory developments were on new cheaper methods for dextran monitoring and biosafety through use of a new biocide developed in prior years. A Phage-display antibody based technology for monitoring dextran is now ready for commercial development, requiring an investor for commercialization.

A trial of the biocide mentioned previously was conducted for controlling slime in a cooling tower at a commercial sugar mill. It will be repeated in 2005.

Studies have been initiated on the effects of microorganisms on sugar loss in cane mud filters.

Impact: Sugar is a major component of Louisiana's agricultural sector. The direct value of this crop, not including value-added calculations is in excess of \$640,000,000. Microbial losses during sugar production are small but not trivial, and range from sugar loss due to undesirable polysaccharides to equipment loss due to corrosion from microbially generated acids. Control of these losses can significantly improve the operating costs of sugar mills.

Dextran is a continuing economic problem in sugar production. The primary source is from stale cane. The ability to rapidly detect stale cane as it reaches the sugar mill prior to processing would be of great value. The volume of analyses required needs an alternative analytical method than is lower cost than currently available.

Sources of funding: State

Federal Goal 1

Title of Research Project: Minimization and Removal of Evaporator Scale in Raw Sugar Factories

Key Theme: Agricultural Profitability

Peter Rein, Professor and Head, Audubon Sugar Institute, LSU AgCenter

Issue: Reducing the cost of cleaning evaporators and the downtime which reduces sugar mill capacity.

What was done: Work continued on the on-line evaluation of evaporator heat transfer coefficients. The set of evaporators at St James mill fitted with the instrumentation necessary to calculate heat transfer coefficients in individual evaporator vessels on line with the aid of a computer model running in real time was used to generate additional data. The data now obtained has enabled a new correlation of evaporator heat transfer coefficients to be developed. A model of scaling behavior in evaporators has been developed. Scaling is most severe in the last effect.

The pilot plant falling film plate evaporator set up to run in parallel with first and final effect evaporators at Cinclare mill was operated again in 2004. Problems were experienced with blocking up of the heating surfaces, which had to be chemically cleaned before reasonable results could be obtained.

Publication:

- i. Solberg D.; Rein P.W.; Schlorke D. (2004): Online evaporator heat transfer coefficient measurement. Am. Soc. of Sugar Cane Tech. Conf., Baton Rouge

Impact: Valuable information was generated at St James mill, to assess the performance of individual evaporator vessels. This enabled a reduction in cleaning frequency to be employed on the first two effects, saving chemical cleaning costs. The data generated was useful in assessing the efficiency of the cleaning of individual vessels. Modeling the scaling characteristics of each vessel enabled predictions to be made of when cleaning will be necessary. The data was also used to evaluate the effect of the modified liquid feed arrangements on each vessel.

The data generated will be able to be applied to other evaporator arrangements in Louisiana.

Data has been generated at Cinclare that will provide a useful comparison of the heat transfer performance of different types of evaporator.

Sources of funding: State

Federal Goal 1

Title of Research Project: Improvements to Sugar Mill Recoveries and Efficiencies

Key Theme: Agricultural Profitability

Peter Rein, Professor and Head, Audubon Sugar Institute, LSU AgCenter

Issue: Improving the efficiency of sugar mills involves reducing the losses of sugar which occur in processing.

What was done: The accurate survey of molasses produced in all Louisiana mills was continued. This provides good information to the processors on the degree to which molasses has been exhausted, and shows what room for improvement exists.

Collaboration with Raceland mill was continued in an effort to measure accurately the inputs and outputs of the process to correctly quantify losses of sugar in bagasse, in molasses, in filter cake and undetermined losses. Accurate analyses by HPLC of juice, syrup, various intermediate massecuite streams and final molasses was done.

An evaluation of two Coriolis meters measuring the molasses flow for factory control purposes was undertaken.

Extension of HPLC analyses to weekly composite juice samples at some of the mills was initiated, to help quantify losses.

Efforts to improve the factory efficiencies through the use of more instrumentation and instrumentation culminated in an all-day symposium with the processors on the subject.

Publications: Rein P.W. (2004): What does it cost the Louisiana industry to process trashy cane and are there any methods to reduce these losses? Sugar Bulletin. 82, 11, 13-17.

Rein P.W. (2004): Instrumentation and automatic control. Sugar Bulletin. 82, 7, 11-12

Impact: The losses of sugar in nearly all the Louisiana mills has reduced over the last 4 years as the molasses survey has come to be accepted and the understanding of how they represent true losses of sugar in molasses has been accepted. A reduction in average purity since 2002 of 1.5 units of purity translates into an increase in sugar production of 0.5%. Based on an average crop, this represents an increase of 7500 tons of sugar per year, with a value of \$4.5 million.

Substantial progress in understanding how and where losses of sugar in the process occur has been made at Raceland. It is expected that this will lead to further substantial savings in other loss areas.

Sources of funding: Hatch

Federal Goal 1

Title of Research Project: Optimization of Sugar Crystallization Processes

Key Theme: Agricultural Profitability

Peter Rein, Professor and Head; Michael Saska, Professor, Audubon Sugar Institute, LSU AgCenter

Issue: Crystallization is a major unit operation in sugar processing and improvements here translate to significant benefits for processors.

What was done: Because of the move of the Audubon Sugar Institute from the Baton Rouge campus to St Gabriel, the pilot plant vacuum pan crystallizers were disconnected for most of the year. This has put work on crystallization on hold for most of the year. The larger of the two pans was connected up and the automatic control systems re-installed. The opportunity was taken to improve the installation with some new control elements.

A course on pan boiling was run at Audubon using this pilot plant pan. Little progress was made in identifying what action to take in the event of “pan death syndrome”, where the pan stops boiling due to particular molasses characteristics. This phenomenon did not recur in the 2003 or 2004 season.

Impact: Experience gained on the pilot plant system was used in the design of some automatic control schemes in some of the Louisiana mills.

Work done in the previous year in the pilot plant on crystallization rate measurements was analyzed. Useful results have been obtained which are being prepared for publication.

Sources of funding: Hatch

Federal Goal 1

Title of Research Project: Removal of Color in Sugar Processing and Effluent Treatment

Key Theme: Agricultural Profitability

Peter Rein, Professor and Head; Michael Saska, Professor; Donal Day, Professor; Audubon Sugar Institute, LSU AgCenter

Issue: The direct production of white sugar at the Louisiana mills can lead to significant added value, in producing a product that attracts a higher price than raw sugar.

What was done: Work on the effect of treatment of clarified juice with different adsorbents on a lab scale was completed and resulted in an MS dissertation in chemical engineering being awarded.

The work was taken further in a pilot plant at St James mill. The color results comparing the feed color to the final product color showed that 80 to 90% decolorization could be achieved. Although more samples are still to be analyzed, the results are very promising even with minor setbacks occurring. The main problem encountered was the failure of the peristaltic pump tubing with prolonged use. This problem improved by changing the pump head and the peristaltic tubing but the tubing still required frequent changing. Other problems encountered were associated with the blocking of various thin tubes. Also, when an increased throughput was passed through the column a larger pressure drop was witnessed across the bed. This could be attributed to increased mud deposition, which was experienced at low flow-rates too when large amount of mud were present in the feed cane.

Crystallization tests are to be performed on syrup, which was concentrated and collected using a small evaporator. Approximately 20 gallons of syrup were collected which will enable ion exchange work and other treatments to be performed on the product at a later stage.

Low temperature regenerations were used to clean the column once fouled. The regenerations were performed every 7-10 days. The cleaning stages included a high up-flow water wash, an acidic treatment and then a series of alkaline washes. Various concentrations and flow-rates were tried during the regenerations as well as different regenerant temperatures.

The patenting of this process is being pursued.

A microorganism that produces a charged gel was isolated and grown. This gel appears to have the ability to bind up color found in sugar juices.

Impact: The production of edible sugars directly in sugar mills is an opportunity to diversify mills production with high added value products. The results of this study (product characteristics and production schemes) will show the value to the industry or individual mills of direct production of direct consumption sugars. For a mill processing 1 million ton cane /yr, the potential benefit in terms of increased revenue is considered to be 3c/lb, or \$6 million/yr.

Sources of funding: Hatch

Federal Goal 1

Title of Research Project: A New Sugarcane for Louisiana Growers and Processors

Key Theme: Agricultural Competitiveness

Kenneth Gravois, Professor; Keith Bischoff, Assistant Professor; St. Gabriel Research Station, LSU AgCenter

Issue: The development of improved sugarcane varieties has been a major factor in sustaining a competitive sugarcane industry in Louisiana. With stagnant sugar prices, new sugarcane varieties have offered higher yields, reduced production costs through insect and disease resistance, and improved stubble longevity. Concentration on economically important traits in the LSU AgCenter's sugarcane breeding program has been a major factor enabling a vibrant sugar economy for south Louisiana. New sugarcane varieties have been developed by both the LSU AgCenter and the USDA-ARS sugarcane breeding programs since the late 1920s. With 88 percent of Louisiana's sugarcane acreage devoted to a single variety, LCP 85-384, vulnerability to new diseases and insects is a grave concern. Another concern is that with early start dates for the processing of sugarcane in Louisiana, growers desire varieties with early maturity.

What was done: The LSU AgCenter sugarcane breeding program is a continuing project with the goal of developing improved sugarcane varieties for Louisiana growers and processors. The current program is a 13-year process that begins with crossing of elite parents and ends with seed distribution to the growers. On May 3, 2004, L 97-128 was released to Louisiana sugarcane growers and processors. The new variety is the product of a cross between LCP 81-10 and LCP 85-384. L 97-128 has high cane yield, early maturity, high sucrose content, resistance to sugarcane rust disease, and good ratooning ability. Sugarcane variety development is a cooperative process involving the LSU AgCenter, the USDA-ARS, and the American Sugar Cane League.

Impact: The impact of LCP 85-384 is well documented. The Louisiana sugar industry would be in dire straits if not for the release of such an impact variety. To no one's surprise, sugarcane growers have quickly expanded their acreage of LCP 85-384, which was grown on 88 percent of the state's 2003 acreage. With so much acreage devoted to a single variety, new variety releases are needed to avoid the problems associated with a monoculture. When LCP 85-384 was released in 1993, the new variety was resistant to the race of sugarcane rust disease found in Louisiana. Beginning in 2000, LCP 85-384 began showing increasing signs of susceptibility to sugarcane rust disease. Apparently, a race change occurred making the once resistant LCP 85-384 susceptible to this disease. The new variety release is resistant to sugarcane rust disease and should afford Louisiana's grower's a choice where this disease is prevalent. L 97-128 should also give Louisiana's approximately 750 sugarcane growers another option of maintaining high yields and thus decrease the acreage devoted to a single variety. The early maturity and high sucrose content is unprecedented in a Louisiana sugarcane variety release, giving growers an early season choice for harvest.

Sources of funding: State, Hatch, American Sugar Cane League

Federal Goal 1

Title of Research Project: Sugarcane varieties keep Louisiana in the sugar business

Key Theme: Agricultural Competitiveness

Kenneth Gravois, Professor; Keith Bischoff, Assistant Professor; St. Gabriel Research Station, LSU AgCenter

Issue: The development of improved sugarcane varieties has been a major factor in sustaining a competitive sugarcane industry in Louisiana. With stagnant sugar prices, new sugarcane varieties have offered higher yields, reduced production costs through insect and disease resistance, and improved stubble longevity. Concentration on economically important traits in the LSU AgCenter's sugarcane breeding program has been a major factor enabling a vibrant sugar economy for south Louisiana. New sugarcane varieties have been developed by both the LSU AgCenter and the USDA-ARS sugarcane breeding programs since the late 1920s. Recently released varieties that were developed by the LSU AgCenter were LCP82-89, LHo 83-153, LCP 85-384 and LCP 86-454 and L 97-128. LSU AgCenter sugarcane varieties are released in cooperation with the USDA-ARS and the American Sugar Cane League. At no time in the history of the Louisiana sugar industry have LSU AgCenter sugarcane varieties so dominated the state's sugarcane acreage.

What was done: Beginning in 1981, steps were taken to reorganize the LSU AgCenter sugarcane breeding program. New photoperiod, crossing and greenhouse facilities were built at the St. Gabriel Research Station with the assistance of the Louisiana sugarcane industry. The seedling greenhouse was expanded in 2000 to handle over 100,000 seedlings. Successful variety development programs also require the cooperation of other disciplines, such as plant pathology, entomology, and genetics. With the proper team in place, sugarcane breeding efforts were undertaken with the goal of having LSU AgCenter sugarcane varieties significantly impact the Louisiana sugarcane industry.

Impact: LCP 85-384, released in 1993, has significantly impacted the Louisiana sugar industry. The sugar yields of LCP 85-384 are about 20 percent higher than sugar yields of other previously grown sugarcane varieties. Along with excellent sugar yields, LCP 85-384 also has good disease resistance, excellent stubbling ability, and cold tolerance. The stubbling ability of LCP 85-384 allows farmers to grow more crops from a single planting, which reduces production costs. The good cold tolerance of LCP 85-384 gives farmers additional insurance against the harmful effects of early winter freezes during harvest. Sugar processors have benefited by the increased utilization of mills due to higher sugarcane yields. Sugarcane growers have quickly expanded their acreage of LCP 85-384, which was grown on 88 percent of the state's 2003 acreage. It is estimated that the economic impact of LCP 85-384 in 2003 to be about \$250 million. The LSU

AgCenter sugarcane breeding program has had, and will continue to have, a positive impact on keeping Louisiana in the sugar business.

Sources of funding: State, Hatch, American Sugar Cane League

Federal Goal 1

Title of Research Project: Biobased Nonwoven Composites

Key Themes: Biobased Products

Y. Chen, Associate Professor, School of Human Ecology, LSU AgCenter

Issue: Biobased products development and environmental and economic performance is a research priority solicited in the current USDA/DOE Biomass R&D Initiative. The undertaken research is focused on producing biobased nonwoven composites for auto interior applications using agricultural crops and residues. With a greater concern for environmental protection, it is more and more important for automakers to improve vehicle recyclability. The European Commission recently proposed a European Guideline 2000/53/EG that sets a goal of improving automotive recyclability, 85% of a vehicle by weight being recyclable by 2005. This recyclable percentage will be increased to 95% by 2015. In the U.S., such requirements have not been regulated. However, any automaker that exports cars to the EU countries must comply with these requirements. This industrial need provides a new opportunity for the U.S. agriculture to support the industrial base by developing biomass technologies for producing biobased material products to replace petrobased materials.

What was done: Research progress achieved in this reporting period is summarized in the three aspects: improvement of processing technology for making bagasse-based nonwoven composite; fabrication of light-weight biobased composites and biodegradable acoustic composite; and evaluation of mechanical and acoustical performance of the biobased composites. A protocol of producing pure bagasse nonwoven composite using a wetlaid method was developed. This new approach reduced the number of processing steps and eliminated use of chemical binders. Therefore, it had a great potential to lower production costs and achieve the economic goal for marketing. A light-weight bagasse-based composite was developed in cooperation with the Louisiana Department of Economic Development. Original laboratory data indicated that the weight of bagasse composite could be reduced over 10% with use of a special polymer additive. Auto makers are particularly interested in the light-weight biobased composites. An acoustic nonwoven composite was produced using activated carbon fiber and ramie or cotton fibers. This biobased composite was biodegradable and featured a superior ability to absorb low-frequency sound waves. There was a potential market for this environmental-friendly sound barrier material. Mechanical and acoustical properties of the biobased nonwoven composites were instrumentally evaluated. Composite complex deformation and sound absorption coefficient were tested in accordance with the ASTM methods. This work was a type of fundamental study following the composite thermal analysis completed in the last reporting year.

Impact: The research is targeting the national research priority for developing biobased products from agricultural renewable resources. Implementation of this research helps develop a national and international research cooperation. The research accomplishments also make an impact on the sugarcane industry, auto industry, and advanced material manufacture that is categorized in the state strategies for economic development.

Sources of funding: Hatch, multi-state, and Governor's Biotechnology Initiative.

Federal Goal 1

Title of Research Project: An Examination of Market Structures and Issues Impacting the Louisiana Secondary Forest Products Industry

Key Themes: Niche Market

R.P. Vlosky, Professor, Department of Renewable Natural Resources, LSU AgCenter

Issue: Understanding markets is critical to industry viability

What was done: 1) A comparison of the Louisiana Forest Stewardship Program (LFSP) and National Forest Certification Programs. This research compares the LFSP with guidelines of four sustainable forest management/certification approaches. Results: Randomly selected LFSP management plans used in the study would generally not meet criteria of these programs. 2) Certification Involvement by the Value-Added Wood Products Industry. This study determined attitudes of value-added manufacturers with regard to current and potential participation in certification. Results: Respondents do not have a very clear understanding of certification or of chain-of-custody requirements; only two percent of the respondents completely understand certifier services and objectives and a third have no familiarity with major U.S. certifiers. Nearly half would not be willing to pay a premium for certified raw materials. 3) Home Builder Attitudes about Treated Wood. Public concerns regarding the safety of treated wood are increasing. This research ascertained homebuilder attitudes and preferences for building materials with an emphasis on treated wood products. Results: Respondents generally have a positive opinion of the safety and performance of treated wood. A large majority of respondents indicated that they are willing to use the product in building a new home. 4) A comparison of the Internet Use in the Forest Products Industry in the North Adirondack Region of New York and the State of Louisiana. A study was done to determine Internet business applications and involvement by small wood products manufacturers in upstate New York and the State of Louisiana. Results: There was a statistical difference in perceived website effectiveness. Seventy-three percent of New York respondents believe that their websites are either "very effective" or "somewhat effective" in attracting new customers as opposed to only 33 percent of Louisiana respondents. Similarly, 62 percent of New York respondents felt that their websites are "very cost effective" compared to 40 percent of Louisiana respondents. 5) Success and Failure of Forest Industry dotcoms. Currently active or failed forest sector eMarketplaces were surveyed to ascertain reasons for failure and survival. Results: Overcapitalization, lack of strong

business plans, and lack of understanding of the forest sector landscape were determined to be major contributors to dotcom failure. 6) Market Potential for Tropical Hardwood Lesser-Used Species from Ghana. Increasing demand for traditional market species of Ghanaian timber has led to dwindling stocks and quality within the Ghanaian tropical forest. As a result, there is a pressing need to introduce lesser-used species (LUS) to serve as substitutes. Results indicate that a majority of Ghanaian forest products manufacturer respondents are willing to use LUS in their raw material mix, provided export buyers or manufacturers are willing to accept them. Overall, it is perceived that export buyers will not accept LUS products in the marketplace unless there is adequate technical information and effective marketing strategies.

Impact: Certification: As certification becomes part of the sustainable forest management landscape, Louisiana stakeholders at every step in the value chain from the forest to the consumer, including the value-added producers queried in this study, need to be aware of current activities in this arena. This information also may help in the development of viable alternative strategies to third-party certification in Louisiana as well as help landowners develop certification planning and marketing tools for those that wish to participate in the third-party certification process. Treated Wood: Approximately 55 percent of Southern pine is treated, making this issue of paramount importance for Louisiana primary softwood lumber and other wood product producers. eBusiness: Using the Internet to buy and sell wood products is well established. The industry is currently experiencing the transition period between early adoption and growth. This project provides an approach suitable for researching influences adoption of the Internet by relatively small value-added wood products manufacturers. Results can help small manufacturers make decisions regarding eBusiness adoption and implementation. Use of LUS: The implications for Louisiana clients are in the secondary value-added products sector. The successful introduction of LUS from countries like Ghana can provide Louisiana producers with alternative sources of tropical raw materials. This research will aid the forest sector companies and other stakeholders to make strategic and tactical decisions in all of these important areas/issues.

Sources of funding: McIntire-Stennis; State; grants

Federal Goal 1

Title of Research Project: Mechanical Properties of Composite Transmission Poles from Plantation-Grown Wood and Recycled Poles

Key Theme: Adding Value to New and Old Agricultural Products

Todd Shupe, Associate Professor, School of Renewable Natural Resources, LSU AgCenter

Issue: New wood products are needed to add value for the industry

What was done: Experiments were conducted to investigate strip thickness and strip number effects on the flexural properties and shear stress of wood composite poles. Reduced-size (diameter = 7.6 cm (3 in), length = 1 m (46 in) and full size poles (diameter = 10.2 cm (4 in),

length = 6 m (20 ft) were manufactured for this purpose. Four strip thickness levels and three strip number levels for the reduced-size pole and three thickness levels and two strip number levels for full-size poles were chosen as experimental variables. The lumber was cut into strips bonded with resin in molders, and the resulted poles were evaluated in a cantilever test. Results show that both strip thickness and strip number had significant effects on flexural properties and shear stress. Maximum stress of reduced-size composite poles was linearly correlated to the variation of strip thickness. Strip number had negative effects on the maximum stress and positive effects on Young's modulus. A theoretical analysis was carried out to study the deflection and stress of composite poles. Governing differential equations were derived from high-order differential equations based on the principle of minimum potential energy theorem. Transverse shear and body force were included in the model. Investigations have also been carried out to find glue-line effects on the stress and deflection analyses of composite poles. The analytical solution is modeled with the [mite element analysis using ANSYS. Both theoretical and analytical solutions were verified by the experimental data. One graduate research assistant is dedicated to this project.

Impact: This research will help reduce the demand for pole sized timber, increase environmental stewardship, and decrease the amount of preservative treated wood waste in landfills. There also is substantial potential for rural economic development by applying this technology to primary producers of wood products for value-added production of composite poles and other engineered wood products.

Sources of funding: McIntire-Stennis; State; grants

Federal Goal 1

Title of Research Project: Characterization Of The Compositional And Functional Properties Of Rice Starch As A Potential Value-Added Food Ingredient

Key Theme: Adding Value to New and Old Agricultural Products -

Joan M. King, Associate Professor, Department of Food Science, LSU AgCenter

Issue: The rice industry suffers from a glut in the market, which has driven the price for rice as a whole kernel down. The economic returns for rice has dropped from \$4 / bushel to less than \$2 / bushel, while those of the soybean and corn industries have remained steady from 1998 to 2002. The total 2001 U.S. production value for corn and soybeans were \$19 billion and \$12 billion, while rice was only \$0.9 billion. The main difference between these industries is that corn and soybean are not only sold whole but are made into value-added ingredients. The modification of corn starch to produce value-added food ingredients has driven the selling price of native corn starch from \$0.20/pound to \$2.50/pound for modified corn starch-based fat replacers. There is a potential of a 10-fold increase in the value of rice starch, from the development of rice starch-based fat replacers and resistant starch, through utilization of the same technology.

What was done: The overall goal of this research is to develop value-added rice starch based ingredients. The specific goal of this research is to enhance the resistant starch properties of rice flours and starches. Our main objectives are 1) to determine the effects of enzymatic treatments on the resistant starch properties of rice starch and flours; 2) to determine if oxidized starches with resistant starch properties can be formed using ozonation with and without additives. Objective 1) Studies on enzymatic treatments of rice flour and starch to enhance resistant starch properties were successful. Ingredients with a range of resistant rice starch levels could be produced on a lab scale. Some showed stability to heating and had viscosity properties similar to the starting material. A patent application has been submitted. The next steps are to determine scalability of the results. Objective 2) Chemical modifications such as esterification, oxidation, or etherification have been done to improve functional properties of starches. Ozonation may be a simpler method for modifying starches. We tested if ozonation with and without addition of amino acids could affect the pasting properties of rice starch. Oxygen was used as a control. Commercial rice starch that was treated with oxygen presented the greatest cooking stability with leucine and without additives compared to untreated control. Ozonated rice starch with lysine reduced viscosity up to 1400 cP compared to control and had the least retrogradation potential. Isolated starch treated with oxygen or ozone without additives had increases in paste viscosity of 140 cP to 600 cP depending on the time of treatment. Isolated starch ozonated for 30 minutes and lysine added showed greatest cooking stability and least retrogradation tendency. Processing commercial rice starch or starch isolate by ozone for 30 minutes with lysine produced a starch product that had the lowest pasting time, paste viscosity and retrogradation tendency and the greatest cooking stability. Information from this research can be used to develop new starch ingredients with various functionalities without using typical chemical modifications. Further study is necessary to determine the effects of ozonation on resistant starch levels.

Impact: The information from this research could be utilized to produce value-added food ingredients from rice starch and flour. There could also be an increase in the value and use of broken rice kernels, which make up 15% of milled rice in the U.S., through their use in the production of starch-based food ingredients. This research will benefit the Louisiana rice farming and processing industries by providing a new utilization for rice that will result in an increase its national competitiveness and demand in the food ingredient and product market. This will in turn increase the economic value of rice and increase the amount of production and processing done by the existing industry and result in new facilities being opened. This research will also provide an easily incorporated source of food fiber that can be beneficial in helping to control or prevent diseases such as diabetes and cancer.

Sources of funding: State, Hatch, Louisiana Rice Research Board

Federal Goal 1

Title of Research Project: Investigating Long-Term Structural Performance of Borate Modified Oriented Strandboard

Key Theme: Adding Value to New and Old Agricultural Products

Wu, Q., Professor; Roy O. Martin, Sr. Professor of Engineered and Composite Forest Products, LSU AgCenter

Issue: New, environmental friendly, wood preservatives are needed

What was done: This study was conducted to examine the effects of powder zinc borate (ZB) and calcium borate (CB) on resin gel time, strength, swelling, leaching, termites, decay, and mold resistance properties of oriented strandboard (OSB). It was found that gel time of phenol formaldehyde (PF) resin decreased with increased amount of ZB, indicating interaction between the borate and the resin. The reduced gel time was partially recovered by using polyethylene glycol (PEG) in combination with ZB. Although panel stiffness was not affected by borate up to a 3.5 percent boric acid equivalent (BAE) level, ZB and CB showed a negative effect on the bending and internal bond (IB) strength. Thickness swelling (TS) of treated panels after 24-hour water soaking increased with borate level. ZB-treated OSB displayed less TS than CB-treated OSB at an equivalent BAE level. CB with a larger particle size caused significant TS. However, the chemical with a smaller particle size helped bring TS to a stable and acceptable level. A certain portion of borate leached out from OSB samples under the water-soaking conditions. The leaching rate varied with wood species, borate types, and amount. The use of borate with a smaller particle size helped reduce the leaching rate. The relationship between assayed BAE and leaching time followed a decaying exponential function for ZB and a decaying power function for CB. Laboratory termite tests showed that wood weight loss decreased and termite mortality increased with the increased BAE level. At the 1 percent BAE or above, there was little damage on wood samples. There were significant correlations among termite mortality, weight loss, and visual damage ratings. Both borate chemicals provided an excellent decay and mold resistance for OSB. The information on various properties of borate-modified OSB is of significant value for developing durable structural panels from southern wood species. Further development of the products with other resin and chemical systems is currently on-going.

Impact: The research provides comparative properties between zinc and calcium borate modified OSB and thus identifies alternative treating methods for structural OSB (i.e., calcium borate). This will allow the OSB manufacturers, which are not included in the license agreement for using zinc borate, to manufacture chemically modified OSB.

Source of funding: McIntire-Stennis; State; grants

Federal Goal 1

Title of Research Project: Investigating the Influence of Voids on the Engineering Constants of Oriented Strandboard

Key Theme: New Uses of Agricultural Products

Wu, Q., Professor; Roy O. Martin, Sr. Professor of Engineered and Composite Forest Products, LSU AgCenter

Issue: New forest products are needed to improve Louisiana's economy

What was done: A laminated model based on continuum theory combined with finite-element analysis (FEA) was used to predict the influence of voids on engineering constants of oriented strandboard (OSB). Cylindrical voids with three material density classes in the void region were considered at various void volume fractions (VVF) and matrix anisotropies. It was found that the presence of voids resulted in substantial decreases in the elastic moduli and Poisson ratio of OSB. The hygroexpansion coefficients were affected little by voids. The elastic constants normalized with their void-free (matrix) values were found to depend little on the anisotropy of the matrix, especially at high VVFs. Increases of material density in the void region led to increases in predicted elastic constants. The predicted moduli values for the void models with certain material densities correlated well with available experimental data for the selected panel structures. The FEA provided a comprehensive numerical tool in predicting localized elastic properties of porous OSB. The model is the basis for modeling three-layer boards and for constructing in-plane modulus map of full-size panels. A silicon-gel coupled ultrasonic transmission (UT) was used to locate, map, and validate the horizontal density distribution in laboratory-made OSB. Test boards consisted of two replicates at each of the three densities and three resin-content (RC) levels. UT -Velocity, attenuation, and root mean squares were significant predictors of density for all panel types. The combined power-transformed variables led to a lesser variability in density prediction at both high RC and panel density levels and formed a better density model compared with the corresponding polynomial models. The predicted density point of each grid in the panel was validated on control charts within 10 percent tolerance limit of the average density. All 6 percent RC panels with densities of 0.60 g/cm³ or greater conformed well to the limit with declining conformity towards the 2 percent RC panels. The challenges in using a gel-coupled UT system for measuring wood composite properties were discussed.

Impact: The prediction provides important information on how flake property and its orientation distribution affect the panel engineering and durability performance for OSB. This will help design and manufacture more durable OSB.

Sources of funding: Competitive grant

Federal Goal 1

Title of Research Project: Linking Forest Stand Growth and Yield Models having Different Resolutions

Key Theme: Natural Resource Management

Cao, Q. V., Professor, School of Renewable Natural Resources, LSU AgCenter

Issue: Understanding the biometrics of forests is critical to their management

What was done: Data from the Southwide Seed Source Study were summarized and put in appropriate formats. Preliminary research involved attempts to link an individual tree model with a diameter distribution model. This phase of research is still ongoing.

Impact: Foresters have to make decisions on how to manage forest stands, or specifically, what kind of silvicultural treatments to apply. The treatments include site preparation, whether or not to fertilize, how to control undesirable species, when to thin, how to thin, how much wood to be taken out in thinning, harvest age, and regeneration method. These decisions are made based on information obtained from growth and yield models. Inaccurate models can therefore lead to poor decisions that might result in substantial losses to timber companies. The objective of this project is to produce superior growth and yield models that should help forest managers select correct strategies to optimize economic returns.

Sources of funding: McIntire-Stennis; State

Federal Goal 1

Title of Research Project: Effects of Selective Herbicide Application on Vegetation, Invertebrates, and Small Mammal Communities within Managed Pine Forests

Key Themes: Wildlife Science and Management

M.J. Chamberlain, Assistant Professor, School of Renewable Natural Resources, LSU AgCenter

Issue: Herbicides may have potential in wildlife management

What was done: Application of selective herbicides (imazypyr) generally improved vegetative characteristics for northern bobwhite quail. This improvement came through reductions in woody vegetation, reductions in vertical height of vegetation, and overall increases in abundance of quail food plants. Notably, the greatest net improvement to habitat following herbicide application occurred after a renovating prescribed fire during the second growing season following application. Invertebrate abundance was not affected by herbicide application, although invertebrate diversity generally improved from a bobwhite perspective. Small mammal

abundance was unaffected by herbicide application and diversity did not change over the course of the study.

Impact: Information resulting from this study provides land managers with opportunities to improve habitat for northern bobwhite quail using herbicides. This study also solidifies the notion that although herbicides offer land managers a valuable tool for managing habitats for bobwhite, herbicide in conjunction with prescribed fire produces the greatest net benefit to bobwhite quail.

Sources of funding: McIntire-Stennis; grants

Federal Goal 1

Title of Research Project: Applications of Molecular Genetics to the Breeding of Trees

Key Theme: Forest Crops

Stine, M., Associate Professor, School of Renewable Natural Resources, LSU AgCenter

Issue: Understanding of molecular genetics is critical to understanding tree breeding

What was done: This project developed genetic markers for use in genetic analyses. Random amplified polymorphic DNAs (RAPDs) and amplified fragment length polymorphism (AFLPs) were used in both basic and applied research programs. Linkage maps of RAPD markers were created for individual longleaf pine (*Pinus palustris*) and slash pine (*P. elliottii*) trees and for F1 hybrids of these species. Quantitative trait loci (QTLs) for early height growth in longleaf pine were mapped in F1 and backcross populations. The total number of genes estimated to regulate early height is from four to ten, depending on the crosses being examined. AFLP and RAPD markers were used to fingerprint eastern cottonwood (*Populus deltoids*) clones and for estimating patterns of genetic variation in natural populations found throughout the southeastern United States. The breeding of longleaf pine for early height growth was advanced with controlled pollinations and five plantations of longleaf pine x slash pine hybrids were established. A cottonwood clones bank, representing elite clones from throughout the southeastern US, was established at the LSU AgCenter and will be used for future cottonwood breeding programs.

Impact: This project developed breeding populations of longleaf pine, slash pine, their hybrids, and eastern cottonwood. It also developed molecular markers for use in genetics analysis and applied breeding programs. This research will enable tree breeders to select for important traits at an earlier age and will help diversify the species commercially grown in Louisiana.

Sources of funding: McIntire-Stennis; State

Goal 1 - Extension Program Summaries

- Licensed nursery and industry professionals received information annually from the extension commercial nursery and landscape systems program, with 40% - 50% of growers participating on a regular or occasional basis. Adoption of current recommended practices is primarily in the areas of irrigation, fertilizer management, and selling new plant material. Landscapers are adopting improved pest management strategies and learning to improve horticultural services provided to their clientele. Stakeholder input was requested by extension educators quarterly at meetings attended by representatives of the Louisiana nursery and landscape industry.
- The Louisiana commercial vegetable industry includes about 3,000 growers located in 51 of the state's 64 parishes, with various vegetable crops produced on approximately 9,000 acres. The impact of the extension commercial vegetable education program has been to increase vegetable yields and profits by growers using research-based information provided by extension faculty. These increases in both yield and profit are due to better selection of new varieties, employment of improved production techniques, and increased usage of direct marketing techniques.
- The extension cotton education program included 40 producers meetings, nine on-farm research projects with faculty from the AgCenter experiment station, 50 on-farm demonstrations, three field days, a weekly newsletter, and a cotton web page updated weekly. Additionally, e-mail updates on the current production situation were sent weekly to farmers and agribusiness representatives. Over 2,000 farmers, consultants, and industry personnel attended these educational programs. Advisory groups and a state-wide survey were used to identify direction for cotton extension programs. Five training sessions were held for extension parish faculty having cotton responsibility.
- Cotton producers, parish extension faculty, and agricultural consultants are educated by state extension faculty as an integral part of the IPM (integrated pest management) program, including training 15 parish agents and making 31 presentations at producer meetings throughout the state. Over 2,500 people from the cotton industry were educated by extension faculty at various producers' meetings and field days. With about 95% of Louisiana cotton now being produced using IPM techniques and practices, educational programs in this area continue to provide up-to-date research-based information. This educational material is vital for cotton production at a profitable level.
- In meetings with stakeholders, including dairy farmers, veterinarians, feed company representatives, and other agency representatives, problems with udder health, interpretation and use of dairy herd records, nutrition, waste management, heat stress abatement, and other management factors were identified. Dairy herd record training has continued for farmers and field men, with field days, seminars, conferences, producer meetings, farm visits, on-farm demonstrations, and research verification trials also conducted on a state-wide basis. As a result of these educational efforts, herds on the

Dairy Herd Improvement (DHI) program produced 4,200 pounds more milk annually. Due to collaborative efforts between extension and other producer groups and agencies, a mycoplasma mastitis monitoring program was developed and implemented on all Louisiana dairy farms.

- Approximately 5,000 samples are diagnosed annually by the extension disease, weed, and insect diagnostic lab. To greatly decrease the turnaround time, a digital distance diagnostic network was developed in cooperation with the University of Georgia. Extension parish agricultural agents have been trained to use the system. To-date, about 1,900 digital image samples have been processed, with savings to producers over the last five years estimated at \$1,000,000.
- The Master Horseman education program has trained 210 people in 12 multi-session seminars across the state, with the curriculum including both classroom and hands-on components. Nine additional Master Horseman programs will be conducted by extension in the coming year. Additionally, race horse seminars have drawn 200 people. Verification farms have reported improved profits from horse production. The verification program was initiated to establish model farms, which would then be utilized to educate additional horsemen. Graduates of the Master Horseman program have conducted five camps for youth.
- In order to keep the agricultural community aware of the market, production, and governmental issues that have the greatest potential for changing the landscape of agriculture in Louisiana, a state-wide Agricultural Outlook Conference was held, with over 200 people from the agricultural community attending. Additionally, five meetings were held throughout the state to introduce producers to marketing alternatives and strategies. Approximately 100 farmers attended these educational forums.
- In order to increase the general public's understanding and appreciation of forestry, a three-day forestry AgExpo display provided information to 11,200 students, vocational agriculture teachers, and the general public. This program was conducted by extension faculty in conjunction with the Louisiana Forestry Association and Louisiana Tech University, as part of an overall state-wide educational effort to promote public awareness of the importance of the forest industry to the state, and to provide general knowledge of the environmental aspects of forest management.
- Fruit and pecan education programs focused on providing growers information on variety selection, pest control, and marketing through producer meetings, field days, and newsletters. Though still a fledging industry, mayhaw orchard production has in 20 years progressed from wild fruit to a \$100,000 per year business. The Mayhaw Growers' Association has worked closely with extension during these years to make this industry a reality. Fruit and pecan educational meetings and training sessions included over 850 people. Over 80% of commercial growers said that they have adopted extension recommended management practices.

- In the past year, extension faculty conducted 25 educational meetings throughout the state, providing to producers information on various marketing strategies, with roughly 1,250 attending. Additionally, information on hunting lease enterprises was obtained from 10 producers from the Louisiana coastal area. From these data, a preliminary document was developed by extension that describes these enterprises in general terms, and gives examples of the costs for developing this type of enterprise. There is considerable interest by farmers across the state in using this type of enterprise to supplement farm income.
- Invasive plant species are of great concern in Louisiana, including cogongrass, tallow, parasol, and aquatic plants. A state-wide conference with an attendance of 117 people, including stakeholders from forestry, wildlife and fisheries, universities, and government agencies, provided ecological, biological, and management information. The conference was held as a part of the overall education program to teach stakeholders to identify and control invasive species.
- Agricultural producers face many risks each production year, and the ability to manage those risks effectively and efficiently often spells the difference in financial success and financial ruin. Producer meetings have been conducted by LSU AgCenter faculty to teach both row crop and livestock producers various marketing alternatives that can help manage market risk. The Marketing Agricultural Commodities (MAC) program continues to be offered state-wide, consisting of a curriculum of eight 3-hour seminars. Additionally, an Agricultural Outlook conference was attended by 200 people, with focus on marketing strategies, production, and governmental issues of importance to Louisiana agriculture. Eighteen catfish producers and one salmon producer received technical assistance training in conjunction with the Trade Adjustment Assistance (TAA) program, with completion of this training making the producers eligible for up to \$190,000 in federal assistance.
- The extension Master Cattle Producer program was developed to make available to producers an educational program which provides to cattle producers a broad and practical knowledge of environmental stewardship, sustainable livestock production, farm management and marketing—with particular emphasis on how these various management practices are interrelated. The curriculum consists of eight lecture topics delivered in 10 three-hour sessions. The program was the result of collaboration between the LSU AgCenter, the Louisiana Cattlemen’s Association, and the Louisiana National Resource Conservation Service. To-date, 311 farmers have participated in this relatively new education program. The program is currently being conducted in three parishes, with about 100 producers on schedule to graduate in FY 2005. Three additional parishes have been scheduled to receive this intense educational offering.
- Through 13 forage demonstration plots located throughout the state, producers were able to observe pasture weed control. Control measures discussed included both chemical and

mechanical options, with particular emphasis on how to read and follow herbicide labels properly. Additionally, eight demonstration plots involving forage varieties were conducted. Producers used the information from both the pasture weed control and the variety selection demonstrations to help them be more cost-effective and efficient in their pasture management.

- Pecan is a specialty crop in Louisiana, Arkansas, Mississippi, Texas, and Oklahoma. Of the land-grant universities, the LSU AgCenter is the only one with a complete research and extension program—including horticulture, pathology, and entomology—to support the commercial pecan industry. The idea of it becoming a regional station was developed, and three meetings have been held by extension and research faculty to further investigate this concept, with an attendance of 180 faculty from the five states involved. This effort is on-going, with its purpose to serve pecan producers in the five-state region.
- The Louisiana Rice Research Verification program has demonstrated to producers the most cost-efficient production practices from following completely research-based extension recommendations. Additionally, the program increased the confidence of rice growers, and extension faculty in these recommendations. Also, after extension faculty and industry leaders realized that precise data were not available, a five-year study was funded in conjunction with the verification program to collect information on water use. Use of the verification fields to educate extension parish faculty has been an immediate benefit of the state-wide verification program.
- Educational programs in soybeans and feed grains provided to farmers information on variety/hybrid selection, tillage practices, irrigation, plant population, fertility, and pest management. Fifteen on-farm research projects were conducted jointly with the AgCenter Experiment Station, and 62 on-farm demonstrations were conducted by extension faculty in the major feed grain production parishes. A monthly newsletter was distributed electronically to over 500 producers, consultants, extension faculty, and others involved in production agriculture.
- Spatially Variable Treatment (SVP) offers producers significantly reduced insecticide costs using historical yield patterns, without substantially affecting crop yields. Extension cotton pest management faculty conducted 24 field demonstrations that showcased spatially variable insecticide, plant growth regulator, and defoliation treatments. Over 500 cotton producers were introduced to SVP at producer meetings and demonstrations, and 150 agricultural consultants were trained to make recommendations using SVP.
- Sweet Potato growers attended two field days which included 17 weed control trials and over 20 insect control farm demonstrations. As a result of collaborative efforts of the LSU AgCenter and the Louisiana State Department of Agriculture, petitions were approved for the use of both herbicides and insecticides which have been valuable new

tools for sweet potato growers. Extension faculty responded to numerous inquiries regarding proper use of newly labeled herbicides.

- With weeds and grasses continuing to be a considerable expense to producers, a comprehensive program provided education to producers on weed identification and herbicide selection for control. In addition to 2,000 farmers, consultants, and industry personnel attending six on-farm demonstration field days, over 6,400 people visited the “2004 Suggested Weed Control Guidelines” web site for weed control guidance. The diverse weed spectrum in Louisiana makes proper weed management imperative to farmers for profitability in row crop production.
- Producer surveys in rice, cotton, soybeans, sugarcane, forestry and other agricultural commodities, conducted on a four-year rotation, consistently have shown the average adoption rate of BMPs in these Louisiana staple agricultural commodities to be around 70%.

Total extension FTEs on Goal 1 programs were 124.35 for a total expenditure of \$9,964,912. A total of 1,198,174 educational contacts were made in Goal 1 programs.

Goal 1 - Extension Program Reports

Federal Goal 1

COMMERCIAL NURSERY AND LANDSCAPE SYSTEMS

Key Theme: Ornamental/Green Agriculture

Allen Owings, Professor, Department of Horticulture, LSU AgCenter

Program Description

Louisiana's commercial nursery and landscape systems program provides service to clientele engaged in commercial green industry activities. This includes wholesale nursery growers, retail garden center managers and personnel, landscape contractors, landscape architects, landscape and horticulture maintenance personnel, arborists and others. Commercial turfgrass producers and service providers are also included in this effort. The LSU AgCenter has increased participation in certification of retail garden center personnel in the state and is now serving as the lead agency in providing continuing education opportunities for licensed arborists in Louisiana. Stakeholder input is requested quarterly during the year at meetings attended by representatives of Louisiana's nursery and landscape industry. Clientele surveys are also conducted to obtain program input. Major problems being addressed at the current time include promotion and marketing of plant material (Get It Growing program, Louisiana Plant Materials Conference, Plant Locator Lists), best management practices for irrigation and fertilization management (primarily for nursery crop producers), pest identification and control, and improving efficiency and profitability by adopting other recommended production practices. Nursery and landscape professionals are more aware of educational programs now offered by the Louisiana Cooperative Extension Service. As a result of these program efforts the following has been accomplished: (1) increased use of county agents and regional horticulturists for problem diagnosis and problem prevention, (2) introduction of new plant material, (3) retailers are providing training opportunities for their employees, (4) increased industry awareness of TMDLs, best management practices, and similar environmental issues, and (5) water quality is being recognized by nursery and landscape professionals as a key part of their production and maintenance programs. Primary program delivery has been accomplished by education programs (in-state and collaboratively with Arkansas, Mississippi, Alabama, and Texas), on-site farm visits, e-mail updates, web page development, mass media, and newsletters. Cooperative and collaborative efforts are maintained and are ongoing with the following: Louisiana Nursery and Landscape Association (newsletters and education programs), Louisiana Turfgrass Association (newsletters and education programs), Texas Nursery and Landscape Association (five-state educational program effort), and the state cooperative extension services in Arkansas, Alabama, and Mississippi (Gulf States Horticultural Expo and Mid-South Greenhouse Growers Conference).

Program Impact

Licensed nursery and landscape professionals receives information from the Louisiana Cooperative Extension Service's commercial nursery and landscape systems program annually. Approximately 40-50% participate in the education programs on a regular or occasional basis. Many make production changes based on information learned. These changes are primarily in the areas of irrigation and fertilization management and selling new plant material. Landscapers are adopting improved pest management strategies and learning to improve horticultural services provided to their clientele using LSU AgCenter recommendations.

Source of Funds

Smith-Lever 3 b, c

Scope of Impact

The commercial nursery and landscape systems program impact is multi-state (AL, MS, TX, AR) and multi-function. The Louisiana Cooperative Extension Service allocated 6.02 FTEs for the commercial nursery and landscape systems program for FY2004.

Multi-state: Approximately 30% ($0.30 \times 6.02 \times \$80,136 = \$144,725$) of the program in commercial nursery and landscape systems is attributable to multi-state efforts (primarily Gulf States Horticultural Expo, Mid-South Greenhouse Growers Conference, and Nursery/Landscape Expo educational short course).

Multi-function: Approximately 25% of the commercial nursery and landscape systems program is multi-function valued at \$120,604 ($0.25 \times 6.02 \times \$80,136$).

Federal Goal 1

COMMERCIAL VEGETABLES

Key Theme: Profitability in Vegetable Production

James Boudreaux, Professor, Department of Horticulture, LSU AgCenter

Program Description

The Louisiana Commercial Vegetable Industry involves 3000 growers in 51 parishes who produce 35 different vegetable crops on 9,000 acres for a gross farm value of \$40.1 million. The Louisiana commercial vegetable program provides information and assistance to growers involved in commercial vegetable production. Programs direction is obtained for commercial vegetable growers, grower organizations and inputs from county agents. Major problems addressed at the current time are evaluation of Tomato Spotted Wilt Virus (TSWV) resistant

tomato and bell pepper varieties, cultural practices to lessen the occurrence of TSWV, evaluation of new vegetable varieties, efficient use of plastic mulch and drip irrigation, adoption of efficient production practices, adoption of profitable marketing practices and employment of best management in the production of vegetable crops.

As a result of these programs the following has been accomplished: 1) increased production of tomatoes by growers in areas of high TSWV occurrence, 2) increased production of bell peppers by growers in areas of high TSWV occurrence, 3) use of new vegetable varieties, 4) increased yields from the use of drip irrigation and plastic mulch and 5) increase income from the use of direct marketing opportunities. Primary program delivery has been accomplished by farm visits, grower meetings, publications demonstration plots, email updates and phone calls.

Cooperative efforts involved 1) Louisiana, Mississippi and Alabama to put on the Deep South Fruit and Vegetable Growers Conference, 2) a LSU and MSU partnership in vegetable crop research efforts, 3) participation in the Southeastern Vegetable Crop Extension Workshop to develop the Vegetable Crop Guidelines for the Southeastern U.S.

Program Impact

The main impact this program has accomplished is increased vegetable yields and profits by growers who are utilizing the information generated from this work. These increases are due to the use of new varieties, employment of improved production techniques and increased use of direct marketing opportunities.

Scope of Impact

The Louisiana Cooperative Extension Service allocated 7.65 FTEs for commercial vegetable production in 2004. ($7.65 \times \$80,136 = \$613,040$). The majority of the time was spent in state program work. Multiple state effort in this program increased over the last time of this report and is expected to increase in the future.

Federal Goal 1

COTTON

Key Theme: Agricultural Profitability

Sandy Stewart, Professor, Central Region, LSU AgCenter

Program Description

Advisory groups were used to determine industry problems and direction for cotton extension programs. Results from previously conducted surveys were also used for program guidance.

Problems identified included need for cotton variety, pest management, conservation tillage systems, weed control and herbicide information; ways to improve cotton fiber quality; soil management; defoliation and plant growth regulation; irrigation timing and management.

A comprehensive extension education program for cotton producers was implemented. The performance goal of the program was to increase yields and profits of Louisiana cotton producers by following recommended best management practices to produce their crop. The program provided information in the areas of variety selection, pest management, tillage, fertility, plant growth regulator usage, herbicide selection and weed control, defoliation, and irrigation. The following educational activities were conducted during the year.

- Five agent training sessions were conducted to inform LSU Agricultural Center personnel working in cotton production of the latest recommended best management practices. Additionally, agents toured the High Plains of Texas in a collaborative effort with the Texas Cooperative Extension Service to learn about production practices, critical issues, and research and extension programs in a different cotton growing region from Louisiana.
- The state cotton specialist and parish extension agents conducted 50 on-farm demonstrations in the major cotton growing parishes.
- Nine on-farm research projects were conducted jointly with faculty of the LSU Agricultural Center's Experiment Station.
- Forty educational meetings and three field days were conducted to keep growers informed of recommended practices.
- A weekly cotton newsletter was distributed to producers, consultants, and agribusiness personnel throughout the growing season. The newsletter contained updates on recommendations and kept clientele informed of current events.
- Mass media programs were produced weekly to keep clientele informed.
- Specialists and agents were quoted in or wrote news articles pertaining to cotton production throughout the growing season.
- The LSU AgCenter cotton web page was updated weekly and e-mail updates were sent weekly to growers and agribusiness personnel.
- The state cotton specialists worked across state lines and attended professional work group sessions to insure that Louisiana growers are receiving the best possible information.
- Faculty from other land grant universities in cotton producing states and industry personnel were used to conduct statewide education programs.

Collaborators in the cotton education program included extension and research faculty within the cooperating land grant system (Louisiana State University and A&M College and Southern University and A&M College); other educational institutions within the state; extension research faculty within the region's land grant institutions (University of Arkansas, University of Tennessee, Auburn, Mississippi State, Texas A&M, Virginia Tech, North Carolina State, University of Georgia, Clemson University, and Oklahoma State); USDA agencies; state environmental agencies; Louisiana Farm Bureau Federation; Louisiana Cotton Producers Association; Louisiana Association of Agricultural Consultants; Louisiana Department of Agriculture and Forestry; Private industry.

Program Impact

- Over 2,000 farmers, consultants, and industry personnel attended the field days and educational meetings.
- Training sessions for LSU AgCenter personnel were attended by extension agents and other LSU AgCenter faculty working in cotton production programs.
- Extension agents and specialists made presentations at national meetings.
- Fifteen extension agents and/or specialists attended national meetings.
- Extension agents and/or specialists conducted 50 on-farm demonstrations.
- Five joint research-extension farm projects were conducted.
- Four out-of-state speakers were used for education programs.
- Almost 80% of Louisiana cotton producers follow LSU AgCenter recommendations according to a survey conducted in 2004

Source of Funds

Federal Smith-Lever 3 b, c
Cotton Incorporated
Private Industry grants

Scope of Impact

Multi-state: Participation in and information-sharing from Beltwide Cotton Conferences, with a total multi-state effort valued at \$185,314 (9.45 FTEs x \$80,136 per FTE x 0.25).

Multi-function: Researchers and extension specialists collaborated on preparing publications, development and training of agents, consultants, agribusiness personnel, and farmers for a multi-function effort valued at \$757,285 (9.45 FTEs x \$80,136 per FTE x 1.0).

Federal Goal 1

COTTON INSECT PEST MANAGEMENT EDUCATIONAL PROGRAMS

Key Theme: Agricultural Profitability

Ralph Bagwell, Professor, Northeast Region, LSU AgCenter

Program Description

The objective of the cotton insect management educational program is to maintain production at a profitable level by reducing insect pests to the point they cause no economic losses. Program needs were identified by stakeholder meetings, county agent meetings and one on one interaction with stakeholders. A stakeholder meeting is conducted yearly to identify cotton IPM needs for the year. Needs and recommendations are identified for cotton IPM are identified.

Recommendations developed during this meeting are presented to cotton producers, county agents, agricultural consultants and include the latest cultural, biological and chemical practices for cotton insect. IPM programs are designed to accomplish cotton IPM at reasonable costs with minimum adverse effects on human health and the environment. Such a blend of chemical and non-chemical insect control practices provides insect control with the minimum amount of insecticides and results in more efficient control of the pest insects.

- The cotton pest management specialist in cooperation with county agents conducted 15 demonstrations that demonstrated recommended scouting procedures, treatment thresholds, application techniques, cultural control options, and biological control.
- 15 county agents were trained on cotton IPM at a county agent training.
- Cotton insect scouting schools were conducted at two locations.
- 31 presentations on cotton IPM were given at producer meetings.
- 6 national and one international presentation on Louisiana cotton IPM were made.
- Cotton IPM issues were discussed in 8 newsletters distributed electronically.
- LSU AgCenter insect control guides were updated and published.
- Program collaborators included faculty from other land grant institutions (University of Arkansas, Auburn University, University of Georgia, Mississippi State University, University of Missouri, University of Tennessee, Texas A&M University); USDA agencies; Louisiana Farm Bureau Federation; Louisiana Cotton Producers Association; Louisiana Department of Agriculture and Forestry; private industry; Cotton Incorporated.

Program Impact

- Over 95% of Louisiana cotton is produced using IPM techniques.
- Over 2,500 contacts from the cotton industry were educated at various producer meetings and field days.
- Over 30 cotton scouts were trained in proper scouting procedures and insect pest identification.
- 15 county agents were trained on cotton IPM at a county agent training.
- Cotton insect control recommendations were distributed to over 500 recipients either electronically or in printed form.

Source of Funds

Smith-Lever 3 b, c
Private industry

Scope of Impact

This program is multi-state and involves land grant institutions in the following state: Alabama, Arizona, Arkansas, California, Georgia, Missouri, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia.

Fifteen percent of the program is a result of multi-state meeting and materials. 0.85 FTEs were devoted to the cotton IPM effort. Therefore the dollar value of the multi-state effort = [(15% multi-state)(0.85 FTE)(\$80,136/FTE)] = \$10,217

Twenty percent of the program is a result of multi-function programming. At 0.85 FTEs devoted to cotton IPM the dollar value of the multi-function effort is = [(20%)(0.85 FTE)(\$80,136/FTE)] = \$13,623.

Federal Goal 1

DAIRY

Key Theme: Agricultural Competitiveness

Charles Hutchison, Associate Professor, Department of Dairy Science, LSU AgCenter

Program Description

In meetings with stakeholders (dairy producers, feed company representatives, milk marketing cooperatives field men, veterinarians, Department of Agriculture and Forestry personnel, lenders, NRCS and FSA personnel, health department sanitarians and other agribusiness personnel) problems with interpreting and utilizing dairy herd records, udder health (somatic cell count (SCC) and mastitis), forage quality, nutrition, dry cow and replacement management, herd health, cow comfort (heat stress abatement), financial and risk management, and waste management were identified. Dairy herd record training for field men and producers has continued. Field days, seminars, conferences, meetings, farm visits, demonstrations and research verification trials were conducted. Materials on forage quality, dairy cattle nutrition, dry cow management, replacement heifer management, cow comfort, financial risk management and herd health were disseminated. A Master Farmer program was developed and implemented to educate producers on environmental and waste management concerns. Due to the collaboration of extension specialists and agents, health department sanitarians, milk marketing cooperatives field men, Louisiana Department of Agriculture and Forestry Livestock Sanitary Board, Louisiana Farm Bureau dairy committee and research personnel from the Hill Farm Research Station, a mycoplasma mastitis and other mastitis pathogens monitoring program was developed and implemented on all Louisiana dairy farms in 2004. A committee was formed to research the potential of establishing a large confinement dairy operation in the delta region of the state.

As a result of these programs, herds on DHI produce approximately 4,200 pounds more milk annually due to producers making improvements in their management and profitability while staying in business longer. Forage quality is improving due to the adoption of improved harvesting and storage methods of home grown forages such as round bale silage of primarily ryegrass along with some other perennial grasses and corn processors on silage cutters. More producers are purchasing higher quality forages such as alfalfa to improve the overall nutrient value of the forages consumed by the milking herd. More producers are adopting heat stress

abatement strategies in the summer in order to improve cow comfort. Producers are making progress in lowering SCC and improving herd health by implementing new procedures and technologies associated with milk quality and herd health. Producers are making progress in the area of environmental stewardship of the land by taking advantage of programs implemented to improve the waste management systems of their operations. The committee working on the large scale confinement dairy have produced a video, developed a prospectus and an enterprise budget. They have made contact with both lenders and some prospective investors.

Source of Funds

Smith – Lever 3 b, c

Scope of Impact

Ideas and materials for the program are the result of SERA – IEG 15 (Dairy), a memorandum of understanding between Louisiana and Mississippi on joint dairy educational programs, collaboration between LA DHIA and MS DHIA for joint training, Southern Dairy Conference, Mid-South Ruminant Nutrition Conference, Dairy Records Management Systems and professional contacts with other state's dairy professionals.

Multi-state: 70% of the program is a result of these meetings and materials. 4.12 FTEs were devoted to the adult dairy effort with an FTE valued at \$80,136. Therefore, the dollar value of the multi-state effort was \$231,112.

Multi-function: Researchers, extension specialists and agents collaborated on the development, education and training of agents and producers. It is estimated that 80% of the program was multi-function with 4.12 FTE devoted to the program and the value of an FTE being \$80,136, the multi-function effort was valued at \$264,128.

Federal Goal 1

DIGITAL DIAGNOSTIC PROGRAM

Key Theme: Agricultural Profitability

Clayton A. Hollier, Professor, Department of Plant Pathology and Crop Physiology, LSU AgCenter

Program Description

Disease, weed and insect diagnosis has been an important educational and service function of the Louisiana Cooperative Extension service for years. Approximately 5,000 samples are diagnosed annually. Traditionally, samples are received by mail and “drop-in” service. The turnaround time by mail is slow and many times unacceptable for serious commercial pest problems.

Agricultural agents, through personal communication and feedback from training sessions, have had several streamlining and clarification suggestions that have been implemented by incorporation or changing within the digital distance diagnostic network. These suggestions have come from use of the network and network programmers have responded to those suggestions.

Agricultural agents and large commercial agricultural production operations now have a faster way to send pest samples and to receive the identification or diagnosis.

Impact of Program

A digital distance diagnostic network was developed with the University of Georgia. Named the Louisiana Distance Diagnostic Network (LDDN), approximately 1,900 digital image samples were received and diagnosed during the first five years. The savings to Louisiana clients are being calculated, but preliminary estimates are approximately \$1,000,000. More savings are expected during upcoming years of operation.

Source of Funds

Smith-Lever and state funding for technology enhancement.

Scope of Impact

Louisiana, Texas, Alabama, Illinois, Oregon, Washington, Guam and Georgia (with other states expressing interest) have been impacted positively by this system. Extension and research scientists are involved in the reception and diagnosis of the pest problems. Time and money allocations for 64 agricultural agents and 9 specialists have averaged 3% with the PI averaging 10% in multi-state efforts. The dollar equivalent of multi-state extension work is $\$183,507 (73 \text{ FTEs} \times 80,136 \text{ per FTE} \times .03) + (\$80,136 \text{ per FTE} \times 0.1 \text{ FTE})$.

Federal Goal 1

EQUINE EDUCATION PROGRAM

Key Theme: Animal production efficiency

Clint Depew, Professor, Department of Animal Sciences, LSU AgCenter

Program Description

A survey of the equine industry, meetings with producers and 4 meetings with the Equine Educational committee (agents, researchers and industry leaders) were used to identify problems in the equine industry. Many problems in the feeding, breeding, marketing and training of horses

were identified. Additionally, horsemen tend to look to other horsemen, and breed publications as their primary source of information.

A “Master Horseman” program was developed to provide training to a select group of leaders in the industry. These trained volunteers would in turn have the responsibility to teach others in the industry the scientific concepts they have learned. This program will improve the skill of the industry leaders which will influence the rest of the industry. Additionally a verification program was started to make model farms out of a few operations which would then be used to influence others. A tour of outstanding equine operations was conducted to help industry leaders evaluate their operations and develop a vision of the equine industry in Louisiana. Meetings were established on the race tracks to impact the development and training of race horses in the state. A multi state web page was developed (HorseQuest.info) to answer questions for horse producers. Industry leaders, researchers, and agents were involved in the planning, implementation and evaluation of the program.

Program Impact

Twelve Master Horseman programs have been conducted training 210 people and 9 more are planned this coming year. Evaluations have indicated a very high level of satisfaction with the program. The trained volunteers have conducted 5 camps for youth, many clinics, a breeder’s school, and sponsored educational programs at the race tracks. Several groups are planning their own Master Horseman programs for their adults and youth. The verification farms have reported improved profits from horse production and the race horse seminars have drawn 200 participants who reported improved knowledge in the development and care of their horses. The horse tour resulted in a greater vision for the Louisiana horse industry, contacts for future workshops, and greatly expanded knowledge of the horse industry.

Source of Funds

Smith Lever 3 b, c

Scope of Impact

A southern regional multi state web page was developed which serves the producers and horsemen in 13 states. Additionally the Arkansas Cooperative Extension Service is collaborating on the equine educational program. Joint planning, agent training, master horseman programs and seminars have been conducted. The Southern Regional Championship Horse Show and Contest was jointly sponsored this year. An estimated 10% of the equine program is a result of multi state activities (10% X 4.52 X \$80,136 = \$36,221).

Research is involved in the equine educational committee which formulates the programs and activities of the equine program. Additionally, they are involved in program delivery and evaluation. The dollar value of this multi function effort equals \$181,107 [50% (estimated % of

program) X 4.52 (FTE's devoted to equine) X 80,136 (\$ equivalent of 1 Extension professional FTE) = \$181,107].

Federal Goal 1

FORESTRY AWARENESS

Key Theme: Forestry Competitiveness and Awareness

Steve Hotard, Agent, North Central Region, LSU AgCenter

Program Description

The general public including youth do not understand or appreciate the importance of Louisiana's forests. The impacts on the economy, water quality, products, and the overall standard of life are obscure in the general mind-set of those benefiting from the management and processing of natural resources.

The agricultural awareness forestry Ag-Alley display featured the importance of Louisiana's forests to the environment, wildlife, products, and economy. The individual display area highlighted the above topics where school youth and general public viewed and received educational material on the impact forests have on their way of life.

The Forestry Ag-Alley was a cooperative effort of the LSU AgCenter, LSU School of Renewable Natural Resources, Louisiana Tech University, Louisiana Forestry Association, and regional forest industries. The display was open for three days. The first day was dedicated to school aged 4 and 8 grade students, with the last two days open for the general public.

4.1 Stakeholder Input in Program:

4.1.1 Actions taken to seek stakeholder input: AgExpo Planning Committee on Forestry, meeting and planning

4.1.2 Process used: AgExpo Planning Committee planning meeting, discuss what is to be highlighted and how to accomplish goals.

4.2 Problems Identified: See Issues

4.3 Initiation and Progress of the Program: Forestry Committee design Forestry Display Alley to promote and make clientele aware of the importance of forestry to Louisiana. Two day school tours and two days of public viewing, with information given out.

Program Impact

The Forestry Ag-Alley (AgExpo) increased the public's and student's knowledge and awareness of the concepts of good forest management and benefits and products which come from Louisiana's forests. 11,200 students, teachers, and public viewed the display and received materials covering broad forestry concepts.

Source of Funds

NE Agri-business Council, State and federal

Scope of Impact

Multi-state: It is estimated that 50% of the program is multi-state, valued at 7,212 (0.18 FTE x 80,136 x .75).

Multi-function: It is estimated that 75% of the program is multi-state, valued at \$10,818 (0.18 FTE x 80,136 x .75).

Federal Goal 1

FRUITS AND NUTS

Key Theme: Agricultural Profitability

John Pyzner, Associate Professor, North Central Region, LSU AgCenter

Program Description

The Fruit and Pecan Extension Program used horticulture extension personnel, researchers and county agents to assist fruit and pecan growers in the profitable production of fruit and pecans. Activities used in implementation of the program included grower meetings, field days, orchard workshops, master gardener training, research/demonstration plot, newsletters, grower publication articles, mass media, farm visits and telephone calls.

Inputs received from the Louisiana Pecan Grower's Association, Louisiana Pecan Producers Association, Mayhaw Growers Association, parish horticulture advisory committees, fruit conference evaluations, growers and county agents identified six major concerns of fruit and nut growers. These concerns were stinkbug and leaf-footed bug control in pecans and fruit, alternate bearing in pecans, oak root rot control in peaches, fruit pest control, peach frost protection and fire blight control on mayhaws.

Extension and research faculty within the LSU AgCenter collaborated in the fruit and pecan education program. Louisiana Pecan Grower's Association, Pecan Producers of Louisiana, Mayhaw Association, Texas Pecan Growers Association and Georgia Pecan Growers Association have assisted the extension program by providing teaching opportunities for AgCenter personnel in their meeting, publications, newsletters and websites. Auburn University collaborated with a pecan alternate bearing research/demonstration plot. University of Georgia collaborated with Louisiana and nine additional states in the development of the Southeastern

Peach, Nectarine and Plum Pest Management and Culture Guide. Several growers have provided their orchards for research/demonstration plots and orchard workshops.

Program Impact

New growers are starting fruit and pecan orchards with little experience in farming. The LSU AgCenter is making these enterprises more profitable by providing information on variety selection, pest control, orchard management and marketing.

The mayhaw industry has changed from a collector of wild fruit to orchard production in less than 20 years due to the efforts of LSU AgCenter extension and research personnel. Louisiana mayhaw growers are now producing over \$100,000 dollars of orchard fruit annually. They have also developed national jelly and juice markets for their product.

Commercial fruit and pecan growers indicate that 90% use extension and research recommendations in their pest control program. They also indicated an adoption rate of over 80% for pruning, site preparation, fertilization, variety selection and row spacing.

Fruit and pecan educational meetings and training sessions had over 850 participants.

Source of Funds

Smith-Lever 3 b, c (federal funds)

Scope of Impact

Multi-state: Extension specialists, growers and researchers from Alabama, Louisiana and Mississippi collaborate on the development and presentation of the Deep South Fruit and Vegetable Growers Conference and Trade Show. Faculty from Alabama, Arkansas, Florida, Mississippi and Texas participated in conferences and educational meetings for Louisiana fruit and pecan growers. The pecan specialists from Auburn University collaborated on a pecan alternate bearing study in Louisiana. The Southeastern Peach, Nectarine and Plum Pest Management and Culture Guide was developed through contributors from AR, AL, FL, GA, LA, OK, NC, SC, TN and TX.

A substantial portion of the ideas and information used in the fruit and pecan program in Louisiana is attributable to presentations, personal contacts and publications from extension and research personnel from Alabama, Arkansas, Georgia, Florida, Mississippi, North Carolina, Oklahoma and Texas. Louisiana pecan extension and research personnel wrote articles for "The Pecan Grower" and "Pecan South" that are read by most commercial pecan growers in Louisiana and other pecan producing states. Louisiana participated with pecan extension and research personnel from Alabama, Florida, Georgia, Oklahoma and Texas in discussing culture practices, pest management and varieties at the National Pecan Scientist Meeting.

LSU AgCenter Pecan Station, University of Arkansas and Mississippi State University have collaborated in producing pecan production meetings in Arkansas and Mississippi. Additional collaboration with the concept of a regional pecan station serving a multi-state area is being discussed.

Approximately 30% of the program effort was devoted to multi-state collaboration. A total of 8.92 FTEs were devoted to the fruit and pecan program. Hence, the dollar value of the multi-state effort = \$214,444 ($0.3 \times 8.92 \times \$80,136$).

Multi-function: Integrated research-extension efforts are estimated at 80% of the total number of FTEs expended in the program. These efforts include research-extension collaboration in agent training, formulation of recommendations, publications and field trouble shooting during the growing season. The dollar value of these multi-function effort = \$571,850 ($0.8 \times 8.92 \times \$80,136$).

Federal Goal 1

INCREASING FARM PROFITS THROUGH IMPROVED MARKETING AND FARM MANAGEMENT

Key Theme: Agricultural Profitability

Kurt Guidry, Associate Professor, Gene Johnson, Professor; Gerald Giesler, Professor; John Westra, Assistant Professor; Ken Wegenhoft, Professor; Mike Salassi, Professor; Ken Paxton, Professor; Department of Agricultural Economics and Agribusiness, LSU AgCenter

Program Description

When examining the potential profitability of a farming enterprise, impacts can affect either revenue generation or costs. Revenue is impacted by price, yields, and government programs. Costs can be impacted through new technology or weather events. The educational efforts conducted during the reporting period can be thought to help address issues in both the revenue and expense side which can ultimately impact profitability. Some possible areas of improvement are higher production through better variety selection and crop management, reducing costs through more efficient and effective use of inputs, increasing marketing knowledge and performance, and diversifying production to expand income streams. Research verification programs conducted stress improved crop management and its direct relation to production costs and ultimately profitability. An agricultural marketing effort continues to center around market newsletters, producer meetings, individual farm consultation and other publications. A program has begun to expand income opportunities for agricultural producers in the state. Increased interest and demand for natural resource based land use has spurred a project that has examined the potential and economic viability of leasing enterprises (hunting and fishing) as either a supplemental income to agricultural revenue or as a substitute to agricultural production.

Producer meetings have been conducted and plans are under way to develop operational budgets for these alternative enterprises. Finally, work has begun to look at the value-added opportunities for Louisiana producers. During the reporting period, AgCenter personnel worked closely with a group of producers to assist them in applying for and receiving grant money from the USDA to conduct a feasibility study of soybean processing in the state.

The agricultural marketing program is designed to provide the most up-to-date information regarding market supply and demand factors for all of our major agricultural commodities. Developing successful marketing strategies is contingent on a producer establishing some view of future market movement. Critical to this is obtaining reliable market information. The marketing program attempts to provide this information that forms the basis of producers marketing strategies. Producer meetings, monthly newsletters, e-mail updates and other publications are avenues through which this information is provided.

The research verification programs in both soybeans and rice are designed to implement research based recommendations in real world situations. This multifunctional endeavor combines expertise from agronomist, weed scientist, entomologist, pathologist, engineers, and economist. During the reporting year, 10 rice producers and 9 soybean producers participated in the program. These producers were visited once a week during the growing year at which time crop management recommendations were made. The linkage between efficient crop management and profitability is shown through detailed cost of production records kept on each field. In addition to providing a valuable learning experience for the producers and county agents involved in the program, results from the verification program are distributed throughout the state and are made available through the AgCenter webpage.

With weather related production shortfalls over the past several years, agricultural production was faced with difficult financial decisions. These difficult times stressed the need for producers to thoroughly examine their operations to look for areas in which efficiency could be increased or look for alternative opportunities. With tightening profit margins, producers no longer had the luxury of planting acres that could not, at minimum, cover variable production costs. This required producers to examine their operation on an acre by acre basis and to remove acres that were not profitable. In addition to streamlining their operations, producers also began to look for alternative opportunities for generating income streams. A program has been initiated that addresses both the issue of unprofitable acreage and alternative opportunities. Natural resource based land use has been the focus of a program looking to help increase the profitability of agricultural operations. Specifically, the program has examined the potential of hunting and fishing leases as supplemental or alternative enterprises to traditional agricultural operations. Several meetings have been conducted to introduce the agriculture industry to opportunities in this area. The program is now at the stage of conducting surveys with existing enterprises to help develop a database of information. The program plans to take the information it obtains from the surveys and develop comprehensive publications describing the how and why of establishing these enterprises. In addition, cost and return budgets will be developed to provide producers with information about the potential investment requirement possibilities and returns that could be expected from these alternative enterprises.

One way for producers to attempt to increase the amount of revenue to their farming enterprises is to look for ways to increase the value of their commodity. However, value-added enterprises have traditionally been an area in which Louisiana has lacked. Two value-added projects were initiated during the reporting period. One project looked at the feasibility for a vegetable processing operation in North Louisiana. AgCenter personnel developed budgets and projected cash flows for the establishment and operation of a bell pepper and cucumber facility in North Louisiana. The other project involves a soybean processing facility in the state. Personnel with the LSU AgCenter worked closely with the group exploring alternatives and ultimately assisted the group in applying for and receiving a value-added grant through the USDA to conduct a feasibility study on the development of a soybean extrusion facility in Louisiana.

The direction of the programs offered is provided through several avenues. An Extension Farm Management and Marketing Advisory Committee comprised of producers, agribusiness, agricultural consultants, and others from throughout the state provides the basis of the direction for the program. In addition to the underlying direction provided by the committee, Extension specialists participate with parish advisory meetings that also provide insight as to the need of our clientele. Also, producers and county agents have been allowed to review computer-based software, fact sheets, newsletters, etc. and provide their input prior to the final development of these materials.

Program Impacts

Agricultural Marketing – Extension economists prepare monthly commodity outlook newsletters which are e-mailed to county agents and placed on the Department’s Farm Management webpage. County agents electronically forward these newsletters to producers as well as make printed versions of these newsletters available. It is estimated that over 3,000 producers and agribusiness firms receive these newsletters. These newsletters provide clientele with the latest supply and demand information and have been cited by clientele as extremely helpful in making informed marketing decisions. In addition, county agents have expressed that these newsletters are very useful to them in providing a summary of market conditions so that they may stay informed with the markets that affect the commodities grown by their clients. Plans were developed during the reporting period to publish a quarterly Farm Management newsletter that would provide information on important issues facing the agricultural industry, including marketing. Finally, an annual outlook publication was developed that provides a market outlook perspective for every major agricultural commodity in the state. This publication is made available on the Department of Agricultural Economics and Agribusiness homepage and is used by producers and agribusiness personnel in making decisions regarding the upcoming growing season.

During the reporting year, Extension specialists participated in an estimated 25 meetings throughout the state covering various marketing topics. It is estimated that roughly 1,250 producers were in attendance. These meetings are typically concentrated in a January to March time period. The information provided by Extension specialists has been cited by clientele as extremely important in the crop enterprise selection decisions made by producers.

Research Verification Program – The goal of the research verification program is to show that following research based crop management recommendations and improved efficiency can increase profitability. Once again, the research programs showed that higher yields, lower costs of production and ultimately higher profits can be attained. Over the last three years, producers in the rice research verification program have averaged yields of 7,339 pounds. This compares to the state average yield during this time period of 5,623 pounds (NASS estimate). The difference in yields results in an increase in revenue to the verification fields of \$88.00 per acre. Likewise, the producers enrolled in the soybean verification program have averaged 45.6 bushels per acre over the last three years as compared to the state average yield of 33 bushels (NASS estimate). As with the rice verification program, the increased yields associated with the soybean verification program shows a potential increase in revenue of \$66.24 per acre. The results of both the rice and soybean verification programs indicate that if producers would follow recommended practices and improve crop management that increased profitability can be achieved. Given the per acre improvement in revenue exhibited by the verification programs and given the 1.1 million acres of soybeans and 538,000 acres of rice grown in the state, the verification program provides a potential for improved farm revenue statewide of \$72.8 million for soybean production and \$47.3 million for rice production.

Value-Added Enterprises – The vegetable packing plant study focused on the development and operation of a 375,000 carton a year facility. If realized this facility would have an initial investment level of \$1.2 million with an annual operating budget in excess of \$800,000. The facility along with the farming enterprises needed to supply the facility would employ as many as 100 people with an estimated economic impact of nearly \$4 million per year. The soybean processing facility study was just in its preliminary phases during the reporting year. However, LSU AgCenter personnel were largely responsible for the group of producers receiving \$34,700 in both state and federal grant dollars to conduct a feasibility study. The feasibility study will examine the economic potential for a 1 million bushel per year soybean processing facility.

Natural Resource Based Land Use – Information about hunting lease enterprises was gathered from ten producers from the coastal region of the state. From this, a preliminary document has been developed that describes these enterprises in general terms and gives examples of the costs for developing enterprises like these in coastal Louisiana. Additionally, five producers were interviewed in the Delta region of the state to gather more detailed cost estimates for hunting enterprises. This information has been developed into a preliminary publication. Revisions are being made to these two publications and educational programming is being developed for hunting lease enterprises for these two regions of Louisiana to show the potential of these alternative enterprises in providing supplemental income to the traditional farming operation. Preliminary estimates indicate that these enterprises have the potential to add \$3,000 to \$5,000 annually in supplemental income to agricultural operations.

Source of Funds

State and Federal Funds (Smith-Lever 3b+c)

Scope of Impact

Multi-state: Extension economists participate in the Southern Region Extension Outlook conference, the National Rice Outlook conference, the Tri-State Soybean Forum, and regional and national association meetings. In addition to their participation in these multi-state conferences, Extension economists also share much of the information used in development of curriculum for marketing education programs such as the Marketing Agricultural Commodities (MAC) program and the FSA borrower training program.

It is estimated that 25% of this program was multi-state, valued at \$48,081 (2.4 FTE x \$80,136 x .25).

Multi-function: The verification programs, the natural resource based land use project, and the value-added enterprise studies all combine the expertise of faculty from several different disciplines of both research and extension.

It is estimated that 60% of this program is multi-function, valued at \$115,395 (2.4 FTE x 80,136 x .60).

Federal Goal 1

INVASIVE SPECIES IDENTIFICATION, ECOLOGY, MONITORING AND MANAGEMENT WORKSHOP

Key Theme: Invasive species

Hallie Dozier, Assistant Professor, School of Renewable Natural Resources, LSU AgCenter

Program Description

In 2004 the LSU AgCenter received a grant from the Louisiana Department of Agriculture and Forestry (LDAF) to coordinate and host a one-day workshop on the topic of invasive species in Louisiana. The target audience was made up primarily of field foresters from LDAF as well as field personnel from the state department of wildlife and fisheries and the Natural Resources and Conservation Service. The program presented basic, introductory information about invasive plants in Louisiana, including identification, description of their ecology and their impacts on natural systems, and methods for their documentation, monitoring and management. It also provided each participant a copy of *Nonnative Invasive Plants of Southern Forests: A Field Guide for Identification and Control* by James H. Miller (Forest Service Southern Research Station State General Technical Report SRS-62, 2003) and tools for documenting invasive populations in natural areas.

4.1 *Stakeholder Input in Program:*

4.1.1. Actions taken to seek stakeholder input: The PI developed this program in response to three major inputs: (1) A review of a draft of the 2003 State Management Plan for Aquatic Invasive Species in Louisiana, prepared by the Louisiana Aquatic Invasive Species Task Force; (2) a request for a one day educational program on this topic from the funding agency; (3) a review of herbarium collections of invasive plant species in the state.

The draft report includes a recommendation to concentrate available resources on public education, but it also reveals that only forty-six invasive-related projects are either planned (24) or being funded (22). According to the report, only six of the nineteen listed programs that have an educational component are funded.

The LDAF request for programming on this topic came about from availability of US Forest Service Forest Land Enhancement Program funds and alarming reports of new populations of cogongrass (*Imperata cylindrica*) being found in the southern half of the state. Cogongrass is considered one of the top weeds in the world and had been documented in the easternmost states of the Gulf-Atlantic seaboard for several years. This is definitely one invader that the state would like to manage while populations are still relatively small and success is feasible.

The review of the LSU Herbarium collection data base revealed that although these species are known to exist in Louisiana (anecdotally), there is very little scientifically reliable documentation of them in Louisiana. Herbarium collections are the final authority for documenting the presence or absence of plant species in the landscape, and we felt that equipping workshop participants to make collections to submit to the herbarium could play a critical role in future requests for funding to support management and control.

4.1.2. Process used: see above.

4.1.3. How collected input was considered: see below.

4.2 *Problems Identified:* The draft report had the greatest influence on clarifying the problems. The report was generated by the Louisiana Aquatic Invasive Species Task Force, a group appointed by the Governor's Office in 2002 to assess the state and extent of the problem in Louisiana. The Task Force was comprised of stakeholders from several universities, state and federal agencies, industry, shipping and retail. The draft plan resulted from two years of goal setting and data collection about existing and potential problems in the state. The PI served as a task force member from 2002-2004, making contributions to and serving as an editor for the report.

4.3. *Initiation and Progress of the Program:* The workshop was held in September 2004. The workshop goals were to: (1) train participants to collect and document non-native plant populations; and (2) provide participants with ecological, biological and management information on non-native plants of concern in Louisiana. One hundred seventeen people attended the workshop.

4.4. *Collaboration:* LDAF as granting agency.

Program Impact

Workshop attendees learned about methods for monitoring/documenting invasive species in their areas. Forty-two received plant presses, blotters and driers to facilitate collection of specimens for deposit in the LSU Herbarium.

We asked workshop participants if they planned to document, manage and monitor invasive species based on what they learned during the workshop. Seventy-one percent indicated they intended to document invasive species in the field because of the workshop, 67% said they would manage these species because of the workshop, and 72% said they planned to monitor populations of invasive species because of the workshop.

Workshop participants were asked to list two new things they had learned during the workshop. New information for participants tended to be about the different species discussed during the workshop and methods of control. For those indicating they learned something new about a species, cogongrass, parasol, tallow and aquatic plants were the most common. For those saying they had learned something new about control or management, 33% said they learned information regarding control techniques for privet that may prove quite valuable for situations where privet control is prioritized. Attendees also indicated that they believed Chinese tallow tree to be the most important invasive species in the areas they manage, which will help prioritize future research and extension efforts.

Finally, workshop participants (93%) said they benefited from the workshop. Fifty-seven percent indicated that they had increased their knowledge about invasive species ecology, biology and management from the workshop.

Long term impacts for this program, for this workshop is only one component, will take time to document. Future plans include follow up on documentation and collecting information regarding management efforts and their success.

Source of Funds

Louisiana Department of Agriculture and Forestry, Renewable Resources Extension Act, State Funds.

Scope of Impact

In addition to statewide programming, part of the program effort is also multi-function.

Multi-function: 50% of the program is estimated to be multi-function, valued at \$12,020 (.3 FTE x \$80,136 x .50).

Federal Goal 1

MANAGING RISK IN A CHANGING ENVIRONMENT

Key Theme: Risk Management

Kurt Guidry, Associate Professor, Gene Johnson, Professor; Gerald Giesler, Professor; Department of Agricultural Economics and Agribusiness, LSU AgCenter

Program Description

Agricultural producers face many risks and challenges each and every year. The ability to manage those risks effectively and efficiently can often times spell the difference from financial success and financial ruin. Often times, producers have very limited skills and knowledge in dealing with these risky situations. Managing risk is a very broad issue that can have several different areas of concentration. Activities can focus on anything from managing market risk to human resource management. While traditional forms of risk management continue to be a focus of educational programming, some non-traditional areas of risk have been addressed during the reporting year.

Low commodity prices and production shortfalls have placed much more emphasis on producers making informed decisions in marketing their crops. Producer meetings have been conducted to teach both row crop producers and livestock producers various marketing alternatives that can help manage market risk. These meetings tend to focus on utilizing futures contracts and futures options as tools to minimize exposure to price fluctuations. In addition, meetings focus on using these tools either alone or in combination with other tools in developing successful marketing plans.

In a continued effort to provide comprehensive marketing education, the Marketing Agricultural Commodities (MAC) program continues to be offered state-wide. The MAC program consists of 8 – three hour seminars devoted to farm management and marketing education. With low commodity prices and a new farm bill, there were limited opportunities to conduct a MAC program during the reporting year. However, plans are under way to update MAC curriculum and to again heavily advertise its availability throughout the state.

AgCenter personnel also were involved with the development of a regional risk management publication. AgCenter personnel worked with counterparts in three other Southern states to develop comprehensive training and educational curriculum on all areas of risk management. The completed material was developed to be web-based and interactive. In addition, the presentation material will be available for download allowing all extension personnel within the cooperating states to access this information in conducting their own risk management programs. This interactive training material will be available at the Southern Region Risk Management Education Center website.

One of the ways that producers can manage risk is to make more informed decisions regarding their operations and take a more active role in addressing issues that affect agriculture. As such, the LSU AgCenter planned and conducted its second annual Agricultural Outlook conference. This conference provided producers with information on the latest issues that currently provide the greatest potential for impact on the agricultural industry. Issues such as international trade and agricultural policy were presented at this conference.

One of the industries in the state that has been hit hardest by low commodity prices has been the catfish industry. Low prices and climbing input prices have devastated what was once a very promising industry in the state. One program that was initiated has attempted to provide producers with information on federal programs that could provide some financial relief. The Trade Adjustment Assistance (TAA) program is a federal program that provides financial aid to producers of commodities that have been adversely affected by increased imports. As part of the TAA program, AgCenter personnel worked with colleagues in other states and other disciplines in developing a training curriculum to be used in the technical assistance training component of the TAA program. Catfish producers were provided technical training through a workshop and/or individual consultation.

Program Impact

Marketing Education/Ag Outlook Conference – In an attempt to keep the agricultural industry in the state of Louisiana aware of the market, production, and governmental issues that hold the greatest potential for changing the landscape of agriculture, an Agricultural Outlook conference was conducted in conjunction with the North Louisiana Agricultural Expo. Speakers and presenters from across the nation participated in the summit. A crowd of over 200 people from the agricultural community participated. This meeting help establish areas of priority for assuring that the agricultural industry in the state remained economically viable.

In addition to the major outlook meeting, approximately 5 meetings were held throughout the state to introduce producers and cattlemen to marketing alternatives and strategies that could be used to manage market risk. Approximately 100 producers took part in these meetings.

Ag Policy-Catfish - The implementation of the Trade Adjustment Assistance (TAA) program offers those producers of commodities that have been adversely affected by increased imports some financial aid. With the current status of catfish production struggling due to low commodity prices, the need to make producers aware of this potential assistance was critical. In addition to the meetings to make producers aware of the program, technical assistance training was provided to producers through a group workshop and individual consultation. The technical assistance training is a mandated component of the TAA program and provides producers with information on how they can modify their operations to address the pressures of increased imports. Eighteen (18) catfish producers and one salmon producer were trained. The training made producers eligible for up to \$190,000 in federal assistance.

Regional Risk Management Education – Through funds from the Southern Risk Management Education Center, personnel from 4 southern states worked together to develop a comprehensive risk management training curriculum addressing all aspects of risk management. The material were developed to be web-based and interactive. Responses from the Southern Risk Management Education Center suggest that this interactive web-based risk management curriculum will be the official risk management training material for the entire Southern Region. Once fully formatted for the web, this curriculum will be available for all extension personnel in the Southern Region to conduct their own risk management education programs.

Source of Funds

State and Federal Funds (Smith-Lever 3b+c)

Scope of Impact

Multi-state: Extension economists participate in the Southern Region Farm Management, Marketing, and Ag Policy committees, the Beltwide Cotton conference, the National Rice Outlook conference, the Tri-State Soybean Forum, the Delta Farm Management meetings, and regional and national association meetings. The annual outlook conference summit brought in speakers and presenters from all across the nation. The interactive web-based risk management curriculum was a cooperative effort with colleagues at four different land grant universities. Finally, the Trade Adjustment Assistance program is being conducted as a regional effort with extension personnel from throughout the southern region involved with curriculum development.

It is estimated that 50% of this program is multi-state, valued at \$60,102 (1.5 FTE x \$80,136 x .5).

Multi-function: The Trade Adjustment Assistance program involved both agricultural economists and aquaculture specialist in both research and extension.

It is estimated that 20% of the program is multi-function, valued at \$24,040 (1.5 FTE x \$80,136 x .2).

Federal Goal 1

MASTER CATTLE PRODUCER PROGRAM

Key Theme: Agricultural Profitability

Jason Rowntree, Associate Professor, Department of Animal Sciences, LSU AgCenter

Program Description

The Master Cattle Producer Program (MCP) is a commodity-specific follow-up to the Master Farmer Program designed to enhance the sustainability of beef producers. More specifically, Master Cattle Producers should: 1) have working knowledge of environmental stewardship, sustainable livestock production, farm management and marketing; 2) understand how these practices are interrelated and 3) implement these practices on his/her operation.

The MCP was first requested by the Louisiana Cattlemen's Association (LCA) and has been a cooperative effort between the LSU AgCenter, LCA and the Louisiana National Resources Conservation Service (NRCS). The first MCP sessions were offered at the LCA convention, Lafayette, LA in January, 2004.

Three Master Cattle Producer planning meetings occurred from fall, 2002 to January, 2004. Participants involved were the LCA, LSU AgCenter, NRCS and Louisiana Farm Bureau. Meeting discussions culminated in a curriculum comprised of eight lecture topics delivered in ten 3 hr sessions. Furthermore the planning committee decided curricula should include the first 8 hours of Master Farmer Program and Beef Quality Assurance (BQA) certification. Curriculum content committees were appointed and lectures were developed on the following subject matter areas: Pasture Management 1, Pasture Management 2 (NRCS), Nutrition, Animal Health/Biosecurity, Reproduction, Animal Handling, Breeding and Selection, End Product, Financial Management and Marketing.

Though the Master Cattle Producer Program currently constitutes a considerable education initiative, it is only one aspect of the overall Extension beef program.

Other important items of committee discussion were program implementation and cost. The committee decided on an initial implementation date of January, 2004, during the LCA Convention, Lafayette, LA. After the convention, multi-parish delivery areas were identified by County Agents with the initial program taking place July, 2004, in Lafayette, LA. As well, a speakers bureau consisting of LSU AgCenter and NRCS personnel was formed to ensure consistent statewide program delivery. A registration fee of \$ 100.00 to the LSU AgCenter was established to pay for an educational manual, MCP ranch sign, personal identification card and meals or snacks. Importantly, these fees do not cover any AgCenter employee travel expense. Further, a \$50.00 charge was assessed by the LCA to all BQA participants who were not members of the cattlemen's organization.

Presently, 311 people have participated in MCP lectures. Over 70 participated in the initial 2004 LCA convention offering. Lectures were also given to 40 Beef/Forage Short Course participants in Alexandria, LA. The program has also been administered in entirety at the following locations: Lafayette; Port Allen; Hammond; Caddo and Natchitoches with ongoing lectures being offered in Winnsboro, Thibodeaux and Ruston. In the first year of MCP 113 participants finished the program. Spring programs are being planned in Lake Charles, Rosepine and Many.

Program Impact

The MCP program is new to Louisiana and thus it is too early to quantify change in participant practices. However, an exit survey was administered to the Lafayette class with 65 participants. Producers had the opportunity to state whether they gained no, some or very much knowledge from each session and whether they would use none, some or most of the information gathered during the program. The raw results are as follows:

Session Title	Some Knowledge Gained	Very Much Knowledge Gained
Animal Handling	55%	41%
Animal Health	33%	58%
Nutrition	30%	60%
Pasture Management I	37%	50%
Pasture Management II	35%	57%
Breeding & Genetics	40%	54%
Reproduction	37%	52%
End Product	32%	63%
Marketing	40%	54%
Record Keeping	38%	54%

Session Title	Will Use Some of the Information	Will Use Most of the Information
Animal Handling	28%	69%
Animal Health	18%	80%
Nutrition	22%	74%
Pasture Management I	28%	65%
Pasture Management II	28%	71%
Breeding & Genetics	18%	65%
Reproduction	23%	74%
End Product	32%	58%
Marketing	29%	60%
Record Keeping	40%	55%

Source of Funds

Smith-Lever 3 b, c

Scope of Impact

Multi-state: It is estimated that 25% of the overall beef education program is multi-state, value at \$184,313 (9.2 FTE x \$80,136 per FTE x .25).

Multi-function: It is estimated that 30% of the overall beef program is multi-function valued at \$221,175 (9.2 FTE x 80,136 per FTE x .30).

Federal Goal 1

PASTURE, FORAGE, AND SMALL GRAINS

Key Theme: Agricultural Profitability

Ed Twidwell, Professor, Department of Agronomy, LSU AgCenter

Program Description

Stakeholder Input in Program.

Extension agents throughout the state with an interest in livestock and crop production normally have an advisory committee comprised of various types of stakeholders. At the advisory committee meetings, stakeholders provide input as to what topics and programs in the forage and small grain areas that they would like to see addressed. This input was collected by the extension agents, and then passed on to various subject matter extension specialists.

Problem(s) Identified.

Through stakeholder input, the topics of pasture weed control and demonstrations with new forage and wheat varieties were addressed.

Initiation and Progress of the Program.

Field demonstrations involving pasture weed control were conducted at thirteen locations throughout the state. Various herbicide treatments were applied during April through August, and then the test plots were visually rated for amount of weed control. Tours of these demonstrations were held at ten of the test locations.

Stakeholders were able to evaluate and compare the effectiveness of various weed control treatments. Eight demonstrations involving forage varieties were conducted. This involved seven ryegrass variety demonstrations and one bermudagrass variety demonstration. Field tours were held at five of these test locations. Stakeholders were able to observe the variety plots and compare the characteristics of the various forage varieties. Five wheat variety demonstrations were conducted. Field tours were held at two of the test locations.

Stakeholders were able to observe the variety plots and compare the characteristics of the wheat varieties. These wheat demonstration plots were harvested for yield determination and test weight. In all of the forage and small grain demonstrations that were conducted, stakeholders were able to take the results of the information presented and apply it on their own farm or ranch.

Collaboration.

University of Louisiana at Lafayette. The nature of collaboration was to provide a test location and some labor to conduct a ryegrass variety demonstration.

McNeese State University. The nature of collaboration was to provide a test location and some labor to conduct a pasture weed control demonstration.

Nicholls State University. The nature of collaboration was to provide a test location and some labor to conduct a pasture weed control demonstration.

LSU AgCenter/Extension. The nature of collaboration was to provide the labor to coordinate, conduct, and promote the demonstrations.

Program Impact

Stakeholders used the information from the pasture weed control demonstrations to assist them in selecting the proper means of controlling weeds on their farm or ranch. Control measures discussed included chemical and mechanical treatment options. Stakeholders were also educated on how to read and follow herbicide labels properly. As a result of this program, stakeholders will use more efficient and cost-effective means of controlling weeds in their pastures.

Stakeholders used the information from the forage variety demonstrations to assist them in selecting the proper varieties for use in their operation. Stakeholders used the information from the wheat variety demonstrations to assist them in selecting adapted varieties for their locale. Educating stakeholders on how to select varieties based on yield performance and disease resistance was a vital component of the program.

Source of Funds

Smith-Lever 3 b, c (federal funds)

Scope of Impact

Multi-function: (research-extension) Multi-function (integrated research-extension) efforts are estimated at 30% of the total number of FTE's expended in the program. These efforts include research-extension collaboration in agent training, formulation of recommendations, publications, stakeholder meetings, and responding to stakeholder questions and problems. The dollar value of this multi-function effort = [.30 (estimated % of program) x 7.35 (FTE's devoted to pasture, forage, and small grain program) x \$80,136 (\$ equivalent of 1 Extension professional FTE)] = \$176,700.

Federal Goal 1

REGIONAL PECAN WORK

Key Theme: Agricultural Profitability

R.S. Sandelin, M.J. Hall, C.J. Graham, LSU AgCenter Pecan Research and Extension Station, and J.R. Pyzner, LSU AgCenter North Central Region, LSU AgCenter

Program Description

Pecan is a specialty crop in the states of Louisiana, Arkansas, Mississippi, Texas, and Oklahoma. Of the land grant universities in these states the LSU AgCenter is the only one with a complete research and extension program to support the commercial pecan industry. The LSU AgCenter's Pecan Research-Extension Station near Shreveport, Louisiana is the only facility in the mid south region that has research and extension programs in the three primary areas of pecan production: horticulture, entomology and pathology. An initial proposal has been developed to transition the LSU AgCenter Pecan Station into a regional station that will serve the commercial pecan industry in a multi-state area. In early 2004, a letter of inquiry describing the proposal was sent to land grant universities that would be involved in this project. The University of Arkansas, Mississippi State University and Texas A&M University indicated that they were interested in pursuing cooperative work with pecan and the development of the LSU AgCenter Pecan Station into a regional station. In February 2004, meetings were held with extension and research personnel of the University of Arkansas and Mississippi State University to discuss the regional station concept and set up meetings with pecan growers (stakeholders) in these states. Two meetings with the stakeholders were held in Arkansas and Mississippi during the summer of 2004. There were a total of about 180 attendees at these meetings. Collaborators for these meetings included extension and research faculty from the Louisiana State University Agricultural Center, the University of Arkansas and Mississippi State University.

Program Impact

The concept of developing the LSU AgCenter Pecan Research-Extension Station into a regional station was well received by attendees of the meetings in Arkansas and Mississippi. Many of the attendees indicated that they were in need of all types of information on pecan production for both seedling trees and grafted orchards. Several of the attendees from Arkansas and Mississippi indicated a willingness to assist in the project in any way they could.

A regional pecan research and extension station should help underserved pecan growers in Arkansas, Mississippi, and east Texas to obtain current recommendations, and in identifying and solving problems in their individual orchards through extension outreach efforts. Some of the positive effects of a regional station for stakeholders could include better education for the currently underserved areas, better detection of pest outbreaks within the multi-state region, and better communication of crop management situations throughout the region.

Source of Funds

Smith-Lever 3 b, c (federal funds), state funds, private donations

Scope of Impact

Multi-state and Multi-function: The effort to explore the concept of developing the LSU AgCenter Pecan Station into a regional station involved university extension and research faculty and stakeholders from Louisiana, Arkansas, and Mississippi. Faculty and stakeholders were involved in planning each of the three meetings. Faculty and stakeholders from Louisiana were included in the meeting programs in each state. Faculty and stakeholders from Arkansas and Mississippi were included in the programs in their respective states. The two meetings in Arkansas were held in commercial pecan growers orchards, and the meeting in Mississippi was held at a Mississippi State University experiment station in Crystal Springs, Mississippi.

It is estimated that approximately 25% of the FTE time on pecan was devoted to the regional station concept in 2004. The dollar value the multi-state multi-function effort spent on the regional station concept would be \$20,032 (1 FTE x \$80,136 per FTE x .25).

Federal Goal 1

LOUISIANA RICE RESEARCH VERIFICATION PROGRAM

Key Theme: Agricultural Profitability

Johnny Saichuk (Agronomy), Professor, Southwest Region, LSU AgCenter

Program Description

The Louisiana Rice Research Verification Program (LRRVP) is a program designed to demonstrate the most cost-efficient production of rice, increase confidence of rice growers in extension and research recommendations, increase confidence of county agents and specialists in their recommendations, educate county agents and growers in all aspects of rice production, develop an economic data base for rice production, and relay “real world” conditions to researchers in an effort to enhance scientific studies.

Program Impact

The program has met or is achieving all of its intended goals and has expanded in scope each year of the program. Education of county agents both those directly involved and others through training programs, has been an immediate success. Other projects continue to evolve from the verification program. A five year water use study was funded after realizing through efforts at data collection that precise information on water use was not available. A study involving scientists from the Agronomy department will begin in 2005 in response to a problem

encountered in verification fields and other commercial fields for which there is no defined cause.

Source of Funds

Funding has come from the Louisiana Rice Research Board

Scope of Impact

Although other states are not specifically involved, this program is similar to one in Arkansas. Mississippi, having noted the success of Louisiana's program is investigating the possibility of setting up their own program. Information exchange between rice specialists in each state adds to the body of knowledge concerning rice production. The program regularly involves researchers making it a multi-function effort. The greatest percentage of time devoted to the program is provided by extension personnel even though researchers are intimately involved.

Multi-function: Multi-function (integrated extension-research) efforts are estimated at 35% of the total number of FTE's expended in the program. These efforts include research-extension collaboration in agent training, formulation of recommendations, publications and trouble shooting during the growing season. The dollar value of the multi-function effort is \$114,434 (4.08 FTE's x \$80,136 per FTE x .35).

Federal Goal 1

SOYBEANS AND GRAIN PRODUCTION

Key Theme: Agricultural Profitability

David Lanclos, Assistant Professor (Soybean, Corn, Grain Sorghum), Central Region, LSU AgCenter

Program Description

During the year, several parish level committees or advisory groups had meetings to steer program development for soybean and feed grain extension programs. Surveys were used from the previous year as supplemental steering mechanisms.

Potential program issues included more in field testing of soybean and feed grain varieties/hybrids due to the ever increasing number of varieties/hybrids that are available to producers commercially; better disease management systems; evaluation of lowering the stinkbug (red shoulder) threshold numbers when insects are allowed to attack the crop for long periods of time (soybeans only); irrigation management and timing as well as continued implementation of the soybean verification program.

From these directives, a comprehensive education program for soybean and feed grain producers was implemented. The performance goals of the programs were to increase yields and thus profitability of Louisiana soybean and feed grain producers by following recommended agronomic practices suggested by the LSU AgCenter. The education programs provided information on the importance of proper variety/hybrid selection, agronomic practices involving tillage, plant populations, irrigation, fertility and pest management in regard to herbicides, insecticides and fungicide applications. The following educational activities were conducted during the year:

- Five agent-training sessions were conducted to inform LSU AgCenter personnel working directly with soybean and feed grain production on the latest recommended practices.
- The state specialist and parish extension agents conducted 62 on-farm demonstrations in the major feedgrain production parishes.
- Fifteen on-farm research projects were conducted jointly with faculty of the LSU AgCenter Experiment Stations.
- Forty educational meetings and ten field days were conducted to keep growers informed of recommended practices.
- A monthly newsletter is distributed electronically to over five hundred producers, consultants, extension personnel and others involved in production agriculture. The newsletter primarily focuses on agronomic practices in addition to the latest research that is being generated by LSU AgCenter Experiment Station personnel. This electronic newsletter kept clientele informed of these facts as well as current and future events occurring in the AgCenter and around the state.
- Mass media programs were produced at least weekly to keep clientele informed of anything that was pertinent to soybean and feed grain production during the season.
- Specialists as well as county agents were interviewed or wrote news articles pertaining to soybean and feed grain issues during the growing season.
- The LSU AgCenter soybean, corn, and grain sorghum production web pages were updated by the soybean and feed grain specialist in an attempt to modernize the site and make it more user friendly.
- The state soybean and feed grain specialists (Agronomy, Entomology and Pathology) collaborated with other mid-south specialists and attended professional working group sessions to ensure that Louisiana growers are receiving the latest information available.

- The state soybean specialist and extension personnel participated in a multi-state mock soybean rust study to evaluate the potential ability for aerial applicators to be able to spray for the disease if and when it enters the United States.

Collaborators in the soybean and feed grain education program included extension and research faculty within the cooperating land grant system (Louisiana State University and A&M College and Southern University and A&M College); USDA agencies; state environmental agencies; Louisiana Farm Bureau Federation; Louisiana Soybean Association; Louisiana Association of Agricultural Consultants; Louisiana Department of Agriculture and Forestry in addition to private industry personnel.

Program Impact

- Over 4,800 producers, consultants, and industry personnel attended field days and educational meetings.
- Extension agents and other LSU AgCenter faculty working in soybean and feed grain production attended training sessions for LSU AgCenter personnel.
- State specialists and extension agents made presentations at local, multi-state and national meetings.
- Forty-two agents and/or specialists attended multi-state or national meetings.
- Extension agents and/or specialists conducted ninety on-farm demonstrations.
- Approximately 70% of Louisiana soybean and feed grain producers follow LSU AgCenter recommendations.

Source of Funds

State and Federal (Smith-Lever 3 b, c)
Louisiana Soybean and Feed Grain Research and Promotion Board
Private Industry grants

Scope of Impact

Multi-state: Participation in and information sharing from multi-state conferences as well as national meetings with a total multi-state effort valued at \$202,343 (10.1 FTEs x \$80,136 per FTE x 0.25).

Multi-function: Researchers and extension specialists collaborated on preparing publications, development and training of agents, consultants, agbusiness personnel, and producers for a multi-function effort valued at \$809,374 (10.1 FTEs x \$80,136 per FTE x 1.0).

Federal Goal 1

SPATIALLY VARIABLE PESTICIDE APPLICATION BASED ON REMOTE SENSING

Key Theme: GIS/GPS

Ralph Bagwell, Professor, Northeast Region, LSU AgCenter

Program Description

The objective of this program is to introduce Louisiana cotton producers to spatially variable pesticide (SVP) treatments. Spatially variable treatments offer great promise of increasing agricultural profitability without significantly impacting harvested yield. Remotely sensed imaging offers great potential as a method to base variable rate sprays of plant growth regulators (PGR) and defoliant. Normalized Difference Vegetative Index or NDVI is most often used as a method of remotely sensing plant vigor. NDVI is calculated as a ratio of light intensity in the near infra-red wavelength to the light intensity in the red wavelength. This ratio provides a relative measure of plant biomass. NDVI values are thus used as the basis for changes in rate structures of PGRs and defoliant. Insecticide costs can be significantly reduced using historical yield patterns without significantly impacting crop yield. Lower yielding areas of a field should receive fewer insecticide applications because of a higher EIL value.

- The cotton pest management specialist in cooperation with county agents conducted 24 demonstrations that demonstrated spatially variable insecticide, plant growth regulator and defoliant treatments.
- 15 county agents were trained on SVP a county agent training.
- 15 presentations on cotton IPM were given at producer meetings.
- 3 national and one international presentation on SVP were made
- Program collaborators included faculty from other land grant institutions (University of California, Mississippi State University, Oklahoma State University, Rutgers University); NASA; USDA; Louisiana Farm Bureau Federation; Louisiana Cotton Producers Association; Louisiana Department of Agriculture and Forestry; private industry; Cotton Incorporated.

Program Impact

- 38 agricultural producers, agricultural consultants and aerial applicators were directly involved in decision making on SVP demonstrations.
- Over 150 aerial applicators were introduced to spatially variable application by air.

- Over 150 agricultural consultants were trained on how to make recommendations using SVP.
- Over 500 cotton producers were introduced to SVP at county agent production meetings.

Source of Funds

NASA
Private industry

Scope of Impact

This program is newly initiated thus is considered multi-function program only. Thirty percent of the program is a result of multi-function programming. At 0.70 FTEs devoted to cotton IPM the dollar value of the multi-function effort is = [(30%) (0.70 FTE) (\$80,136/FTE) = \$16,828.

Federal Goal 1

SWEET POTATO INSECT AND DISEASE CONTROL EDUCATION PROGRAM

Key Theme: Agricultural Profitability

Mike Cannon, Professor and Coordinator, Department of Horticulture, LSU AgCenter

Program Description

In meetings held with sweet potato producers in Louisiana, through survey instruments, and from measuring the inquirers for information from extension specialist and county agents, insect and weed control in sweet potato production consistently surface as two of the greatest concern of producers.

One national, one statewide and 3 parish production meetings were held in the winter of 2004 to address insect and weed control as well as providing other production information. Two field days were conducted, one at the Sweet Potato Research Station and one on farm in W. Carroll Parish, in which insect and weed control were discussed and observed. Seventeen weed control trials were conducted including 4 on farm demonstrations. Over 20 on farm insect control demonstration were conducted. Light traps to monitor flight of a new insect pest the Sugarcane Beetle were placed in 6 locations statewide and monitored. A fact sheet regarding the lifecycle and identification of the sugarcane beetle and the damage causes was produced and made available to extension agents and producers. A fact sheet impressing the need to adequately incorporate soil applied pesticides was produced and distributed to county agents

There was considerable collaboration between the LSU AgCenter Departments of Plant Pathology, Entomology, Sweet Potato Research Station, Northeast Research Station, Macon Ridge Research Station, County Agents and the La. Department of Agriculture as well as

numerous sweet potato producers. The Departments of Entomology and Plant Pathology along with county extension agents were responsible for identifying cooperators for the 20 on farm insect demonstrations and assisting with these on farm plots. The personnel at the Sweet Potato Research Station, Macon Ridge Research Station and Northeast Research Station were responsible for conducting replicated insect and weed control plots both on the research stations and on farms in the northern section of the state. The Extension Sweet Potato Specialist and Weed Control Specialist handled numerous inquiries as to proper use of newly labeled herbicides.

Program Impact

As a result of the efforts of this group 3 section 18 petitions for herbicides were submitted to EPA; 2 were granted, Dual and Valor, and a crisis exemption was issued by the Dept of Agriculture for the herbicide Sandea. Two section 18 petitions for insecticides were submitted 1 insecticide, Capture, was granted a section 18 exemption by EPA. The significance of the new labels was to provide herbicides that control several weed pests such as sedges, smell melon, pigweed, morninglory that the one labeled herbicide for sweet potatoes does not control. The insecticide Capture has proven to be a valuable new tool applied to the soil and foliar in controlling several insect pests in sweet potatoes. During the two field days growers were able to observe the efficacy of these new pesticides. Growers that used these materials reported excellent weed and insect control.

Results from the 20 on farm demonstration/test plots indicated that the current recommended insect control program provides significant control of soil insects. This is not to indicate that greater control is not desirable. There was a significant correlation between weed infestation and insect damage. Light traps to capture adult sugarcane beetles were quite successful in the early part of the year, April and early May, but after that few adults were observed. There is some speculation that the excessive rainfall during May and June may have impacted these populations.

Source of Funds

Smith –Lever 3 b, c
Louisiana Sweet Potato Association

Scope of Impact

The scope of this program impacted other sweet potato producing states as they followed our lead in submitting section 18 requests for all but one of the herbicides and one of the insecticides. Labels were granted in at least one state for two of the herbicides.

Mississippi and Arkansas submitted section 18 requests for Sandea. Information involving research data on efficacy of these pesticides was shared between these states as well a North Carolina. Collaborative meetings were held in Louisiana in January 2004 to discuss weed and

insect control in sweet potatoes. Specialist remained in contact by email and phone. One visit was made by the extension weed specialist to attend a weed control field day in Ponotoc, Ms. The section 18 packet from Louisiana for Sandea was shared with both Mississippi and Arkansas. A joint meeting was held with La. Department of Ag, Mississippi Dept of Ag, the Louisiana Extension Sweet Potato and Weed Specialist, and Gowan Chemical Co. to discuss label request for Sandea.

Multi-state: Louisiana, Mississippi, Arkansas .25% of 2FTE'sX\$80,136 = \$40,068

Multi-function: .10% X 7 FTE'sX \$80 136=\$56,095

Federal Goal 1

WEED SCIENCE EDUCATION PROGRAM

Key Theme: Agricultural Profitability

Steve Kelly, Associate Professor, (Weed Science), Northeast Region, LSU AgCenter

Program Description

Louisiana producers are faced with a variety of weedy pests and have several options to deal with them. These options range from new herbicide resistant cotton to new herbicides. Widespread adoption of Roundup Ready technology has led to the need for new herbicides and a means for injecting new herbicide mode-of-actions to combat potential weed resistance to glyphosate.

A comprehensive extension education program for crop producers was implemented. The goal of this program was to demonstrate the critical need for proper weed identification and herbicide selection for controlling the specific weeds present. The diverse weed spectrum present in Louisiana makes proper weed identification imperative. The following tasks were completed:

An agent-training session was conducted to educate LSU Agricultural Center personnel, working in crop production and horticultural areas of the latest weed control recommendations, new herbicides, proper weed identification and herbicide symptomology (25 agents).

The state weed specialist in cooperation with county extension agents and private consultants conducted six on-farm demonstrations including Liberty-Link cotton (cotton resistant to the herbicide Ignite), controlling winter vegetation in reduced tillage situations, demonstrating new cotton herbicides, and corn weed control programs.

A cotton newsletter was distributed to producers, consultants, and agribusiness personnel throughout the growing season via electronic mail (300 contacts) and printed media (200 copies).

The newsletter contained updates on recommendations and kept clientele informed of current events and potential situations that they may see in their crops.

Nine news articles were written and distributed.

LSU AgCenter weed control publications were revised, updated and made available on the LSU AgCenter website.

County agents, producers and consultants were made aware of new herbicides, label changes, etc. through the use of electronic mail.

Program collaborators included other educational institutions within the state; Extension Service and Research faculty within the region's land grant institutions (University of Arkansas, University of Tennessee, Mississippi State, University of Missouri); USDA agencies; Louisiana Farm Bureau Federation; Louisiana Cotton Producers Association; professional organizations; Louisiana Department of Agriculture and Forestry; private industry; Cotton Incorporated.

Program Impact

- Over 2,000 farmers, consultants, and industry personnel attended the field days and educational meetings.
- Training sessions for LSU AgCenter personnel were attended by 80% of the Extension agents working in row crop production programs.
- Extension specialists made 17 presentations at parish crop production meetings.
- Extension specialists made six presentations at national meetings.
- 12 extension agents and/or specialists attended national meetings.
- Extension agents and/or specialists conducted six on farm demonstrations.
- Producers gained knowledge of new herbicide technology.
- More than 6,400 people visited the “2004 Suggested Weed Control Guidelines” website for weed control information.
- “Controlling Weeds in Cotton – 2004” was updated and posted on the LSU AgCenter website.

Source of Funds

Smith-Lever 3 b, c
Private industry

Scope of Impact

Multi-state: Delta; Cotton Incorporated herbicide review – 5 FTE’s with a 5% effort was devoted to the program for a total multi-state effort of \$20,034 (5 FTE’s x \$80,136 per FTE x .05). Weed Workers Meeting - 5.5 FTE's with 20% effort were devoted to the program for a total multi-state effort of \$80,136 (5.5 FTEs x \$80,136 per FTE x .20).

Multi-function: Researchers and extension specialists collaborated on the development of publications, training of agents, consultants, agribusiness personnel, and farmers for a 100% multi-functional effort of \$1,568,261 (19.57 FTEs x \$80,136 per FTE x 1.0).

Goal 2

LSU AgCenter Goal 2 is to provide a safe and secure food and fiber system which specifically will improve food and fiber safety and eliminate food-borne risks.

Goal 2 – Research Project Summaries

- Each summer, the Louisiana oyster industry is threatened by a recall of oysters due to contamination of *vibrio* which are bacteria widely distributed in the estuarine and marine environments. Bacteriophages have been found in seawater and oysters, and could be used to control such pathogens in oysters. Research results showed bacteriophages active against the virulent *vibrio vulnificus* are naturally found in oysters and could possibly be used as a processing aid to control the pathogen in live oysters. By destroying these human pathogens in shell stock oysters it will reduce the economic loss due to recalls, and protect the oyster industries' reputation along with the welfare of consumers.
- With the recurring recalls of ready-to-eat meat and poultry products due to contamination from food-borne infections, research results showed that acidified sodium chlorine is effective in inhibiting growth of pathogens when the pathogen was grown on the surface of ready-to-eat meat products. This could help to prevent economic loss and possible deaths from food-borne infections and will benefit Louisiana based ready-to-eat meat processing companies as well as the general public.
- There is considerable need for the reduction of *E. coli* and other pathogens in livestock prior to slaughter. Currently there is a focus on development of best management practices (BMPs) to control food-borne pathogens prior to slaughter. This study investigated the growth of *E. coli* and other pathogens collected from cattle water troughs on various surfaces to better understand the ability of these pathogens to survive, and to develop methods to control them in the environment of small cattle farms. The research showed that biofilms from cattle water troughs can support growth of pathogens, and that copper could possibly be used to control these food-borne pathogens in cattle water trough biofilms.
- Pathogens found in the environment of ready-to-eat processing plants have been linked to contamination of these products. Research by LSU AgCenter scientists could provide ready-to-eat meat processors a method to control these pathogens within the food processing environment by using copper-based alloys. Study results indicated that copper or brass metal could be used to control some pathogens in hard to clean areas, such as drains or air vents, of the ready-to-eat processing environment.
- Aflatoxin has been a costly disease of grains in Louisiana, especially with both the high temperature and humidity normal to the state. Many detoxification techniques have been applied with some success. This study found that ozonation reduced aflatoxin levels by 92% and no reversion to the parent compound was observed. Chemical inactivation by ammoniation has wide-spread acceptance and use, however the cost is about \$20 per ton. Compared to ammoniation treatment, decontamination with ozonation is estimated to cost about \$4 per ton. If ozone is proven to be effective and does not cause harm to grains, it will result in farmers getting a higher return on their grain, a safer food, and less harm to the environment.

- Maintaining the quality and safety of fresh-cut produce is a major challenge to the food industry. Many techniques, including edible coatings, have been studied to overcome these problems and extend the shelf-life of fresh produce. This study found that crawfish chitosan edible coating with added microbiocides is anticipated to extend shelf-life and assure desirable quality of fresh-cut produce. Chitosan also may serve as an antimicrobial cleaning agent for food contact surfaces in food processing plants. With consumer demand increasing for minimally processed foods, crawfish chitosan may offer the food industry a viable means of better meeting this demand.
- Improved rice varieties with higher yield potential and quality can greatly improve economic returns to the farmer, while providing to the consumer a safe and healthy diet selection. The Rice Breeding Project is continually striving to develop new, improved varieties with improvement not only in yield but in other important characteristics as well. Cheniere, a new variety, is expected to account for a substantial portion of Louisiana's rice acreage. Cheniere has comparable yield potential to the widely used variety Cocodrie, but superior milling characteristics and grain appearance. This newly developed variety not only will potentially improve farm income, but will also provide the public with a safe and economical diet staple.
- Vaccinating cattle against brucellosis, tuberculosis, and Johne's Disease with a multivalent vaccine that is safe and efficacious, which additionally will assist in the protection of the animal from a potential agroterrorist attack using these pathogens is imperative to the well-being of all people. In this research, all animals were challenged with various virulent organisms, and all animals remained negative on all routine diagnostic tests. All three of the regulatory diseases addressed in this study deleteriously impact the economics of cattle production, which in turn affects all consumers.

Goal 2 – Research Project Reports

Federal Goal 2

Title of Research Project: Effect of temperature, pH, and salt content on bacteriophage activities against virulent *Vibrio vulnificus*, attenuated *Vibrio vulnificus* or *Vibrio parahaemolyticus*

Key Theme: Food Safety

Marlene E. Janes, Assistant Professor, Department of Food Science, LSU AgCenter

Issue: *Vibrio parahaemolyticus* and *Vibrio vulnificus* are bacteria widely distributed in the estuarine and marine environments. Every summer, the oyster industry is threatened by recall of oysters due to *vibrio* contamination. Bacteriophages, viruses that lyse bacteria specific to *Vibrio parahaemolyticus* and *Vibrio vulnificus* have been found in seawater and oysters. Bacteriophages could be used to control pathogenic *Vibrios* spp. in oysters. A better understanding of the effects that harsh environmental conditions have on bacteriophages antimicrobial activities is needed. We investigated the effects that pH (3, 4, 5, 6, 7, 8, 9, or 10) temperature (4, 30, and 45°C) and salt content (0, 2, 6, 10, 14, 18, 22, 26, or 30%) have on the activities of bacteriophages isolated from oysters against virulent *Vibrio vulnificus* (Vvo), attenuated *Vibrio vulnificus* (Vvt) or *Vibrio parahaemolyticus* (Vp).

What was done: Our results indicated that the bacteriophages Vvo, Vvt and Vp retained their activity at a pH of 7 and 8 after 36 days at all temperatures tested. All of the bacteriophages immediately lost activity at an acidic pH of 3 and 4 for all temperatures tested. The bacteriophages lost activity by day 28 when stored at 45°C in all salt concentrations tested. However, when the bacteriophages Vvo and Vvt were stored at 4°C in salt concentrations of 6 to 22% and at 30°C in salt concentrations of 6 to 10% they had retained activity by day 52. Bacteriophage Vp remained active in salt concentrations of 6 to 30% at 4°C and in salt concentrations of 6 to 22% at 30°C by day 52.

Impact: Every year during the summer months the oyster industry is threatened by closure of water ways and recall of oysters due to *V. vulnificus* and *V. parahaemolyticus* contamination. Our results indicate that bacteriophages active against the virulent *Vibrio vulnificus* are naturally found in oysters and could possibly be used as a processing aid to control this pathogen in live oysters. By destroying these human pathogens in shell stock oysters it will reduce the economic loss due to recalls, protect the oyster industries reputation along with the health and welfare of the consumers. These results showed that bacteriophages Vvo, Vvt, and Vp lost activity at an acidic pH and were sensitive to elevated temperatures. The bacteriophage Vp was more salt tolerant than the phages Vvo and Vvt.

Sources of funding: Hatch project and Multi-state project

Federal Goal 2

Title of Research Project: Acidified Sodium Chlorite Treatment for Inhibition of *Listeria Monocytogenes* Growth on the Surface of Various Ready-to-Eat Products

Key Theme: Food Safety

Marlene E. Janes, Assistant Professor, Department of Food Science, LSU AgCenter

Issue: On October 2, 2003 the United States Department of Agriculture, Food Safety and Inspection Service issued a new directive for the control of *Listeria monocytogenes* on ready-to-eat products. In order to help local processors meet this new requirement, we have been investigating acidified sodium chlorite as a possible method for the control of *Listeria monocytogenes* on RTE turkey, ham, and hog head cheese (45g).

What was done: Our study evaluated various concentrations of acidified sodium chlorite (ASC) needed to effectively reduce *Listeria monocytogenes* counts on 45-gram cubes of ready-to-eat turkey, ham and hog head cheese samples vacuumed packaged then stored at refrigerator temperatures. An initial inoculation of about 6.00 Log CFU/g of *L. monocytogenes* grew to greater than 9.40 Log CFU/g on all three ready-to-eat meat products. By day 14 the ASC (500, 750, or 1000ppm) treated RTE turkey samples had about 2.30 Log CFU/g reductions in bacterial counts compared to the control. Both the ham and hog head cheese inoculated samples had about 1.50 Log CFU/g reduction of *L. monocytogenes* counts compared to the controls at day 14 when treated with 500, 750, or 1000ppm ASC. On day 28, there were no significant differences in the reduction of *L. monocytogenes* counts between the different concentrations of ASC treated ready-to-eat meat samples with the turkey samples having about 2.00 Log CFU/g reductions, ham 1.92 log CFU/g reductions and hog head cheese 1.42 Log CFU/g reductions as compared to the controls non-treated RTE meat samples.

Impact: With the recurring recalls of ready-to-eat meat and poultry products due to contamination by *Listeria monocytogenes* there is a clear need to develop additional methods to prevent economic loss and possible deaths that can occur from foodborne listeriosis infections. Our results have shown that acidified sodium chlorite is effective in inhibiting the growth of *L. monocytogenes* when this pathogen was grown on the surface of ready-to-eat meat products and will benefit Louisiana based ready-to-eat meat processing company's.

Sources of funding: Hatch project and Industry

Federal Goal 2

Title of Research Project: Growth and survival of foodborne pathogens in biofilms collected from cattle water troughs

Key Theme: Food Safety

Marlene E. Janes, Assistant Professor, Department of Food Science, LSU AgCenter

Issue: On September 9, 2003, the Food Safety and Inspection Service (FSIS) held a meeting concerning pre-harvest food safety issues. This meeting focused on the gaps in research needed for the reduction of *E. coli* O157:H7 and other pathogens in livestock prior to slaughter. One of the focuses of FSIS is the development of Best Management Practices to control foodborne pathogens in livestock before slaughter. Our study investigated the growth of *L. monocytogenes*, *E. coli* O157:H7 and *S. typhimurim* in biofilms collected from cattle water troughs on various surfaces to better understand the ability of these pathogens to survive and to develop methods to control them in the environment of small cattle farms.

What was done: Biofilms previously collected from cattle water troughs (0.1 grams) were placed onto the surface of wood, glass, tin, copper or rubber then placed into sterile Petri plates. The biofilms were inoculated with *L. monocytogenes*, *E. coli* O157:H7 or *S. typhimurim* and 10 ml of sterile water was added to each plate. Plates were placed at 37°C or 4°C. Bacterial counts were determined at day 0, 4, 8, 12, 16, and 20 for 37°C and at day 0, 7, 14, 21, and 28 for 4°C. By day 20 at 37°C *L. monocytogenes* had grown to 7.0 Log CFU/g in biofilms on glass, rubber, or tin whereas *L. monocytogenes* counts were reduced to 4.68 Log CFU/g on the surface of wood which was significantly different from the other surfaces. However, when grown in biofilms on the surface of copper, *L. monocytogenes* counts were at non-detectable levels from 8 to 20 days at 37°C. At 4°C *L. monocytogenes* was able to grow and maintain counts above 7.0 Log CFU/g on the surface of glass, rubber and tin over the 28 day study. Conversely, when biofilms were placed on the surface of wood and copper then stored at 4°C *L. monocytogenes* counts were reduced to non-detectable levels by day 14 for copper and day 21 for wood. *Escherichia coli* O157:H7 grew to above 8.0 Log CFU/g by day 8 in biofilms placed onto the surface of wood, glass, rubber and tin at 37°C and maintain high counts on these surfaces through out the 20 day study. However, when grown in biofilms on the surface of copper, *E. coli* O157:H7 counts were at non-detectable levels from 8 to 20 days at 37°C. *Escherichia coli* O157:H7 initial counts of about 7.0 Log CFU/g in the biofilms on the different surfaces slowly dropped when stored at 4°C. By day 28 at 4°C *E. coli* O157:H7 counts had reached non-detectable levels in biofilms on the surface of copper, wood and tin. The *E. coli* O157:H7 counts were 2.50 Log CFU/g for glass and 3.54 for rubber by day 28 at 4°C. An initial 3.50 Log CFU/g of *S. typhimurim* grew to greater than 9.0 Log CFU/g when inoculated into biofilms on wood, glass, rubber and tin by day 4 at 37°. By day 20 at 37°C *S. typhimurim* counts were significantly lower in biofilms on the surface of wood and copper with a 1.0 to 1.5 Log CFU/g reduction compared to the other surfaces, respectively. At 4°C an initial inoculation of about 6.5 Log CFU/g for *S. typhimurim* was reduced to 3.71 Log CFU/g for biofilms on glass, 4.59 Log CFU/g for biofilms on rubber,

and 3.49 Log CFU/g on tin by day 28. *Salmonella typhimurim* inoculated into biofilms placed on the surface of copper or wood at 4°C were reduced to non-detectable levels by day 28.

Impact: This study has shown that biofilms from cattle water troughs can support the growth of *L. monocytogenes*, *E. coli* O157:H7 and *S. typhimurim*. These results suggest that methods need to be developed to control these pathogens in biofilms in cattle water troughs. Our study should that copper could possibly be used to control these foodborne pathogens in cattle water trough biofilms.

Sources of funding: Hatch project

Federal Goal 2

Title of Research Project: Antimicrobial Effects of copper ions on the growth of *Listeria monocytogenes* at different temperatures.

Key Theme: Food Safety

Marlene E. Janes, Assistant Professor, Department of Food Science, LSU AgCenter

Issue: *Listeria monocytogenes* (Lm) found in the environment of ready-to-eat (RTE) processing plants has been linked to the contamination of these products. Our research could provide ready-to-eat meat processors a method to control this pathogen within the food processing environment by using copper-based alloys. We evaluated the effect of temperature (4, 25, and 37°C) on the antimicrobial activity of copper ions against *L. monocytogenes* when grown on the surface of copper and brass metal surfaces.

What was done: Copper and brass sheets were cut into 2 ½ by 2 ½ disks, autoclaved and placed into Petri dishes. A decimal dilution overnight culture of *L. monocytogenes* (10 µl) was inoculated into nutrient agar (10 ml), poured over the surface of copper, brass or Petri dishes (control) and incubated at 4, 25, or 37°C. Bacterial counts were determined at day 0, 2, 4, 6 or 8. Our results showed that at 4°C *L. monocytogenes* counts on the surface of brass were significantly reduced by 3 Log CFU/g from day 2 through 8 as compared to the controls (4.0 Log CFU/g). The *L. monocytogenes* counts at 4°C on copper were reduced to non-detectable levels by day 8. At 25°C *L. monocytogenes* counts had a 6 Log CFU/g reduction by day 6 when grown on the surface of copper and brass as compared to the controls. At 37°C *L. monocytogenes* counts on the surface of the copper or brass were reduced to non-detectable levels at day 8.

Impact: Our results indicated that copper or brass metals could possibly be used to control *L. monocytogenes* in hard to clean areas such as drains or air vents of the ready-to-eat processing environment.

Sources of funding: Hatch project

Federal Goal 2

Title of Research Project: Use of Ozonation to Degrade Certain Chemicals in Food and Animal Feeds

Key Theme: Food Safety

Joan M. King, Assistant Professor, Department of Food Science, LSU AgCenter

Issue: Aflatoxin is a natural toxin produced by *Aspergillus flavus* and *parasiticus* molds. Grains have been frequently contaminated with aflatoxin, especially in climates with high temperature and humidity such as Louisiana. A drought in Louisiana caused a major outbreak of aflatoxin in corn, where as high as 80% of corn and 10% of cottonseed was contaminated with aflatoxin. These infections resulted in a large financial loss to Louisiana farmers who had to either destroy their crops or sell them at a significantly reduced price after hard work and major investment. If a viable alternative had existed for treating the infected crops to eliminate the aflatoxin, the farmers could have received a larger return for their investment. Research emphasis has focused on both pre-harvest prevention and post-harvest removal of aflatoxin from grains. The continuing challenge of aflatoxin control necessitates the need for improved post-harvest techniques to detoxify valuable grain supplies that would otherwise end up as a hazardous waste material. Many detoxification techniques have been applied with some success; however, great potential for ozonation exists because of potential economic benefits and effectiveness of treatment. It is important that the process be proven to be effective in destroying toxic compounds without producing new ones, as well as not causing harm to the grain nutrients.

What was done: Ozonation reduced aflatoxin levels by 92% and no reversion to the parent compound was observed. Fractionation of corn samples was done following a series of extraction, partition and digestion procedure. Each extract collected was subjected to preliminary thin layer chromatographic analysis to determine the distribution of aflatoxin. Result of the analysis showed that aflatoxin B1 is present in methylene chloride, methanol, acetone, pronase soluble solid and pronase organic fractions of untreated contaminated corn. Aflatoxin was also observed in extracts from treated contaminated corn but to a lesser extent. No aflatoxin was observed in extracts from untreated and treated clean corns. No aflatoxin was observed in hexane extracts from all samples. Hexane extracts from ozone-treated contaminated corn had lower inhibitory effects. This suggested that a fat-soluble mutagen was being formed or natural inhibitors of mutagenicity were being destroyed. There were results indicating the possible formation of new mutagenic compounds and the presence of anti-mutagenic or inhibitory compounds depending on the solvent. Further investigation into the products being formed and the inhibitory compounds being destroyed is underway. Preliminary results indicated that lutein is not destroyed by ozonation and the molecular weight of the proteins is not altered. Further study is necessary to verify these results and to determine if the lutein extracted still shows antimutagenic capability against aflatoxin as reported in the literature.

Impact: Chemical inactivation by ammoniation has wide spread use and acceptance, however, the cost is approximately \$20 per ton. Compared to ammoniation treatment, decontamination with ozonation is estimated to cost only about \$4 per ton. Processing with ozonation will not leave any harmful solvent wastes that ammoniation does and is much more suited to on the farm use. Farmers will benefit economically due to the lower costs and better feasibility and will obtain a higher return on their grain instead of having to sell it as animal feed or just throw it away. If ozone is proven to be effective and does not cause harm to the grains, its use will result in a safer food and less harm to the environment.

Sources of funding: State, Hatch, LA Soybean and Grain Research and Promotion Board, Board of Regents - Research Competitive Subprogram

Federal Goal 2

Title of Research Project: Edible Film Coating and Quality Evaluation of Fresh-Cut Fruits and Vegetables

Key Theme: Food Safety

Witoon Prinyawiwatkul, Associate Professor, Department of Food Science, LSU AgCenter

Issue: Fresh-cut produce sales are estimated at \$10 billion. Consumers are more demanding for minimally processed foods. Minimal processed fruits and vegetables are highly nutritious, but highly perishable. Removing the skin from the surface or altering the size leads to leakage of nutrients, accelerated enzymatic reactions, rapid microbial growth, color and texture change, and weight loss, resulting in deteriorated quality of the product. Many techniques, including edible coating, have been studied to overcome these problems and extend the shelf life of fresh produces. Maintaining the quality and safety of fresh-cut produce is still a major challenge for the food industry.

What was done: Crawfish chitosan may be utilized to produce edible film or coating similar to those conventionally produced from polysaccharide-based or protein-based materials and other crustacean shell wastes. Chitosan is an inherent antimicrobial agent, and thus when used as a coating on fresh-cut fruits, vegetables, or meat products may prolong their shelf life. Increasing incidents of food-borne illnesses and unavailability of potent antimicrobial agents applicable to control food-borne pathogens prompt development of more effective antimicrobial systems for fresh cut fruits and vegetables. Chitosan and lactoferrin are natural antimicrobial agents, and, when combined, may provide synergistic effects against food-borne pathogens. We studied synergistic effects of crawfish chitosan and lactoferrin against *Listeria monocytogenes* and *Escherichia coli* 0157:H7. Chitosan was prepared from crawfish shell waste. Chitosan (1% w/v) in 1% acetic acid was hydrolyzed and mixed with 0.25, 0.50, 0.75, 1.0 and 2.0 % w/v lactoferrin. The chitosan-lactoferrin (CL) solution was allowed to hydrolyze overnight. Pellets of bacteria prepared from 1 mL of *L. monocytogenes* and *E. coli* 0157:H7 with 10^7 - 10^8 cfu/mL were introduced to 1 mL of CL solution and incubated at 37C. Samples were drawn at 0, 2, 4, 8,

and 24 hours and plated for bacterial enumeration. Chitosan without lactoferrin (CH), lactoferrin without chitosan (LF), and phosphate buffer solution (PBS) were used as controls. Triplicate experiments were conducted. CH showed inherent antimicrobial property and caused gradual reduction of both pathogens with increased time. Compared to the controls, CL solution caused significantly more reduction in cfu/mL of *L. monocytogenes* and *E. coli 0157:H7* than did CH or LF alone; this indicated synergistic antimicrobial effects of chitosan and lactoferrin. Increased lactoferrin concentration in CL solution caused greater reduction of bacteria counts, indicating that antimicrobial effect of CL was a function of lactoferrin concentration. CL solution with 2% lactoferrin was most effective against *L. monocytogenes* and *E. coli 0157:H7*; the cfu/mL of both pathogens reached zero within 2 hours. Similar reductions (zero cfu/mL) were also observed with CL solution with 1% lactoferrin within 4 hours. The study demonstrated the synergistic antimicrobial effects of crawfish chitosan and lactoferrin against *L. monocytogenes* and *E. coli 0157:H7*. It is known that microorganisms can attach to solid surfaces and form microcolonies or biofilms on food contact equipment surfaces. *Listeria monocytogenes* can survive for prolonged periods on stainless steel and rubber materials commonly used in food processing plants. Routine chemical cleaning, accompanied by manual/mechanical scrubbing, of food contact surfaces, especially for fresh-cut fruits and vegetables, is an effective way to minimize biofilms. We evaluated efficacy of chitosan against *Listeria monocytogenes* (LM) and *Escherichia coli 0157:H7* (EC) adhered to stainless steel, rubber, and glass surfaces commonly found in the processing plants. Both 0.5% and 1% chitosan solutions (in 1% acetic acid) were prepared from high (1,100 kDa, HMw) and/or low (470 kDa, LMw) molecular weight chitosan, and the pH of the solutions was adjusted to 5.6. 100 μ l of overnight cultures of LM and EC was separately inoculated onto each of three surfaces and incubated at 37°C for 1hr. Each inoculated surface was treated with chitosan, acetic acid (as control) or PBS (as control) solution for 15 min, then plated onto Oxford and SMAC agar plates, incubated at 37°C for 48 hr, and CFU/ml was determined. Triplicate experiments were conducted. Data were statistically analyzed ($\alpha=0.05$). Regardless of surface type, EC counts were reduced by ca. 2 log CFU/ml with the highest reduction observed on the surface treated with 1% HMw chitosan. LMw (0.5 and 1%) and HMw (1%) chitosans were more effective against EC on the glass surface than on the stainless steel surface. For stainless steel surface, 0.5% LMw chitosan was most effective against LM, with 2.5 log CFU/ml reduction. For both 0.5% and 1.0% concentrations, HMw chitosan was more effective against EC than LM on the stainless steel surface. Our study showed that chitosan has the ability against LM and EC adhered to different surfaces. Chitosan may serve as an antimicrobial cleaning agent for food contact surfaces in food processing plants.

Impact: Consumer demand for ready-to-consumer fresh-cut fruits and vegetables has increased. The combined minimal processing used to prepare fresh-cut fruits and vegetables causes quality deterioration at a faster rate than normally observed in whole raw/unprocessed fruits and vegetables. Post-harvest microbial growth and decay of fresh-cut fruits and vegetables can be controlled or reduced. The crawfish chitosan edible coating with added microbiocides (lactoferrin) is anticipated to extend shelf life and assure desirable quality of fresh-cut produces. The information from the consumer survey will help the food industry meet the consumer and market demand on fresh-cut fruits and vegetables.

Sources of funding: State and Hatch

Federal Goal 2

Title of Research Project: **New Rice Varieties Show Improved Straighthead Resistance, Grain Quality, and Earliness**

Key Theme: **Food Accessibility and Affordability; Food Quality**

Steve Linscombe, Professor, Rice Research Station, LSU AgCenter

Issue: Rice is produced on approximately 3 million acres in the southern United States (500,000-600,000 in Louisiana) annually. Improved varieties with higher yield potential and quality can greatly improve economic returns per acre.

What was done: The Rice Breeding Project is continually striving to develop new improved varieties with higher yield potential, as well as improvements in other important characteristics. The Rice Research Station released a new early, semidwarf long-grain variety in 2003 (Cheniere) and a very early, long-grain variety (Trenasse) in 2004 (for production in 2005).

Impact: Cheniere was grown on a limited acreage in 2003 and 2004 due to seed availability. In 2005, it is expected to account for a substantial portion of Louisiana's rice acreage. Cocodrie (a long-grain rice variety released by the Rice Research Station in 1998) has been the most widely grown variety in Louisiana and the United States since 2001. Cheniere has comparable yield potential but superior milling characteristics and grain appearance. In addition, Cheniere has much better resistance to physiological straighthead. Superior milling results in higher cash prices for Louisiana producers, and straighthead resistance will mean less yield decrease in fields where this disorder is a potential problem. Trenasse has a 4- to 5-day maturity advantage compared with Cocodrie. This will allow producers to begin harvest earlier and provide more efficient utilization of harvest machinery and drying facilities. These two varieties should lead to substantial economic benefits for Louisiana and southern U.S. rice producers.

Sources of funding: State funds, Louisiana Rice Research Board grants, Industry grants

Federal Goal 2

Title of Research Project: **Evaluation of *Brucella abortus* RB51 as a Multivalent Vaccine to Generate Immune Responses against Brucellosis, Tuberculosis, and Johne's Disease in Cattle**

Key Theme: **Animal Health/Bioterrorism**

Philip H. Elzer, Professor Department of Veterinary Science, LSU AgCenter

Issue: Vaccinating animals, specifically cattle, against brucellosis, tuberculosis, and Johne's Disease, with a multivalent vaccine that is safe and efficacious, which will additionally assist in the protection of the animals from a potential agroterrorist attack using these pathogens.

What was done: Animals that had previously been vaccinated with *B. abortus* RB51 expressing protective antigens from different *Mycobacterium* species were challenged with either virulent *B. abortus* or *M. bovis*. All animals remained negative on all routine diagnostic tests. Significant protection was noted against virulent *Brucella* challenge in all vaccinates. Significant protection against virulent *M. bovis* challenge was only observed in the RB51-Esat-6 group. *M. bovis* challenges were conducted by our collaborators at Texas A&M University.

Impact: A disease-free food animal population is imperative to the well-being of all individuals. All three of the regulatory diseases addressed in this study deleteriously impact the economics of cattle producers, directly affecting the market price and interstate and international import/export potential of the animals, which in turn influences all consumers. As zoonotic organisms, *Brucella* and *Mycobacterium* species pose a human health threat hence, a protected animal population benefits the general public. Brucellosis animal vaccine work has a significant impact in protecting the human population since *Brucella* species are also known as bioterrorist agents or "agents of mass destruction."

Sources of funding: Animal Health, USDA cooperative agreements, State, and industry funds.

Goal 2 – Extension Program Summaries

- A total of 74 participants from seafood processing plants received training in HACCP (Hazardous Analysis of Critical Control Points) and SCP (Sanitation Control Procedures). As a result, seafood processors learned the requirements of HACCP regulations and food safety management principles. Twenty-five Walmart distribution center employees from Louisiana and other states were also HACCP certified. Participants learned the HACCP record-keeping system, as well as preparation of HACCP plans. Round table sessions, held quarterly, with poultry and red meat processors, USDA FSIS regulatory officials, and academia helped participants to understand and thus better comply with HACCP regulations.
- People who are at-risk from a food safety standpoint include the very young, the elderly, and those with a compromised immune system. Many of these at-risk citizens live in the Lower Mississippi Delta (LMD). Many of these individuals depend on reclaimed or rescued food, either from soup kitchens or shelters. In conjunction with three other universities in the region, a train-the-trainer curriculum, “Serving Food Safely,” was developed by extension faculty. The curriculum includes 10 lessons, complete with lesson plans, fact sheets, and presentations. Approximately 500 food recovery agency personnel and volunteers have completed the 10-lesson course.
- Targeted at-risk consumers and health care providers were provided with Oyster Food Safety education information, including presentations at meetings and printed materials, focused on reducing *Vibrio vulnificus* illnesses state-wide. In addition to food safety workshops conducted across the state, education meetings were held by extension faculty with the Louisiana Restaurant Association and Louisiana Pharmacy Association. Louisiana supplies about one-third of the nation’s oysters, and Louisianans consume more oysters than any other state, with a large percentage eaten raw. The program participants were made aware of the dangers of *Vibrio vulnificus* to at-risk consumers, and the measures to follow for food safety.

Total extension FTEs on Goal 2 programs were 6.13 for a total expenditure of \$491,234. A total of 89,497 educational contacts were made in Goal 2 programs.

Goal 2 – Extension Program Reports

Federal Goal 2

HACCP – FOOD SAFETY

Key Theme: HACCP

David Bankston, Professor, Department of Food Science, LSU AgCenter

Program Description

HACCP training for the seafood processing industry in Louisiana utilizes the AFDO (American Food & Drug Officials) standardized training programs for SCP (Sanitation Control Procedures) and HACCP to meet FDA requirements for the seafood industry.

All seafood processors are required by the FDA to attend HACCP training. The AFDO HACCP course includes certification of training for the participants. The SCP course is not required by the FDA, but forms the foundation of food safety control and helps increase the understanding of HACCP. In 2004, three Basic Seafood HACCP and two Seafood SCP training programs were conducted in Baton Rouge, which provides a central location to the industry in Louisiana. For the HACCP workshops, a total of 59 students completed the course and received certification from AFDO. For the SCP courses, there were a total of 15 attendees. The Basic Seafood HACCP training course duration is three days, while the SCP training is one day. As part of these trainings, all stakeholders provide evaluations of the course. The major criticism is the length required for the HACCP training. The training courses were held in the LSU Ag Center Food Processing and Technology Pilot Plant, which provided the instructors the opportunity to conduct value-added processing demonstrations and practical sanitation controls activities. These added activities were very well received by the course attendees. There were several groups that cooperated in providing the training. In addition to LSU Ag Center faculty, instructors from both the LA Department of Health and Hospitals and the US Food and Drug Administration participated in all of the training sessions.

In addition, a one-day segment-two AFDO HACCP workshop trained and certified 25 Wal-Mart distribution center employees from Louisiana and other states. The LSU Ag Center Department of Food Science instructor team was selected and funded by Wal-Mart Quality Assurance management to provide this seafood HACCP training program.

HACCP-based plant visits and HACCP plan consulting activities were conducted for over 10 seafood processors. Additional HACCP consultations were provided for these groups of processors.

Quarterly Round Table discussions, established in the prior year, continued for meat and poultry processors. Participants included processors (primary), academia and regulatory officials from

the USDA FSIS and from the state of Louisiana. The round tables followed a format of a presentation on some pertinent or pressing aspect of processing followed by a general discussion among participants. These meetings have been beneficial in facilitating improved understanding between industry and regulators and in improving HACCP compliance in the industry, and have been particularly helpful in addressing new regulations or interpretations. Attendance at the meetings ranged from 22 to 46 participants.

During the course of the year on-site visits were conducted at 9 processing plants. These visits involved assistance in meeting HACCP requirements including consultation on the HACCP plans, technical evaluation and investigations and personnel instruction. This included extensive work with two processors to bring them back into compliance.

A retail HACCP trainings program with emphasis on reduced oxygen packaging was developed as requested by the Louisiana Department of Health and Hospitals to meet a particular need of very small processors who sell through one or two retail outlets. Three training programs were held at various locations in the state.

A breakout session at the annual Louisiana Food Processors Conference for red meat and poultry processors was held to assist RTE processors in meeting a new requirement for re-evaluation of HACCP plans for Listeria. The session included an explanation of the new Listeria guidance and requirements by Dr. Bobby Palesano, of USDA Office of Policy and Program and Policy Development, and a presentation by Dr. Marlene Janes of the LSU AgCenter Food Science department on microbiological test procedures, material and equipment. The program received excellent evaluations by the attendees.

In addition, numerous phone consultations have been conducted with processors, regulators and the USDA tech center regarding HACCP requirements, interpretations and implementations. These consultations were prompted primarily by industry and regulatory questions regarding new regulations and guidance by FSIS, unique situations for individual processors or by difficulties in meeting requirements.

Additional work has been done in juice HACCP and in areas related to HACCP. Juice HACCP was a part of a joint three day seminar with Southern University AgCenter and with FDA food inspectors. Dr. Trappey also had a display booth at the annual Miss-Lou Fruit and Vegetable Assoc. meeting pertaining to GAP and HACCP. The Better Processing Control School was conducted and also this year an Acidified Food Processing Seminar was conducted. This training is required under 21CFR113 and 21CFR114. A technical session on Acidified foods which included information on HACCP and GMP was part of the 2nd Annual Louisiana /food Processors Conference.

Program Impact

As a result of the HACCP and SCP training, seafood processors better understand the requirements of the HACCP regulations and food safety in general. They learned to prepare

HACCP plans and record keeping systems for HACCP and sanitation. Including representatives from state and federal regulatory agencies help to ensure that these processors are now prepared to comply with complex state and federal regulations. Food processors are in an improved position to ensure safely processed seafood products and understand the food safety principles involved.

As a result of educational efforts with meat and poultry processors, processors were better able to properly implement and maintain HACCP programs to improve food safety. Greater understanding of requirements and application was obtained by processors, regulators and academics. Two processors were able to regain USDA inspection which allowed them to operate.

Forty-five individuals received BPCS certification. Non- meat or seafood processors were introduced to HACCP and gained knowledge to enable greater assurance of producing safe food for public consumption.

Source of Funds

Smith Lever, 3 b, c (federal funds)
Sea Grant (federal and state)

Scope of Impact

State and regional HACCP, SCP training courses and plant visits.

Federal Goal 2

PREVENTING FOODBORNE ILLNESS IN A VULNERABLE POPULATION IN THE LOWER MISSISSIPPI DELTA (LMD)

Key Theme: Food Safety

Beth Reames, Professor, Department of Human Ecology, LSU AgCenter

Program Description

According to Centers for Disease Control (CDC) estimates, the toll from foodborne illness is 76 million illnesses, 325,000 hospitalizations and 5,000 deaths in the United States each year. Those most at risk of serious harm are very young children, elderly people and people with immune systems compromised by HIV, cancer treatment, diabetes, lupus and other disorders. Pregnant women are also at risk; some foodborne disease can cause miscarriages. Research shows that proper food handling and preparation can prevent 90 to 95 percent of foodborne illnesses. Recommended food safety practices to prevent foodborne illness include cooking foods thoroughly, not allowing raw meats to contaminate other foods and washing hands.

Food-insecure individuals comprise a vulnerable population at increased risk of illness and for whom medical treatment may not be readily accessible. Many of the at-risk, food-insecure individuals in the LMD depend on reclaimed or rescued food, either from institutions that donate prepared and perishable foods, commodities, soup kitchens, shelters or even field gleaning. The LMD population is a more vulnerable group than the average consumer because of many factors: poverty; age, including the very young, frail and elderly; generally poorer state of health, including the immuno-compromised and those suffering from chronic diseases; lack of accessible medical care; and lower educational level. Rescued food has a greater potential for microbiological contamination than does freshly prepared or non-stressed commodities in commercial channels because of several factors including additional handling and longer food chains. Access to food through food recovery operations is important in reducing hunger and improving nutrition for at-risk populations, and personnel handling these foods must be aware of the sanitation and safe food handling practices involved in perishable food distribution (from its release by the donor, through delivery, storage, preparation and consumption.)

Program Impact

Selected food recovery agencies were queried individually and in group settings to collect input for program development. These agencies were also asked to review the curriculum during the developmental process.

Process: Project co-directors and agents identified existing food recovery organizations in their respective states, by county or parish. Site visits were made by project co-directors to selected food recovery agencies in Louisiana and Arkansas to assess food handling practices.

Consideration: Program suggestions from the food recovery agencies were incorporated into the educational plan.

Problem(s) Identified: Food-insecure individuals comprise a vulnerable population at increased risk of illness and for whom medical treatment may not be readily accessible. Many of the at-risk, food-insecure individuals in the LMD depend on reclaimed or rescued food, either from institutions that donate prepared and perishable foods, commodities, soup kitchens, shelters or even field gleaning. The LMD population is a more vulnerable group than the average consumer because of many factors: poverty; age, including the very young, frail and elderly; generally poorer state of health, including the immuno-compromised and those suffering from chronic diseases; lack of accessible medical care; and lower educational level. Rescued food has a greater potential for microbiological contamination than does freshly prepared or non-stressed commodities in commercial channels because of several factors including additional handling and longer food chains. Access to food through food recovery operations is important in reducing hunger and improving nutrition for at-risk populations, and personnel handling these foods must be aware of the sanitation and safe food handling practices involved in perishable food distribution (from its release by the donor, through delivery, storage, preparation and consumption.)

Another identified problem is that food recovery agencies have rapid turnover of volunteers who often are not adequately trained in safe food handling practices.

Initiation and Progress of the Program – “What was done”:

The LSU AgCenter formed a tri-state coalition with three other land grant universities, Southern University Agriculture and Research Center, the University of Arkansas Cooperative Extension Service and Mississippi State University, serving the Lower Mississippi Delta (LMD) to develop and teach a safe food handler training curriculum to benefit vulnerable populations in the LMD. The objective was accomplished by obtaining funding in the amount of \$444,642 from USDA and working through food recovery agencies.

The project goal was to develop and implement an effective safe food handler train-the-trainer program for preventing foodborne illness and improving nutrition in vulnerable populations in the LMD who use the services of food recovery programs. An additional goal was to enhance and reinforce the food safety efforts of food recovery agencies.

A train the trainer curriculum, “Serving Food Safely,” was developed and implemented. The curriculum contained 10 lessons complete with lesson plans, fact sheets and presentations for each lesson. In addition, a video and display were produced for trainers’ use. Evaluation survey instruments, including food safety knowledge pre- and posttests and food safety practices post- and delayed tests, were developed by the HUEC nutrition graduate student under the direction of the project co-directors. A core of extension agents was also trained to serve as a resource for the food recovery agencies in their training efforts. During the implementation phase of the project, Serving Food Safely workshops were conducted by project faculty in Louisiana, Mississippi and Arkansas for approximately 500 food recovery agency personnel and volunteers.

Collaboration: Collaboration included the following:

Project co-directors from 4 universities - A tri-state coalition of four land grant universities, LSU AgCenter, Southern University Agriculture and Research Center, the University of Arkansas Cooperative Extension Service and Mississippi State University, was formed to develop and teach a safe food handler training curriculum to benefit vulnerable populations in the Lower Mississippi Delta.

Project Institutions and Project Co-Directors:

LSU Agricultural Center - Reames, Elizabeth S.; Bankston, J. David; Moody, Michael W.; Keenan, Michael J.; Trappey, Alfred F.; McMillin, Kenneth W.

Other LSU AgCenter participants: (HUEC nutrition graduate student – Katie Waggoner; Food Science graduate student – Ashley Bond; Extension agents – Sally Soileau, Alexis

Navarro, Ramona Gentry, Bertina McGhee, Terri Crawford, Sheila Haynes, Berteal Rogers
Southern University Agricultural Research & Extension Center - – Friendship, De’Shoin Y (Southern University graduate student – Tracy Smith)

Mississippi State University - Mixon, Melissa P.

University of Arkansas Cooperative Extension Service - Tucker, Easter H

Other collaborating agencies:

Greater Baton Rouge Food Bank, Second Harvester’s Food Bank, Food Bank of Northeast Louisiana, Mississippi Food Network

Food recovery agencies located in the Lower Mississippi Delta
Governmental and community agencies: Dept. of Health and Hospitals, Office of Public Health;
Louisiana Restaurant Association

Impact: Project evaluation was conducted using data from food safety knowledge and practices survey instruments administered at the workshops and by mail follow-up 3 to 4 months following the workshops. Results demonstrated the food safety curriculum was used successfully to improve food safety knowledge and to promote and support the use of recommended food safety practices by food recovery agency personnel and volunteers. Safe food handler training workshops will continue to be conducted throughout the tri-state area.

The study was the topic for an LSU School of Human Ecology Master of Science thesis: FOOD SAFETY KNOWLEDGE AND PRACTICES OF FOOD RECOVERY AGENCY WORKERS BEFORE AND AFTER FOOD SAFETY TRAINING. Presentation of research findings from the study includes the following:

Federation for American Societies for Experimental Biology – Washington, D. C. – April 2004

Institute of Food Technologists Annual meeting – Las Vegas, NV - July 2004

Tri-State Food Service Exposition – New Orleans, LA - July 2004

Presentation of “Delivering the Goods” video - Institute of Food Technologists Annual meeting – Las Vegas, NV - July 2004

Source of Funds: Project No.: 2002-51110-01502: National Integrated Food Safety Initiative (406) project funded through the Cooperative State Research, Education and Extension Service of the United States Department of Agriculture; Award total - \$444,642

Scope of Impact

Multi-state: In FY 2004, an estimated 8.9 FTEs were spent on food safety education. Based on an FTE cost of \$80,136, the total cost of the program was \$713,210.40. Of this effort, 40% is involved in the acquisition of sharing of resources and information through multi-state efforts, valued at \$285,284.16 (8.9 FTEs x \$80,136 per FTE x .40).

Multi-function: Contributions from research counterparts included assistance in developing and implementing the Serving Food Safely program. It is estimated that 30% of FTE allocations to this program is attributable to multi-function work. The dollar equivalent of multi-function work is \$213,963.12 (8.9 FTEs x \$80,136 per FTE x .30).

Federal Goal 2

OYSTER FOOD SAFETY - *Vibrio vulnificus* (Vv) EDUCATION

Key Theme: Food Safety Education

Sally Soileau, Extension Agent (East Baton Rouge Parish), LSU AgCenter

Program Description

Targeted at-risk consumers and health care providers were provided with Oyster Food Safety educational information, printed materials, and programs focused on reducing *Vibrio vulnificus* illnesses statewide.

Stakeholder groups included in program planning included the Louisiana Department of Health and Hospitals (DHH) Office of Public Health Epidemiology personnel in New Orleans, the LA DHH Sanitation department personnel and the seafood section of this department in Baton Rouge, conferences with LSU Food Science department head and staff in Baton Rouge, Interstate Shellfish Sanitation Conference (ISSC) head from Columbia, South Carolina, ISSC national educational coordinator from Maryland, ISSC Vv education subcommittee chair from Ocean Springs, Mississippi and committee members, Louisiana Seafood Promotion Board members (New Orleans), Louisiana Oyster Task Force members, Oyster Vv researchers at Nicholas State University, Oyster fishermen, Oyster processors, dietitians, Center for Disease Control CDC personnel (Atlanta), restaurant personnel (New Orleans), physicians, pharmacists, community leaders, at-risk consumers group representatives, and published materials from related groups. Interaction with stakeholders provided information to focus Vv educational efforts and resources for educational outreach.

Appointment to National ISSC Vv Subcommittee and as Louisiana state Vv coordinator provided key placement to effectively plan, implement and guide Vv education in collaboration with National ISSC efforts and to network with other states.

An educational proposal was made based on goals and guidance from ISSC representatives, LA DHH Office of Public Health personnel and networking with other state coordinators along with assistance with department head at LSU Food Science. With funded proposal in place that identified the targeted groups and outline plan the next step was to utilize educational Extension methods (media, personal contacts, workshops, literature, educational booths, and guest speaker) to reach targeted audience with educational messages. With appropriate outreach and contacts, the groups targeted have been receiving the information with positive results. For example: Louisiana Dietetic Association receives regional in-service training sessions and statewide outreach with educational booth at annual meeting site. Ongoing email Q & A has also evolved as continuity has built up over 3 year span and even a presentation of an award to me for LDA Distinguished Service Educator of the Year.

Problem (s) Identified. Millions of Americans enjoy eating raw molluscan shellfish, especially oyster and clams. At-risk consumers or those with liver disease, iron overload disease, diabetes, cancer, stomach disorders, or any illness or medical treatment that weakens the body's immune system can avoid serious illness or death by abstaining from consumption of raw or uncooked shellfish. Since you can also become infected with the *Vv* naturally occurring bacteria that may enter your body through an open wound while swimming, it is also recommended that the at-risk audience never swim or wade in seawater with sore or open wounds. In fact, to safeguard one's health, physicians recommend that those at risk not eat any food of raw animal protein origin including raw shellfish. Louisiana supplies about 1/3 of the nation's oysters and natives consume more oysters than other states.

Initiation and Progress of the Program:

Risk of Eating Raw Oysters in summer article submitted through LSU AgCenter communications department for use with state news packet to reach all state newspapers.

Vv education included with Food Safety information live radio in broadcast from Main Street Market in Baton Rouge;

Food Safety Workshops including *Vv* education for Baton Rouge Libraries, Senior Food Safety including *Vv* education for Council on Aging sites, library sites, Mall of Louisiana site; Grandparents raising Grandchild workshop on Food Safety; Holiday Food Safety programs included Oyster Food Safety booth and information; Independence park and other park programs for seniors on food safety included *Vv* education;

Included *Vv* education with food safety information for programs at hospital site: Earl K. Long staff of health care providers nutrition education series *Portions*;

Food Safety *Vv* education outreach booth at Main Street Market, *Vv* educational booth with literature provided at state training meeting for Extension paraprofessionals in Woodworth LA;

Vv educational booth with literature provided at state training meeting at professional meeting for Extension professionals and through Distance Learning statewide with materials provided to each site;

Oyster Food Safety *Vv* education booth at Train-the-trainer multi-state *Vv* educational program in New Orleans;

Hispanic Festival in Baton Rouge provided opportunity to reach multi-lingual audience with literature in English and Spanish with Oyster Food Safety *Vv* Educational booth (7000) participants in for 2 years (Fall 2003 and 2004);

Southern Medical Association outreach education on *Vv* to physicians in Atlanta (fall, 2003) teamed with Tori Stivers from University of Georgia and reached over 900 physicians and health

care providers.; SMA Booth on Vv in New Orleans (2004) with CME session on Vv for participants provided-also team article on Vv in Southern Medical Association Abstract Journal (fall, 2004)

Louisiana Restaurant Association outreach education on Oyster Food Safety Vv in New Orleans (2003 &, 2004) with 6500 participants each year;

La Pharmacy Association state meeting in Alexandria (2003)-Provided CME 1 ½ workshop for pharmacists with program on Oyster Food Safety Vv;

Provided Oyster Food Safety Vv education for curriculum and implementation of pilot program training for 1st graduates of LA Master Nutrition Volunteer group with classes for course held throughout fall of 2004;

Regional in-service training provided for EFNEP/FNP Extension paraprofessionals and peers at Burden Center in Baton Rouge (spring, 2004) on Food Safety including Oyster Food Safety Vv education and literature;

Health and Wellness Conference at Pennington in Baton Rouge site for Wellness Educational Booth with nutrition and food safety (including Vv education display and materials) reached 80 professionals in healthcare, city parish, business and industry;

Extension Nutrition Team planning meetings for curriculum for Master Nutrition Volunteer Guide with presentation of Food Safety information and Oyster Food Safety Vv to Extension peers on team.

Provided Oyster Vv education at workshop for students at LA Technical College and students and faculty at LSU Food Science Department in fall 2004 seminar;

Collaboration: Networking/programming for Vv outreach with ISSC Vv Education Subcommittee members and Gulf & South Atlantic Fisheries Foundation at meetings in Portland, Oregon, Key West, Florida, New Orleans, LA, Jekyll Island, Georgia to confer on shellfish topics including food safety issues. Presentations were made at sessions to these groups on Louisiana situation and outreach efforts. Also participated in the group sessions and discussions held with industry, education, governmental agencies and representation from Interstate Shellfish Sanitation Conference (ISSC).

Collaborative efforts for Vv education are ongoing with the Louisiana Department of Health and Hospitals (DHH) Office of Public Health Epidemiology personnel in New Orleans, the LA DHH Sanitation department personnel and the seafood section of this department in Baton Rouge, conferences with LSU Food Science department head and staff in Baton Rouge, Interstate Shellfish Sanitation Conference (ISSC) head from Columbia, South Carolina, ISSC national educational coordinator from Maryland, ISSC Vv education subcommittee chair from Ocean Springs, Mississippi and committee members, Louisiana Seafood Promotion Board members (New Orleans), and dietitians.

Program Impact

Of the 31,762 participants reached with Oyster Food Safety *Vibrio vulnificus* and other food safety information, 62% of those surveyed indicated that they had learned what can cause food borne illness.

Evaluative activities with national ISSC Vv subcommittee members conducted through conference calls, emails, meetings, workshops and power point presentations at National ISSC Vv subcommittee meeting included team planning, implementation and review of consumer surveys on oyster consumption and CDC statistics on Vv illnesses by state, age, etc.

Report to review from fall 2004 Southern Medical Association outreach Oyster Food Safety Vv contacts from Nov 04 conference with data as follows:

2004 Professional Attendance Profile: Total 813

Physicians 633 = 78%

Residents/Fellows 131 = 16%

Other Healthcare Professionals 49 = 6%

2004 Attendance Breakdown

Physicians 633

Residents/Fellows 131

Other Healthcare 49

Spouse/Guest 337

Exhibitors 175

Total Participant Attendance 1325

Top 15 States in Attendance (41 states represented at the meeting)

- 1 Louisiana
- 2 Texas
- 3 Alabama
- 4 Mississippi
- 5 Tennessee
- 6 North Carolina
- 7 Florida
- 8 Virginia
- 9 Georgia
- 10 South Carolina
- 11 Missouri
- 12 Oklahoma
- 13 Kentucky
- 14 West Virginia
- 15 New York

Due to team effort of the ISSC personnel and Vv education subcommittee result is that as of fall 2004 - now available CME online Physician Course Diagnosis, Treatment, & Prevention of

Vibrio vulnificus Infection E-learning Course for Physicians; Continuing medical education (CME) program is part of a national effort to prevent illness and death from *Vibrio vulnificus* infection; Course will prepare physicians to identify the clinical manifestations of *Vibrio vulnificus*, know current treatment guidelines, recognize groups who are at a higher-risk of illness, and advise patients to avoid exposure;

A Baseline Survey of Raw Oyster Consumers in Four States: Louisiana, Texas, Florida and California document is available online at the ISSC website. This survey compiles data to establish a baseline for consumers' beliefs, consumption patterns and knowledge of risks. The consumer survey planned in collaboration with the *Vv* education subcommittee also has results on a state by state basis. A second follow-up survey to compare results with the baseline survey has been developed in collaboration with efforts of the *Vv* subcommittee;

Key findings pertain to raw consumers in all four states survey findings:

43% of consumers are unfamiliar with any at-risk group;

Consumer awareness that people with liver disease are at higher risk of illness is moderate;

Consumer awareness that people with diabetes are at higher risk of illness is minimal;

Among at-risk consumers, 37% are eating raw oysters less often primarily for health reasons;

42% of at-risk consumers are doing "nothing" to reduce their risk of illness; Misconceptions about how to reduce one's risk of *Vibrio vulnificus* infection are widespread.

Programs have the obstacle of reducing raw oyster consumption among those at-risk, while maintaining overall consumer demand for raw oysters.

Recommendations for key messages in education include addressing: which groups are at-risk; effective actions by consumer for illness prevention; popular myths about *Vv* prevention; Health care provider such as diabetes care managers and dietitians and others who reach those at risk with direct contact need to be reached with educational efforts.

Source of Funds

Interstate Shellfish Sanitation Conference (ISSC) \$35,000 grant per year for 3 years

Scope of Impact

Impact reaches beyond Louisiana to including program planning and delivery in cooperation with ISSC *Vibrio vulnificus* education subcommittee members from stakeholder states: Louisiana, Texas, Mississippi, Alabama; Georgia, South Carolina, Florida. Outreach program efforts also included Southern Medical Association health care provider outreach to physicians and others in multi-state effort in past two years held in Atlanta (fall, 2003) and New Orleans (fall, 2004).

For multi-state impact programs: (a) Louisiana, Texas, Mississippi, South Carolina, Georgia, Florida, Alabama, were among states represented in the program planning and implementation for outreach educational activities, participation in conferences/workshops/meetings, preparation and sharing of educational materials, train-the trainer with Vv materials and program evaluation, and (b) Ideas shared with Louisiana personnel for outreach through Train-the trainer multi-state program held in New Orleans for Vv education, CME Vv online education for physicians collaborated on with ISSC Vv education for national internet site, article in Southern Medical Association on Vv also had a multi-state impact to reach physicians and other health care personnel on issue. Subcommittee reports were prepared for national website of state outreach efforts. Networking of state efforts by state coordinators also served to update shared ISSC publications prepared for Vv education. Sharing of Vv educational power points and teaching methods was handled through ISSC Vv education committee on national level. Through regular presentations and by email for reporting the Louisiana outreach education methods were shared with other state coordinators: multi-parish level educational programs offered, state and regional Louisiana Dietetic Association teaching methods.

It is estimated that 1/3 FTE is devoted to this program, with 50% of that effort multi-state, valued at \$13,222 (.33 FTE x \$80,136 per FTE x .50).

Goal 3

LSU Ag Center Goal 3 is to achieve a healthier, more well-nourished population by improving dietary quality, food quality, and food choices of Louisiana citizens.

Goal 3 – Research Project Summaries

- Louisiana has one of the highest rates of coronary artery disease in the U.S. However, the state is one of the leading rice producers, and rice bran appears to have potential to reduce coronary artery disease. Yet rice bran is discarded as a by-product of milling because it is considered unpalatable. This research has focused on identifying components of rice bran that reduce coronary artery diseases so that they could be successfully extracted and incorporated into viable food products. If the study is successful, this could positively affect not only the rice farmers but also the entire rice industry, plus contributing to the health of the people of Louisiana.

- Identifying by-product components of agricultural commodities that could be incorporated into consumer food products as health-promoting ingredients could greatly increase the value of the agricultural products to farmers and could promote the health of the people of Louisiana. This study evaluated soybean and rice bran for their ability to inhibit enzymes associated with carcinogenesis. Collagen from blackdrum and alligator were studied for possible usefulness associated with angiogenesis. Lutein was isolated from aflatoxin-contaminated corn and was free of aflatoxin. The process allows recovery of lutein for food application. Using these by-products could increase profitability of agriculture in Louisiana.

- With the rise in obesity and obesity-related health problems, there is a need to consider modifications in the American diet that may benefit health by reducing body fat. In this AgCenter research, diets were developed to increase the amount of undigested starch residue entering the large intestine. Inclusion of resistant starch in the diet increased the release of two satiety peptides. It is proposed that these satiety factors are released in the blood stream, go to the brain, and alter the expression of neuropeptides involved in hunger. Including resistant starch in the diet could lead to decreased incidence of obesity and thus reduce health care costs involving the treatment of 30 diseases linked to obesity.

- Much of the cost associated with producing protein-based drugs is the expense associated with the manufacturing facility and the low levels of output from the cell culture expression system. Scientists are using the white leghorn chicken, in combination with state-of-the-art biotechnology, to engineer an animal that can produce pharmaceutical proteins in the white of their eggs. The technology produces transgenic chickens at rates not previously possible and expresses proteins in eggs at commercially viable rates. By integrating into the state layer industry, the LSU AgCenter may provide the base industry that will provide fill and finish on pharmaceutical compounds.

- Prostatic cancer is the second leading cause of cancer deaths in men, and breast cancer represents the most common cause of cancer deaths in women. LSU AgCenter researchers have discovered and tested novel treatments for both prostatic and breast cancers. These are compounds composed of ligands linked to membrane-disrupting peptides. The ligands are small protein hormones which direct the membrane-disrupting

peptide to cancer cells. The compounds hold great promise for both early and advanced stages of prostatic and breast cancer. Importantly, even metastatic cancer cells are selectively destroyed by the compounds. The only side effect of the compounds is loss of fertility.

- Although dairy fat imparts some desirable qualities such as improved flavor, texture, and appearance to dairy foods, it is high in fat content and saturated fatty acids, making it unappealing. Researchers proposed that dairy fat be used in conjunction with a fat absorbing fiber or be replaced by health beneficial lipids. Incorporating these ingredients in cheddar cheese could make it healthier. Use of health beneficial lipids can be recommended as a partial substitute for milk fat because as a partial substitute they do not adversely affect most of the microbiological aspects. Increase in amount of lipids in cheddar cheese should be done with caution, because it results in a harder product. In addition to healthier cheese, using these ingredients could increase consumer demand, thus increasing income for dairy farmers and benefiting the dairy industry as a whole.
- Recent studies have indicated that agricultural plant products provide not only many essential nutrients for the human body, but also some health functional chemicals that could reduce the risk of various diseases, such as cardiovascular diseases and cancers. Phytochemicals are a major group of these chemicals. This study demonstrated that crude soybean and rice bran oils may contain high levels of phytochemicals that reduce cholesterol. The study provided information that may aid consumers in selecting vegetable oil for cooking cholesterol-rich foods. With Americans increasingly health conscious, Louisiana's substantial acreage of rice and soybeans gives the state potential value-added for these commodities.
- To develop new crops in Louisiana for medicinal use, the medical functions of the plants and the extracts obtained from them must be clearly established. Research focused on: the bark of the *Eucommia* tree as a dietary supplement for healthy blood pressure; *Camptotheca* as an anti-cancer extract for animal use; and *Rubus* leaf extract for its anti-inflammatory effects. The research results have technology transfer potential and can lead to commercialization of health care products and demand in Louisiana for raw plant materials, creating new agricultural opportunities.
- The development of new technology for the production of biopolymers from sucrose offers direct benefits to the Louisiana sugar industry, with a market potential as functional foods estimated as high as \$250 billion. It appears that there could be a specific use as a health food, with the possibility also of use as a poultry feed additive to help replace antibiotics in raising "safe" poultry. This is of extreme interest with the reported rise in antibiotic resistant microbial infections. The effects of variation in oligomer structure on functionality is still to be investigated, as well as animal safety and functionality studies.

Goal 3 – Research Project Reports

Federal Goal 3

Title of Research Project: Functional Foods Development and Evaluation

Key Theme: Nutraceuticals

J. Samuel Godber, Professor, Food Science Department, LSU AgCenter

Issue: It has been established that rice bran oil (RBO) has the ability to reduce the occurrence of atherosclerosis and coronary heart disease. A relatively high level of unsaponifiable components is believed to be the source of these health benefits. However, the precise mechanism for this effect has not been identified. A major component of the unsaponifiable fraction of RBO is a group of compounds collectively referred to as oryzanol. Oryzanol includes a variety of sterol and stanol components that have structural properties similar to cholesterol. Thus it is possible that these compounds in some way interfere with the normal metabolism of cholesterol such that a net reduction in serum cholesterol is achieved.

What was done: Thus, we investigated the possibility that a cholesterol-lowering effect of oryzanol may occur through increased fecal steroid excretion. We used retired breeding rats that had been ovariectomized as a model of post-menopausal women. We compared fecal cholesterol and bile acid excretion as well as bioavailability of three different forms of oryzanol: crystalline oryzanol added directly to the diet, crystalline oryzanol dissolved in corn oil prior to addition, and an equivalent amount of oryzanol naturally present in RBO. Results indicated that oryzanol in rice bran oil produced the greatest fecal cholesterol excretion among the diet groups ($P < 0.05$). Both fecal cholesterol and total bile acid excretion were significantly higher in rats fed RBO oryzanol than the average of the other two treatment groups ($P < 0.001$). This suggests that the hypocholesterolemic activity of RBO may occur through synergistic effects with other components of the unsaponifiable fraction. The effect of treatment compared to control was greater for bile acid excretion than for cholesterol excretion, which suggests that the primary mechanism of the hypocholesterolemic effect of oryzanol may be through the interference of bile acid reabsorption in the enterohepatic circulation.

Impact: Louisiana has one of the highest rates of coronary artery disease in the country. Ironically, Louisiana is one of the leading rice producing states and rice bran appears to have great potential to reduce coronary artery disease, yet it is discarded as a byproduct of rice milling. One of the reasons that rice bran is not considered a viable human food ingredient is that it is considered unpalatable. This research focuses on identifying the components of rice bran that reduce coronary artery diseases so that they could be extracted and incorporated into viable human food products. If successful, this could greatly enhance the value of rice as a commodity and also improve the health of the citizens of Louisiana.

Sources of funding: Hatch, State, USDA-IFAFS

Federal Goal 3

Title of Research Project: Functional Foods Development and Evaluation

Key Theme: Nutraceuticals

Jack Losso, Assistant Professor, Food Science Department, LSU AgCenter

Issue: Agricultural products contain a wealth of components that may have health benefits, which are often overlooked and/or discarded. The purpose of this research program is to identify potential health promoting components of agricultural products produced in Louisiana, with special emphasis on agricultural byproducts. Once promising components are identified they are incorporated into functional food products having potential consumer food usage.

What was done: The Bowman-Birk inhibitor from soybean and rice bran were evaluated for their ability to inhibit enzymes (metalloproteinases) associated with the early stages of carcinogenesis. Both rice and soybean BBI dose-dependently inhibited the in vitro activation of pro-MMP-1 and pro-MMP-9 by trypsin. The potentials of rice and soybean BBI as functional food ingredients are being investigated.

Collagen from blackdrum and alligator were hydrolyzed and peptides obtained were studied for ability to inhibit metalloproteinases associated with angiogenesis. At 2 microM, peptides from black drum and alligator cartilage collagen significantly inhibited colon cancer Caco-2 cell proliferation, weakly prevented cell migration in the Boyden Chamber, and did not cause cell death. But both peptides inhibited MMP-9 (angiogenesis stimulator) activities in the extracellular medium. Collagen peptides from aquatic food products are good substitutes for land-based animal collagen peptides and will create better economic opportunities for seafood processors.

Lutein, extracted from corn was added to Cheddar cheese in quantities of 1 mg, 3 mg, and 6 mg per serving size. Measurements of the lutein stability were carried out by HPLC using a YMC C₃₀ carotenoids column. Microbiological analyses of cheese samples included APC, coliform, and yeast/mold counts. The color attributes a* and b* was significantly different among the treatment and control groups; however no significant difference was observed in L* and pH values. Cheese samples contained no detectable levels of coliforms (<10 cfu/g). The HPLC data showed quantitative recovery of lutein during the storage period and no lutein degradation products were identified. These results indicate that lutein, a functional additive with purported ability to prevent or reduce the onset of AMD; can be incorporated in cheese adding value to this product.

Lutein-enriched oil-in-water emulsion were prepared with either phosphatidylcholine or phosphatidylglycerol as a stabilizer and analyzed for heat and emulsion stability. Phosphatidylcholine-stabilized emulsions collapsed after heating at 90°C for 5 min. Emulsion parameters for phosphatidylglycerol-stabilized emulsions heated at 90°C for 5 min were stable for at least 24 h following heat treatment. Lutein remained stable in fresh and heat-treated

emulsions. The potential of lutein incorporation into salad dressings as health enhancing bioactive compounds is being pursued.

Lutein was isolated from aflatoxin-contaminated corn and was free of aflatoxin. The process allows recovery of lutein from contaminated corn for food applications while farmers can find additional markets for aflatoxin-contaminated corn.

Impact: Identifying components of agricultural product that could be incorporated into consumer food products as health-promoting ingredients has two major impacts. First, demonstration of health promoting potential could greatly increase the value of the agricultural products from which these components are derived. This could greatly improve the economics of producing these agricultural products, especially because they are usually derived from byproducts of agricultural production and processing that typically have little or no value and may even incur a disposal cost. Secondly, by identifying health promoting effects and through incorporation into consumer food products, the health and well-being of the people of Louisiana and the world could be improved.

Sources of funding: US Department of Commerce, US Rice Foundation, Louisiana Soybean and Grain Board

Federal Goal 3

Title of Research Project: Reducing Obesity with Functional Foods

Key Theme: Nutraceuticals

Maren Hegsted, Professor; Mike Keenan, Associate Professor; Roy J. Martin, Professor; School of Human Ecology, LSU AgCenter

Issue: The problem of obesity, along with associated co-morbidities, in the United States and other developed countries is referred to as the “obesity epidemic.” Most health professionals agree that we are eating more but using less energy in daily activities than we did years ago. With the rise in obesity and obesity related conditions such as type II diabetes, cardiovascular disease, hypertension and stroke there is a need to consider modifications in the American diet that may benefit the health of consumers by reducing excess body fat. Functional food ingredients that can modify the body’s response to food may be one approach to this problem. Resistant starch is not thoroughly digested by enzymes in the small intestine resulting in a lower release of glucose immediately after a meal and a later release of short chain fatty acids from the large intestine after fermentation of the starch. One potential benefit of resistant starch in the diet is the lower postprandial blood glucose and insulin levels which would assist type II diabetics with regulating their blood glucose levels. Another potential benefit is in reducing appetite and body fat.

What was done: Diets were developed to increase the amount of undigested starch residue entering the large intestine. These diets were fed to laboratory rats and body composition, food intake and gut satiety signals were measured. Inclusion of resistant starch in the diet increased the release of two major gut satiety peptides (PYY and GLP-1), reduced abdominal body fat. Gene expression of PYY and GLP-1 were increased in the colon of rats eating a diet containing resistant starch. It is proposed that these satiety factors are released into the blood stream and go to the brain and alter the expression of neuropeptides involved in hunger and satiety.

Impact: Including Resistant starch in the diet could lead to decreased incidence of obesity and thereby reduce health care costs that are associated with the treatment of the 30 diseases associated with obesity. The major diseases associated with obesity are diabetes, cardiovascular diseases, hypertension and stroke.

Sources of funding: Hatch, State

Federal Goal 3

Title of Research Project: Expression of pharmaceutical proteins in egg white of transgenic chickens

Key Theme: Human Health

R.K. Cooper, Professor, Department of Veterinary Science, LSU AgCenter

Issue: Much of the cost associated with producing protein-based drugs is the expense associated with the manufacturing facility and the low levels of output from the current cell culture or bacterial expression systems – these facilities typically cost between \$200 to \$500 million and require years to build and receive FDA approval. The result is escalating drug costs for the consumer, or abandonment of potentially useful drugs that do not have enough economic impact to justify such capital outlay.

What was done: An alternative to traditional pharmaceutical protein production is being developed. This new approach uses the most prolific protein producer known to man, the white leghorn chicken, in combination with state-of-the-art biotechnology to engineer an animal that can produce pharmaceutical proteins in the white of their eggs. Pharmaceuticals produced in this manner are then purified from the white using known methods for protein purification. The technology developed at the LSU Ag Center produces transgenic chickens at rates not previously possible and expresses proteins in eggs at commercially viable rates. We are currently working on five different proteins with impact ranging from cancer treatment to anti-anthrax treatment. Results are expected in the first quarter of 2005.

Impact: This technology has the potential for lowering drug costs for the consumer and enabling Louisiana to become a center for pharmaceutical protein production. By integrating into an established industry, the layer industry, the LSU Ag Center can lead the way in economic

development and provide the base industry to attract businesses that will provide fill and finish on pharmaceutical compounds. Likewise, Louisiana has the opportunity to become a leader in providing diagnostic reagents and treatments for bioterrorist agents for the Department of Homeland Security. This means numerous, well paying jobs throughout the state.

Sources of funding: Army STTR grant, private grants, State, Hatch

Federal Goal 3

Title of Research Project: Targeted Destruction of Human Prostatic and Breast Cancer

Key Theme: Human Health

F.M. Enright, Professor and Head, Department of Veterinary Science, LSU AgCenter; William Hansel, Professor, Pennington Biomedical Research Center, LSU; and Carola Leuschner, Assistant Professor, Pennington Biomedical Research Center, LSU

Issue: Throughout the world, prostatic cancer is the second leading cause of cancer deaths in men, and breast cancer represents the most common cause of cancer deaths in women. Current therapy is largely ineffective in both types of cancer, following spread from primary tumors.

What was done: A research team at the LSU Agricultural Center and at the Pennington Biomedical Research Center has discovered and tested novel cancer treatments for both prostatic and breast cancers. These are composed of ligands linked to membrane-disrupting peptides. The ligands are small protein hormones, which direct the membrane-disrupting peptide to cancer cells with cell membrane receptors for the ligands. Importantly, even metastatic cancer cells are selectively destroyed by these compounds. The only side effect of these compounds is a loss of fertility.

Impact: These compounds hold great promise for effective treatment for both early and advanced stages of prostatic and breast cancer with minimal side effects, i.e., loss of fertility.

Sources of funding: State, private grants, Dept. of Defense grant

Federal Goal 3

Title of Research Project: Functional Dairy Foods

Key Theme: Human Health

Kayanush J. Aryana, Assistant Professor, Department of Dairy Science, LSU AgCenter

Issue: Demand for good tasting foods that have health benefits over and above its regular counterparts is prevalent. Although dairy fat imparts some desirable characteristics such as

improved flavor, mouthfeel, texture and appearance to dairy foods, it has a high caloric value and is high in saturated fatty acids making it unappealing. Saturated fat contributes to a gradual blockage of arteries restricting blood flow through them. It is proposed that dairy fat be used in conjunction with a fat absorbing fiber or be replaced by health beneficial lipids. Chitosan is a fat absorbing fiber which has been shown to have decreased intestinal absorption of cholesterol, antitumor activity, enhanced macrophage and immunologic function and bactericidal activity against pathogens namely *Escherichia coli*, *Staphylococcus aureus*, *Yersinia enterocolitica*, *Listeria monocytogenes*. Health beneficial lipids such as omega-3 fatty acids contribute to the reduction of cardiovascular diseases by lowering cholesterol and triglycerides, lowering blood viscosity and decreasing blood pressure. Omega Pure™ is a good source of Omega-3 fatty acids and Benecol® is a cholesterol reducing spread. Incorporating these ingredients in Cheddar cheese manufacture could help make it a healthier cheese promoting health of residents of Louisiana and the world. These added benefits could facilitate increased consumer attraction to this dairy product.

What was done: Chitosan incorporation in full fat and low fat Cheddar cheeses resulted in softer and less elastic cheeses compared to the control. The 90% high density chitosan usage at 1.5% w/w fat resulted in the softest cheese. High density chitosan when used at 0.5% either in low fat or full fat cheeses results in the microstructure similar to the control. The two different chitosans, namely high density and granular, differed in their impacts on the microstructure of cheese. The full fat cheeses made with Benecol® were higher in b* (yellowness) values compared to the full fat control. Benecol® and Omega Pure™ did not impact the protein profile. The aerobic counts appeared to increase from 2 to 4 months and then declined at 6 months in both the low fat and the full fat cheeses made using Benecol® and Omega Pure™. Benecol® did not adversely impact the flavor in full and low fat cheeses. Omega Pure™ improved texture in the full fat cheeses but adversely impacted its flavor. The health beneficial lipids did not impact the overall composition of the product. The health beneficial lipids altered the microstructure of the cheeses. Benecol® when used at 25% in Cheddar cheeses allowed to age for 24 weeks, resulted in textural qualities comparable to the control.

Impact: Use of health beneficial lipids can be recommended as a partial substitute for milk fat because as a partial substitute they do not adversely effect most of the physico-chemical and microbiological characteristics. Increase in amounts of health beneficial lipids in Cheddar cheese should be done with caution because they result in a harder product.

Sources of funding: Hatch and State Funds

Federal Goal 3

Title of Research Project: Investigation of Antioxidation Phytochemicals from Louisiana Agricultural Products and Byproducts

Key Theme: Adding value to new and old agricultural products

Zhimin Xu, Assistant Professor, Food Science Department, LSU AgCenter

Issue: Recent studies have indicated that agricultural plant products provide not only many essential nutrients for the human body but also some health functional chemicals that could reduce the risk of various diseases, such as cardiovascular diseases and cancers. A major group of these chemicals is called phytochemicals. The phytochemicals found in plants are phenolic acids, flavonols, flavonoids, anthocyanins, and catechins. These compounds consist of one or more hydroxyl groups on a chromanol ring. The unique structure enables antioxidant function in preventing lipid and protein oxidation that are caused by UV light, toxins, etc. The phytochemicals mostly exist in plants and are produced from their metabolic systems during growth. They are generally highly concentrated in the section of the plant responsible for protection against lethal outside influences, such as UV light, insects, and toxins. That section is usually not considered an edible part and produced as a waste during post-harvest processing. For example, rice bran, apple peel, and grape seed and skin are good sources of antioxidation phytochemicals but are treated as wastes of post-harvest processing or used as animal feeds. Louisiana produces various agricultural products. Rice, soybean, corn, sweet potato, and sugarcane are the important commodities of Louisiana. Also, Louisiana produces many types of vegetables and fruits, such as pepper, tomato, spinach, carrots, cauliflower, and strawberry. These agricultural plants could contain various phytochemicals, such as phenolic compounds, flavones, and terpenoids. Therefore, information on the phytochemicals that have antioxidation function in agricultural plants harvested in Louisiana is very valuable. The results of this study will be extremely useful for Louisiana agriculture to obtain important health promoting functionality information of its products. The information could be used to expand the market of Louisiana agricultural products because more and more consumers are recognizing the function of health promoting food. It is also useful in developing new utilization methods for those anti-lipid-oxidation agricultural products and their byproducts.

What was done: A specific and sensitive analysis method for cholesterol oxidation was developed. This method can be used in a complicated food system to evaluate the status of cholesterol oxidation. With a Mass Detector combined with Gas Chromatograph technique, the quantification of cholesterol and cholesterol oxidation products (COP) is more reliable and accurate through eliminating any interference from other food components. Anti-cholesterol-oxidation activities of rice bran and soybean crude oil and refined rice bran, soybean, and corn oils were evaluated. In control group (without oil), cholesterol was relatively stable and retained 73% of its initial concentration at 125°C after 30 min heating. Less than 30% and 10% of cholesterol remained at 150°C and 175°C after 30 min, respectively, and 10% at 200°C after 10 min. In the treatment group, the cholesterol mixed with corn and soybean oils had significantly

improved thermal stability. More than 60% and 40% of cholesterol remained at 150°C and 175°C after 30 min, respectively. In the control group, 7-ketocholesterol, one of major COPs, was produced when heating above 150°C and increased consistently during 30 min heating. At 175 or 200°C, the level of 7-ketocholesterol did not increase further after it had reached the highest level after 10 min heating. 7-Ketocholesterol is not stable above 175°C and its degradation rate could be much faster than its production at 200°C. 7-Ketocholesterol was not found in the cholesterol mixed with corn oil, crude soybean and rice bran oils until the heating temperature was raised to 175°C for 20 min. The levels of 7-ketocholesterol in those treatment groups were greater than that in the control group at 175°C for 30 min. These oils may increase the thermal stability of 7-ketocholesterol and slow down its degradation rate. This study demonstrated that crude soybean and rice bran oils may contain high level of antioxidant phytochemicals that reduce cholesterol loss and prevent 7-ketocholesterol production during heating.

Impact: Cholesterol in foods is readily oxidized to form cholesterol oxidation products (COPs) when exposed to high temperature, light, oxygen, and active chemicals. High intake of COPs from foods could result in increased plasma and intestinal cell COP levels. A higher ratio of COPs to cholesterol was found in plaque, which is the cause of cardiovascular diseases and certain types of cancers. Therefore, lowering the COPs level in daily foods may reduce the risk of cardiovascular and cancer disease. This study provides information that may aid in selecting vegetable oil for preparing cholesterol-rich foods that would minimize COPs and reduce the possible risk of heart diseases and cancer. Furthermore, the antioxidant phytochemicals in rice bran and soybean could be extracted to be a value adding component in health promoting food products.

Sources of funding: Hatch, Louisiana Soybean and Grain Board
Federal Goal 1

Title of Research Project: Developing Medicinal Crops for Louisiana

Key Theme: Agricultural Profitability

Liu, Z., Research Associate Professor, Agronomy Department, LSU AgCenter

Issue: Farmers and other landowners need new and profitable enterprises

What was done: To develop new crops for medicinal use, the medical functions of the plants and the extracts obtained from them must be clearly established. To obtain those data, multiple disciplinary collaborations are essential. We devoted enormous energy to do just that with scientists in the medical field in 2002. First is the *Eucommia* project. We completed the standardization of the bark extract and produced the needed amount for a human clinical trial to start in January 2003. The human trial, directed by Dr. Frank Greenway at the LSU Pennington Biomedical Research Center, will evaluate the hypotensive properties of the extract, which was observed in rodents. Sage Pharmaceuticals based in Shreveport, Louisiana, discussed the

possibility of marketing the Eucommia extract as dietary supplement for maintaining healthy blood pressure and expressed interest in obtaining the raw tree material locally in Louisiana. In the meantime, a growth study of Louisiana-grown Eucommia trees indicated that they grew well and produced the needed chemical constituents. Secondly, a collaborative plan was developed with a veterinarian to evaluate the anti-cancer properties of the standardized Camptotheca extract in an animal clinical trial. Thirdly, Rubus leaf extract was evaluated for its anti-inflammatory effect at the LSU Pennington Center. The crude extract was effective in inhibiting inflammation and the active fraction was identified. In addition, one doctoral student completed his degree on the Camptotheca study.

Impact: The research results have technology transfer potential and can lead to commercialization of health care products, which will in turn produce a demand for raw plant materials, thus creating new cropping opportunity.

Sources of funding: Grants; McIntire-Stennis

Federal Goal 3

Title of Research Project: Polymers and Polysaccharides from Sugarcane

Key Theme: Efficiency; Biobased Products; New Uses for Agricultural Products; Food Quality

Donal Day, Professor, Audubon Sugar Institute, LSU AgCenter

Issue: The development of new technology for the production of the biopolymers (glucooligosaccharides) from sucrose.

Use of a chain shortening acceptor and a specific microbial strain allowed the production of highly branched polymers in a dextran fermentation, resulting in production of selected glucooligosaccharides. It appears that these oligosaccharides are utilized preferentially by probiotic strains. There is also an added effect in that these compounds act as an inhibitor of α -glucosidase in microorganism, blocking the last stage in the metabolism of starch in the intestines. These studies do not allow direct prediction of “in vivo” effects but indicate that this type of oligomer can be a prebiotic for intestinal microflora.

What was done: Rat toxicity trials were conducted at LSU and the compounds were found to be safe. Chicken feeding trials for broilers (21 day) were conducted by ARS, USDA at Athens, Ga. The results warrant further testing. The chickens were healthy, showed better feed efficiency and a reduced number of Salmonella. A commercial entity has expressed an interest in the production of this material for an animal feed using sugarcane molasses. Developments in this area will be part of a new project.

Impact: The manufacture of glucooligosaccharides from sucrose offers direct and obvious benefits to the sugar industry. These polysugars have a significant market potential as functional foods, estimated as high as \$250 billion. It appears there could be a specific use as a health food. It is possible also that it can be used as a poultry feed additive to help replace antibiotics in raising “safe” poultry. This is of extreme interest with the reported rise in antibiotic resistant microbial infections. The effect of variation in oligomer structure on functionality is still to be investigated, as well as animal safety and functionality studies.

Sources of funding: State

Goal 3 – Extension Program Summaries

- In the Family Nutrition Program (FNP), extension faculty in 44 parishes and the Expanded Food and Nutrition Education Program (EFNEP) paraprofessional educators reached 185, 597 people with information on nutrition, diet & health, and food buying, with 97,752 direct contacts and 117,269 indirect contacts. After participating in the program, the majority of attendees indicated that they learned about several nutritional concepts. Over 75% of those surveyed said that they had learned to read food labels to make healthy food choices, and about 80% learned to choose a diet abundant in fruits and vegetables. Seventy-three percent said that they would start an exercise program. In accordance with the FNP youth program, extension faculty hosted a state-wide Childhood Obesity Seminar via distance education. Extension faculty throughout the state attended the training at 15 sites. At a later event, the 4-H Food & Fitness Fair, a total of 80 4-H members attended, with close to 30% of the youth coming from schools with FNP programs.
- The Portions Healthy Weight Program, a nine-lesson curriculum emphasizing healthy lifestyles, was developed to address Louisiana’s acute obesity problem. With one in three Louisiana adults and almost one in three school children considered obese, the seriousness of this problem prompted the formation of a team of extension faculty, who conducted Portions educational workshops in 12 Louisiana parishes. Since the program’s inception, the workshops have been held in 25 parishes, with approximately 900 people attending. Participants have reported that the program helped them to break habits that led to overeating and not being physically active.
- The LSU AgCenter is spearheading a public-private partnership initiative to create Louisiana House – Home and Landscape Resource Center (LaHouse). With project planning and partnership development initiated in 2000, in FY 2004 grant funding was secured, new partnerships were initiated, technical details were refined, and construction was begun. Educational activities to promote LaHouse over the past year have included presentations to consumers, home builders, health professionals, and college students, plus use of internet, mass media and printed publications. Future impact on stakeholder practices will include such areas as energy and resource conservation, environmental protection, disaster mitigation, family economic stability, and improved environmental health (asthma, allergies, etc.).

Total extension FTEs on Goal 3 programs were 63.66 for a total expenditure of \$5,101,458. A total of 722,760 educational contacts were made in Goal 3 programs.

Goal 3 – Extension Program Reports

Federal Goal 3

FAMILY NUTRITION PROGRAM (FNP)

Key Theme: Human Nutrition

Annrose Guarino, Assistant Professor, School of Human Ecology, LSU AgCenter

Program Description

Extension Family and Consumer Science agents covering forty-four (44) parishes and seventeen (17) nutrition educators in targeted parishes conduct Family Nutrition Programs (FNP) to assist food stamp recipients and potential food stamp recipients improve their diets and budget their food dollar. All FNP parishes have been actively involved in community education and outreach programs. Twenty-two parishes have a paraprofessional to help conduct the FNP program. The main nutrition topics covered by FNP included the Food Guide Pyramid, Dietary Guidelines for Americans, fruits and vegetables, fats, physical activity, healthy weight, food safety, food buying/budgeting, and gardening education. A monthly newsletter covered different nutrition topics: physical activity, fats, nutritional content and benefits of different foods (fish, milk, potatoes, cereal), and commodity foods (canned fruits, canned meats). Reported sites for the FNP outreach program included Office of Family Support (OFS), commodity distribution sites, Women, Infants and Children (WIC), eligible low income schools, and Head Start centers.

During FY 04, five Focus Group Discussions were conducted with 34 FNP participants in 5 FNP parishes. The PRECEDE/PROCEED theoretical model was used to classify information from FGD into predisposing and reinforcing. The purpose of focus groups was to determine whether nutrition education needs of FNP participants are being satisfied by the program and enabling factors. Results suggested that participants learned of FNP through the nutrition educator or community agencies such as Head Start and Office of Family Support. Although all participants were knowledgeable about the program itself, some indicated that lack of knowledge about meeting times and locations of nutrition education sessions was a barrier to participation. Other barriers to participation in FNP were minimal, but did include lack of transportation, lack of childcare, lack of interest, and time nutrition sessions were held. Participants' families and personal barriers to dietary change influenced use of information in FNP. Preferred delivery methods of nutrition education included a variety of methods. Satisfaction with FNP characteristics (program availability, nutrition information, and delivery methods) was related to the effectiveness of the nutrition educator. Thus, results demonstrated the importance of nutrition educators in the dissemination of nutrition education information.

Focus group discussions were used to determine perception of FNP characteristics and utility, nutrition education needs of low socioeconomic status individuals, and how FNP can modify education to meet these needs. Focus groups discussions (FGD) were conducted in 5 FNP

parishes (Concordia, Lafourche, Pointe Coupee, Natchitoches, and Richland) to determine if the nutrition education needs of low socioeconomic status participants are being satisfied by FNP. A total of 37 individuals participated in the study. The pilot test was held in Concordia parish and 12 individuals participated. FGD in Lafourche had 5 participants, Pointe Coupee had 4, Natchitoches had 6, and Richland had 10 participants.

Most participants indicated that they had previously received some form of nutrition education; however, they did not know that it was from the FNP program. Some referred to the nutrition education as the “nutrition lady,” “Extension office,” or “nutrition classes.” Most had heard of FNP or “nutrition classes” through the nutrition educator, WIC, low-income housing facilities, Head Start, or flyers placed in community locations such as town halls and laundromats. Additionally, in a couple of parishes, participants indicated that letters were written to them by the nutrition educator to invite them to participate in FNP. On the other hand, some participants also indicated that more advertising of the program is necessary to attract more people because they had heard of the program through word of mouth by friends, but had not specifically seen any advertisements from FNP.

Additionally, when asked why participants attended or received nutrition education from FNP, several responses emerged. Most participants indicated that they attended because of the educational aspect in general or they wanted to learn more about nutrition. Others indicated that they liked the social contact received when participating in the FNP sessions. Participants from one particular FGD indicated that they would not participate in FNP if it were not required of them from participation in assistance programs. Individuals who voluntarily participated in FNP and the FGD were overall generally satisfied with the program; however, those participants who were required to participate in FNP because of other assistance programs were not as satisfied with FNP. In general, these participants expressed a lack of interest in nutrition education and were not satisfied with the nutrition education content in general. As one participant said, “It’s boring.” The overwhelming majority of participants who volunteered to participate in the FGD and FNP were satisfied with the overall characteristics of the program and did make suggestions for improvement.

A variety of nutrition education techniques were appealing to participants including: small group discussions, cooking demonstrations, videos, brochures, pamphlets, and recipes. Approximately half of the participants liked receiving nutrition education lessons over the telephone; however, the other half did not express interest in receiving nutrition education over the telephone. Several participants indicated that they did not like the lecture-style nutrition education. Hands-on activities were also indicated as preferred delivery methods of nutrition education by several participants. When asked if the FNP nutrition education materials were easy to read and understand the majority stated that they were easy to read. Few respondents had difficulties reading the materials; however, this may be underestimated. Due to the use of FGD, individuals who had difficulties reading the materials may not feel comfortable to openly admit to this in the presence of others. When examining transcripts from the individual interviews from one parish, study participants were more willing to express difficulties in reading; however, because of the study design, these responses cannot be used in the final results. Overall, most participants liked

the design of written nutrition education materials; however, several improvements were suggested. For example, the use of “catchy phrases” and brighter colors were suggested. Additionally, some participants thought the materials contained too much information and should be simplified.

Barriers to participation included lack of awareness of the program, lack of transportation, and inconvenient times (for those with children). Most participants indicated that children were not a major barrier because they could be brought to the sessions. Additionally, some classes were held at the Head Start facilities while the children were in class. Another possible barrier to participation in FNP as indicated by participants in one FGD was the lack of interest in learning about nutrition related topics.

FNP program faculty received a list of parish Food Stamp recipients. The 44 FNP parishes provided direct contact with selected Food Stamp recipients with telephone numbers and current address to offer access to the program and to collect input. The Office of Family Support provided ongoing monitoring and input regarding the needs of the Food Stamp recipients.

A program enrollment form was used to survey the needs of all enrolled participants, encouraging direct client impact on the subsequent delivery of nutrition education topics. Enrollment forms and phone consultations indicated the most popular and requested nutrition education topics as suggested by the stakeholders and additional teaching resources and training was provided to field faculty to deliver these identified programs. Additional programs were conducted to meet the increased demand for selected topics. FNP enrollment data in 2003-2004 is tabulated for numbers and types of people served as well as age, gender, ethnicity, family size, and other services received by the family. Health conditions identified by the client, participation in assistance programs, and lessons received are also documented. Program planning incorporated this information to meet the identified needs of the target audience. From October 1, 2003 through September 2004, 2,116 clients completed the program enrollment forms.

The Delta Hope Tri-state Childhood Obesity Initiative Press Conference was held in Greenville, Mississippi and was attended by State FNP leaders on November, 20, 2003. Arkansas, Mississippi, Louisiana, International Life Science Institute and Michelle A. Lombardo, from Wellness Inc., collaborated with the Childhood Obesity FSNE Initiative. Mississippi FSNE children performed the OrganWise Guys cadence march for media representatives.

The LSU AgCenter hosted a statewide Childhood Obesity Seminar on October 30, from 9:00-11:30 a.m. via distance education. We featured Dr. Bill Dietz, a nationally recognized speaker on the subject of childhood obesity, and Dr. Claude Bouchard, Director of the Pennington Biomedical Center. The FNP field faculty attended this training at 15 distance education sites around the state.

The FNP/EFNEP Annual Nutrition Conference was held on April 5-7, 2004 at Louisiana Conference Center in Woodworth, LA. FNP and EFNEP Agents and Nutrition Educators

participated in this annual in-service training, conducted by the State Office faculty, in collaboration with several field Extension Agents. FNP Nutrition Educators and Agents had the opportunity to participate in a sharing session, where several parishes presented new, creative ideas for program delivery and shared with their co-workers new collaborations that they developed with community agencies that are potential sites for recruiting new FNP participants. The State Office faculty presented an update of the statewide childhood obesity initiative and the role that the FNP Agents and paraprofessionals will play (emphasis was placed on recruiting more FNP eligible schools). An awards banquet was held to celebrate 10 years of FNP in Louisiana and an FNP Paraprofessional Award was given to Janet Franicevich, from Plaquemines and St. Bernard parishes, for outstanding contribution to the Family Nutrition Program. Nutrition Educators who completed the Certification Program were recognized.

State agencies that work closely with the FNP program are the Governor's Office of Elderly Affairs, the Department of Education, the Department of Public Health, the Department of Health and Hospitals, and the US Dept of Agriculture. Private and community organizations including the Association of Independent Grocers, the Southeastern Dairy Association, Blue Cross Blue Shield, Association of Catholic Charities of Orleans and Baptist Community Ministries. These agencies work closely with FNP to enhance our programs and improve out community impact.

The LSU School of Human Ecology has collaborated with FNP and EFNEP to develop evaluation protocols, a nutrition research-teaching lab, and preceptor supervision for dietetic interns. As a result of a close collaboration between the EFNEP and FNP programs, FNP eligible EFNEP graduates in 8 parishes received additional nutrition education in the form of nutrition newsletters. FNP eligible EFNEP graduates were contacted and notified that they can receive additional nutrition education through FNP. Mailing lists were developed at parish level and over 1800 newsletters were mailed during FY04.

The EFNEP and FSNEP Coordinators from 1860 and 1890 Extension Services in LA, TX, MS, AR, OK, TN, KY, VA, NC, SC, GA, FL, AL, and Puerto Rico collaborated on program design, implementation, and evaluation through monthly teleconferences.

The Texas Agricultural Extension Service worked closely with FNP providing a EATSMART: Eat for Better Health workbook used by the Nutrition Assistant Certification program.

Program Impact

Extension agents in 44 parishes and the 17 FNP nutrition educators reached over 185,597 people with information on nutrition, diets and health, and food buying through the FNP program (97,752 direct contacts and 117,269 indirect contacts).

Main topics covered through nutrition education activities included nutrition/diet/health, food safety, food buying/budgeting, and gardening education. The most frequently reported sites for

outreach and nutrition education in the parishes include Office of Family Support, Commodity Food Distribution sites, and schools.

One of the most significant achievements for FNP during FY 2004 was the collaboration with eligible schools, reaching and educating low-income children about nutrition, healthy eating habits, and importance of regular physical activity. LSU AgCenter Agents and nutrition educators (paraprofessionals) conducted nutrition education programs in eligible schools, for over 50,000 youth (pre-K – 12th grade) in 84 FNP schools statewide.

Impact statement data from parishes showed that after participating in FNP, the vast majority of individuals indicated that they learned about several nutrition and health-related concepts. More specifically, over three-fourths of those surveyed indicated that they learned to read the nutrition labels to make health food choices, 100% learned the importance of adequate nutrition for the child's development, and over 90% to use the food guide pyramid when planning meals for the family. Additionally, over 80% of individuals surveyed indicated that they learned to choose a diet abundant in fruits and vegetables, with at least 2 servings of low-fat dairy products, moderate in sugar, and lower in salt after participating in FNP. On the other hand, 42 out of 385 surveyed indicated that they did not learn to choose a diet moderate in sugar and about the same number of individuals indicated that they obtained this knowledge prior to FNP participation. 78% of surveyed individuals indicated that they learned, through participation in FNP, the importance of completing 30 minutes of moderate exercise most days of the week.

FNP program evaluation exit surveys indicated that as a result of what participants learned:

68% of those tested will apply for WIC or food stamps if I am eligible

81% of those tested will choose a diet moderate in sugar

89% of those tested will reduce the number of calories I eat from fat to less than 30%

73% of those tested will start an exercise program

85% of those tested will wash hands with hot, soapy water before handling food

As part of the FNP/4-H outreach efforts, 4-H Agents tried to recruit more FNP eligible youth during other nutrition education programs offered by the LSU AgCenter. A total of 80 4-H'ers from 22 parishes attended the 2004 Food & Fitness camp at Camp Grant Walker. Of all participants (80), 27.5% came from FNP eligible schools. This year's theme was "The Wonderful World of 4-H". The theme centers on movies and shows that were created by the Walt Disney ® Company. Campers, accompanied by teen and adult volunteer leaders, participated in numerous activities conducted by the 2003-2004 4-H State Food & Fitness Board members and their advisors. Projects included hands-on activities focused on nutrition, food preparation, food safety, and fitness. Lessons were developed by the 4-H State Food & Fitness Board members, under the coordination of faculty advisors. Most of the lessons were designed to relate to the LSU AgCenter statewide childhood obesity initiative. Participants were introduced to the OrganWise Guys® characters and together learned about health and nutrition, while attending a "nutrition boot camp".

Source of Funds

State and Federal (Smith-Lever 3 b, c, d)
Family Nutrition Program (FNP), Food Stamp Nutrition Education Program funded by USDA, Food Nutrition Services (FNS), through the Louisiana Department of Social Services, Office of Family Support, Food Stamp Program.

Scope of Impact

Multi-state: The Family Nutrition Program (FNP) is part of the National Food Stamp Nutrition Education Program sponsored by USDA, Food and Nutrition Service. The EFNEP and FSNEP Coordinators from 1862 and 1890 Extension Services of the Southern Region of CSREES meet at several annual meetings and monthly via conference calls to plan and coordinate the southern region's nutrition education outreach for low-income families. An electronic list-serv provides an excellent medium for daily communications regarding curricula selections, staff training and supervision, and reporting and evaluations among the 14 Southern Region CSREES states: LA, TX, MS, AR, OK, TN, KY, VA, NC, SC, GA, FL, AL, and Puerto Rico.

Louisiana EFNEP and FNP faculty contributed to a web based paraprofessional training curriculum, Eat Smart. The web based training curriculum includes more than 25 nutrition education modules that are available through Internet access to Louisiana and other states. The training program incorporates pre and post-test components and provides the basis of the Nutrition Assistant Civil Service Certification program. In addition to the Internet curriculum, a workbook developed by the Texas Agricultural Extension Service serves as an additional tool to assist the nutrition educators in the certification process. The information in the manual complements the Internet curriculum and is used as a supplement to enhance learning.

In FY 2004, an estimated 21 FTEs were spent on Food Stamp Nutrition education, resulting in 185,597 contacts. Based on an FTE cost of \$24,514, the total cost of the program was \$1,133,512. Of this effort, 30% is involved in the acquisition and sharing of resources and information through multi-state efforts, valued at \$154,438. (21 FTEs x \$24,514 per FTE x .30)

Multi-function: State agencies that work closely with the FNP program are the Governor's Office of Elderly Affairs, the Department of Education, the Department of Public Health, the Department of Health and Hospitals, and the US Dept of Agriculture. Private and community organizations including the Association of Independent Grocers, the Southeastern Dairy Association, Blue Cross Blue Shield, Association of Catholic Charities of Orleans and Baptist Community Ministries. These agencies work closely with FNP to enhance our programs and improve our community impact.

Contributions from research counterparts included assistance in determining program needs through focus groups, meetings, development of nutrition education materials, agent training and presentations for clientele. It is estimated that 30% of FTE allocations to this program is

attributable to multi-function work. The dollar equivalent of multi-function work is \$154,438 (21 FTEs x \$24,514 per FTE x .30).

Federal Goal 3

A HEALTHY, WELL-NOURISHED POPULATION, PORTIONS HEALTHY WEIGHT PROGRAM

Key Theme: Human Health

Beth Reames, Professor, Department of Human Ecology, LSU AgCenter

Program Description

Louisiana ranks as one of the most obese states in the nation. Obesity leads to increased risk of many medical conditions including heart disease, type 2 diabetes, stroke, hypertension, gall bladder problems, sleep apnea, osteoarthritis, infertility (women) and high blood cholesterol levels, as well as breast, prostate and colon cancer. Obese individuals are 90% more likely to have type 2 diabetes and 50% more likely to have high blood pressure than those who are not obese. In children, obesity leads to high blood cholesterol levels, high blood pressure, type 2 diabetes, asthma and early maturation. Obesity-related diseases account for nearly half of Louisiana's healthcare budget. The Portions healthy weight curriculum, emphasizing healthy lifestyles, was developed to address Louisiana's growing obesity problem by a team of FCS nutrition specialization agents and a nutrition specialist.

Actions: FCS nutrition specialization agents provided input from parish clientele in developing the Portions Program, including assessment of needs and program format. Data and information from research institutions, including the LSU School of Human Ecology, and health and nutrition organizations were collected for program development.

Parish clientele were queried individually and in group settings to collect input for program development. The program was pilot-tested in one parish and changes incorporated. Program participants were informed of the program through the media, newsletters, phone calls, health fairs, exhibits, displays and individual visits. Local Family and Community Education volunteers assisted FCS agents with session preparations and members also publicized the program in their communities.

Process: Individuals, groups and organizations were identified through parish mailing lists, organization lists and referrals. LSU AgCenter Strategic Planning Forums held statewide, people from all walks of life were asked to come together in each parish and discuss the issues most affecting the quality of life for Louisiana's residents. Issues identified by participants included:

health problems caused by both adult and child obesity and inactivity and need for comprehensive nutrition education. Family and Consumer Sciences Advisory Committees held

statewide cited obesity and its related illnesses as the primary area for Extension's nutrition programming.

Consideration: Program suggestions were incorporated into the educational plan. Evaluation instruments were included to monitor the value of the program.

Problem(s) Identified: The 2002 Louisiana Health Report Card reveals that more than one in three (36.3%) of Louisiana adults are overweight or obese (BMI \geq 25). Almost one in three Louisiana school-aged children is overweight (BMI $>$ 85%). Obesity leads to increased risk of many medical conditions including heart disease, type 2 diabetes, stroke, hypertension, gall bladder problems, sleep apnea, osteoarthritis, infertility (women) and high blood cholesterol levels, as well as breast, prostate and colon cancer. Obese individuals are 90% more likely to have type 2 diabetes and 50% more likely to have high blood pressure than those who are not obese. In children, obesity leads to high blood cholesterol levels, high blood pressure, type 2 diabetes, asthma and early maturation. Obesity-related diseases account for nearly half of Louisiana's healthcare budget.

Initiation and Progress – “What was done?” The Portions Healthy Weight Program, a nine-lesson curriculum emphasizing healthy lifestyles, was developed to address Louisiana's growing obesity problem by a team of FCS nutrition specialization agents and a nutrition specialist and launched in late Fall 2001. The Portions Plan provides current, research-based information and recommendations to help Louisiana citizens achieve and maintain a healthy weight by setting realistic goals for better health and learning to balance the food they eat with appropriate physical activity. PARS reports indicate that Portions workshops were conducted in 12 parishes in 2004. Since inception, Portions workshops have been conducted in 25 parishes for approximately 900 people.

Collaboration: Personnel and facilities of local libraries, rural medical centers, rural and urban hospitals, clinics, churches; Family and Community Educators; Office of Public Health; parish and community school boards

Program Impact

In 2004, Extension agents conducting Portions workshops reported that most participants indicated the intent to make lifestyle changes related to achieving or maintaining a healthy weight. One agent reported that on follow-up two years after participation in a Portions workshop, 11 people continued to follow recommended lifestyle changes and to maintain their weight status after losing from 4 to 8 pounds during the program.

Initial data from Portions participants showed that ninety-seven percent of Portions Program participants indicated that they had made at least one recommended lifestyle change. Most reported learning the importance of moderate exercise most days of the week, but many cited “finding time” as an obstacle to regular exercise. Many participants reported starting a walking or other exercise program. Some groups formed walking clubs or asked for a fitness class.

Although the number of pounds lost was not emphasized, a healthy weight loss of an average of 4-8 pounds was experienced by participants during the 9-week program statewide. But more importantly, over 90 percent of the participants (where beginning and ending health assessment were taken) improved their cholesterol, blood pressure or blood glucose levels. Comments from participants about what they learned included: "My portion sizes of food have been much too large; "I've been eating too much saturated fat; "I've been skipping meals to lose weight." FCS Agents reported a change in the participants' attitudes and sense of well-being after the nine weeks with comments like "I feel so much better." Participants reported that the program helped them break habits that had led to overeating and not being physically active. The discussion on fad diets revealed that participants had tried numerous fad diets. Observations by FCS Agents showed knowledge gained by participants and a resolve never to go on an unhealthy fad diet again.

Source of Funds

Smith-Lever 3 b, c; Family Nutrition Program - funded by USDA, FNS, through the Louisiana Dept. of Social Services, Food Stamp Program

Scope of Impact

Multi-state: In FY 2004, an estimated 16 FTEs were spent on nutrition and health education. Based on an FTE cost of \$80,136, the total cost of the program was \$1,282,176. Of this effort, 40% is involved in the acquisition of sharing of resources and information through multi-state efforts, valued at \$512,870.4 (16 FTEs x \$80,136 per FTE x .40).

Multi-function: Contributions from research counterparts included assistance in determining program needs through focus groups, meetings, development of nutrition education materials, agent training and presentations for clientele. It is estimated that 30% of FTE allocations to this program is attributable to multi-function work. The dollar equivalent of multi-function work is \$384,652.80 (16 FTEs x \$80,136 per FTE x .30).

Federal Goal 3

SUSTAINABLE HOUSING (LAHOUSE INITIATIVE)

Key Themes: 3 - Human Health, 4 - Energy Conservation, Integrated Pest Management, Air Quality, Recycling, Water Quality, 5 – Promoting Housing Programs, Home Safety, Aging

Claudette Reichel, Professor, School of Human Ecology, LSU AgCenter

Program Description

Stakeholder Input in Program: The LSU AgCenter is spearheading a public-private partnership initiative to create Louisiana House – Home and Landscape Resource Center (LaHouse). More than 100 stakeholders were involved in an initial strategic planning process (in 2000) that set priorities for the issues and problems that this initiative would address. The stakeholders included representatives of related industries, agencies, educators, civic organizations and consumers. For FY 04 stakeholder input, see list of Collaborators below.

Problems Identified: *Sustainability* (meeting current needs without jeopardizing the needs of future generations) is an emerging necessity. In the southern region, there have been several federal disaster declarations in the last 20 years; natural hazards have resulted in millions of dollars of damages to homes. The average repair cost to homes infested by Formosan termites is \$11,000. Mold litigation and claims have prompted its exclusion from homeowners insurance. Liability insurers of home builders will no longer cover local contractors. Rising energy, water and waste management costs create an economic burden for families and local governments. The list of area challenges doesn't stop there.

Sustainable housing and development should integrate and balance resource efficiency, durability, and healthfulness with practicality and convenience to become mainstream. Most housing in this area either ignores or addresses these criteria in a piecemeal manner. Building sustainable homes in the south poses additional challenges from other places, stemming from this area's high vulnerability to hurricanes, flooding and tornadoes; the warm-humid climate; prevalent decay, mold and indoor air problems; the spread of Formosan subterranean termites; local sewage and solid waste problems, and pollution from run-off.

Initiation and Progress of the Program: Project planning and partnership development was initiated in 2000. In FY 04, new partnerships were initiated, additional capital donations and grant funding were secured, a variety of educational and marketing activities were conducted, technical details of the educational facilities and exhibits were refined into construction and product specifications, and construction began.

Educational activities included presentations to consumers, home builders, health professionals, and college students as well as internet, printed publications and mass media outreach. Through funding support from four agencies, a LaHouse Coordinator position was established and filled.

Collaborators include:

- An LSU AgCenter team of specialists and scientists in housing, engineering, disaster education, environmental sciences, wood products, entomology, horticulture, family economics and communications guide and lend expertise to the project.
- Local professionals (practicing architects, home builders and landscape designers) are involved in planning, design and development.
- Nationally recognized Building Science Consortium of U.S. Dept. Of Energy Building America Program, Institute of Business and Home Safety *Fortified for Safer Living* program, and scientists of Florida Solar Energy Center provide technical assistance.
- Partners providing program grants or contracts to help support initiative: La. Dept. of Natural Resources and U.S. Dept. of Energy, La. Office of Emergency Preparedness and FEMA, U.S. EPA, USDA-CSREES, and U.S. Dept. of HUD Healthy Homes Program.
- Allies giving time or expertise include faculty, staff and/or students of : LSU's Hurricane Center, School of Architecture, Dept. of Interior Design, Real Estate Research Institute, School of Human Ecology, Dept. of Civil & Environmental Engineering, Institute for Ecological Infrastructure Engineering, Dept. of Biological and Ag Engineering, Dept. of Horticulture, Dept. of Construction Management, Construction Mgt. Student Assoc., Office of Parking, Traffic & Transportation, ULL School of Architecture and Campus Federal Credit Union.
- Many manufacturers and suppliers have worked with the design team.

Program Impact

At this time, the primary impact has been the unprecedented scope of partnerships and collaborations developed and actively involved in the LaHouse initiative and its sustainable housing education objectives. This not only leverages resources, but will also maximize the outreach potential and future impact of the program on audience practices and the resultant economic, environmental and health benefits such as:

- Energy and resource conservation
- Environmental protection
- Disaster mitigation
- Family economic stability
- Improved environmental health (asthma, allergies)
- Increased capacity to “age in place”

Source of Funds

- LSU AgCenter (state and federal) – ongoing base support
- FEMA and La. Office of Emergency Preparedness - \$98,000 three year contract
- U.S. Dept of Energy and La. Dept. of Natural Resources - \$30,000 three year contract
- USDA-CSREES and HUD Health Homes - \$10,000 grant
- USDA-CSREES and EPA Indoor Air - \$3000
- Private gifts and donations to LSU Foundation for LaHouse capital project (reached \$400,000 cash and approximately \$300,000 in-kind commitments).

Scope of Impact

This is a multi-state, multi-function program. LaHouse will serve Extension and audiences of the southern region, particularly the coastal states. The state LaHouse team includes both Extension and research faculty; collaborators include both private and public research scientists and organizations.

State Extension or university programs involved in LaHouse planning, sharing of materials or training included: Florida, Montana, Utah, Texas, Georgia, Mississippi, and Virginia.

It is estimated that 10% of the program is multi-state, valued at \$16,027 (2 FTE x 80,136 x .10).

Goal 4

LSU Ag Center Goal 4 is to achieve greater harmony between agriculture and the environment. The integrity of Louisiana's diverse ecosystem must be ensured by developing, transferring, and promoting the adoption of sustainable agriculture, forestry, and related resource conservation policies, programs, technologies, and practices.

Goal 4 - Research Project Summaries

- This research addresses the suppression of two major Louisiana destructive insect pests, the red imported fire ant and the Formosan subterranean termite. The study investigated potential biological suppression of the red imported fire ant with a microsporidium, a type of insect pathogen. The state-wide survey and field trials are the first steps in weakening populations of red imported fire ants throughout the state. The microsporidium is intended to become a natural mortality agent of this costly pest, not requiring further public funding after it spreads and is permanently established. The termite research is in an early stage, but its impact will be to either improve the efficacy of safe microbial insecticides or to provide a natural repellent against the Formosan subterranean termite.
- Loblolly pine plantations are widely planted and managed by private landowners and industry. Research in such management practices as fertilization and weed control increase knowledge on the effects of site preparation and harvesting on the soil properties and growth rate. This knowledge helps stakeholders to comply with various stewardship programs. As the intensity of forest management increases, knowledge of the impact of practices allows landowners, industry, and other stakeholders to assess the economic and environmental impact of various site preparation and harvesting management practices, and thus more wisely consider alternatives for profitability and sustainability.
- Insufficient data exist on the genetics of this economically and ecologically important tree—the longleaf pine. Ten randomly selected trees were felled, and chemical and anatomical data have been initiated. The research project will determine relationships between genetic parameters, growth patterns, and wood properties. Understanding the relationships between these traits will assist LSU AgCenter geneticists in future tree improvement programs and could lead to increased use of longleaf pine in commercial forest plantations in the state.
- Information on ecology and management of bottomland and wetland forests is insufficient for decision-making and policy formulation. A study was implemented to test site preparation methods and artificial regeneration of three oak species on four agricultural fields in the Lower Mississippi Alluvial Valley of Louisiana. Results showed that some degree of site preparation is needed to establish oak seedlings, but few differences were found between site preparation treatments. Research findings indicated that bottomland oaks can be regenerated using natural and planted seedlings. Given past difficulties, an opportunity exists to promote regeneration during thinning operations where growth of desired over-story crop trees is the primary objective.
- Understanding the total aquatic system is essential to development of management techniques. The Atchafalaya Rive Basin (ARB) is the largest bottomland hardwood swamp in North America and represents a poorly understood ecosystem. This area is highly productive, with a high fish species diversity, often sought by recreational

fishermen. Historic water quality data indicate that hypoxic areas are now much larger than during extensive surveys conducted in the 1970s. Due to these apparent changes, AgCenter researchers have designed a series of short-term studies to examine potential impacts on the ARB biota. Additionally, long-term management plans have been developed in conjunction with several government agencies to restore historic connections between the Atchafalaya River and the extensive floodplain, and to improve circulation patterns in the ARB.

- The Atchafalaya Basin is heavily used by South Louisiana fishermen. Research was completed on the effects of hydrilla (an exotic, submerged plant) on the growth and food habits of young-of-the-year largemouth bass in the Basin. Bass inhabiting high-density hydrilla beds exhibited a delayed switch to fish prey and reduced growth relative to individuals collected in areas of sparse hydrilla cover. Successful draw-down strongly inhibited hydrilla re-growth and resulted in earlier switch to fish prey, with equivocal growth effects. Data from this and related studies are critical to the understanding of effective, sustainable management of Louisiana's aquatic resources.
- Input of nutrients such as carbon, nitrogen, and phosphorus from agricultural lands to surface waters may overly enrich the receiving water bodies with these nutrients, stimulating excessive growth of aquatic plants, algae and other microorganisms, with the overall result of deteriorating water quality. Phosphorus has received the greatest attention because it is typically the most limiting nutrient in freshwater. From this study, it is thought that for streams monitored in Southwest Louisiana, use of best management practices (BMPs) by producers of rice, soybeans, crawfish and beef cattle (pasture) will remedy the impaired water quality problem. However, this must be demonstrated at the field and watershed scales. The scope of this research (watershed scale) provides new approaches to addressing water quality problems, with farmers highly affected by water quality policy and regulations.
- Swine and poultry diets are formulated to achieve optimum economic returns for the producer. Also, land application of swine and poultry wastes leads to accumulation and potential run-off of phosphorus in soils, which can lead to eutrofication of water sources. Research was conducted to evaluate the effect of dietary phytase supplementation in swine and poultry diets on animal productivity and nutrient loss to the environment. In areas of concentrated animal production where phosphorous levels in the soils are an important consideration for land application of animal waste, the use of phytase will increase the amount of waste that can be applied without exceeding the phosphorous standard. Swine and poultry diets also may be more economical because of the reduction in calcium, phosphorus, amino acids, and energy supplementation that is required.
- Cotton production systems have traditionally involved intensive tillage practices for seedbed preparation and weed control. High costs of labor, equipment, and fuel are becoming an ever-greater concern to farmers. Field studies were performed to evaluate effects of tillage practices, cover crops, crop sequences, and fertilizer nitrogen rates on

cotton growth and yield. Results from the research have increased the acceptance and implementation of sustainable and economic best management practices (BMPs) that are highly protective of water quality. Optimal fertilizer nitrogen rates for cotton under several cropping systems were identified, which will help to ensure that producers have the knowledge necessary to optimize nutrient efficiency and minimize nutrient leaching and runoff losses.

- This project was designed to address rice production problems, including improving agronomic practices by efficient utilization of inputs and mitigating concerns regarding soil erosion and water quality. Proper timing of inputs improved yield, decreased cost of production, and minimized any negative effects of nutrient management in rice on the environment. Reduced tillage practices have potential to decrease input costs and at the same time sustain production at profitable levels and mitigate environmental concerns. Ratoon-crop production increased resource use efficiency per unit of time and per unit of land area. Rice producers can benefit considerably from the results of this research.
- Louisiana sugarcane farmers need information and knowledge on management practices which will improve the quality of run-off water flowing from their fields. The purpose of this study is to evaluate the effects of post-harvest residue (mulch cover) on the field with respect to surface water quality. Three management strategies were evaluated with focus on mulch residue and its effect on soil erosion, surface water quality, and crop yield. Management practices studied included (1) burning mulch after harvest and cultivating in the spring; (2) sweeping mulch off the top of the row after harvest and cultivating in the spring; and (3) leaving the mulch on the field after harvest and cultivating in the spring. Results of this study will provide sugarcane farmers with research-based information on selection of best management practices.
- Understanding the effects of best management practices (BMPs) is critical to resource management. Researchers investigated the differences in stream macro invertebrate communities, water quality parameters, channel characteristics, woody debris, and microbial community dynamics in three West Louisiana streams of differing land uses. With increasing intensity of land use, some preliminary findings indicated increasing amounts of woody debris, decreasing complexity of channel characteristics, and decreasing water quality. Unexpectedly, microbial fecal coliform and heterotrophic plate counts did not appear to be related to land use, but instead appeared to be influenced most by point sources along the stream continuum and by wildlife activities. Demonstration of forestry and wildlife BMP effectiveness will have significant positive impacts on the Louisiana forestry industry by minimizing mandatory regulations.
- Understanding biology of ducks is essential to managing populations. One of the most critical aspects of waterfowl management involves harvest regulation. Age ratios are one of the key inputs (along with habitat conditions, population size, and survival rates) to the adaptive harvest models that are used by the U.S. Fish & Wildlife Service to set annual regulations. The researcher initiated work to test the accuracy of the age ratios generated

from samples of wings provided by hunters. The LSU AgCenter study indicated a 20% bias in age ratios, with these biased data inputs having led to conservative harvest regulations. Research results leading to the discovery of biased age ratios have allowed the U.S. Fish & Wildlife Service to establish harvest regulations that were less restrictive.

- Field management zones differing in soil attributes useful for variable rate fertilizer application (VRT) have been helpful in minimizing environmental insult of excess nutrients entering ground water and for lowering the farmers' fertilizer expense. Apparent soil electrical conductivity can articulate such management zones. The need exists for a close examination of the interrelationship of soil attributes when application prescriptions are developed for site specific work. Research is scheduled to continue, with VRT being an environmentally friendly, economical approach to fertilizer management.
- The Louisiana black bear is a threatened species of critical importance to natural resource management in the state. LSU AgCenter research indicated that relocating females with newborn cubs is a successful technique to ensure colonization of the site by the female. The willingness of the female to leave the release site appears to be limited by the presence of cubs, thereby ensuring her acclimation to the release site. A follow-up study has begun to expand this work and is examining ecology of female black bears relocated during the restoration efforts. Natural resources scientists also are conducting a project on effects of forest management on wild turkey habitat use in bottomland hardwood systems. The relationship between wildlife management and forest management is not well understood, and the study will be of much interest to Louisiana outdoor enthusiasts.

Goal 4 – Research Project Reports

Federal Goal 4

Title of Research Project: Development, Evaluation and Safety of Entomopathogens for Control of Arthropod Pests

Key Theme: Biological Control

James R. Fuxa, Professor, Department of Entomology, LSU AgCenter

Issue: This project addresses the suppression of populations of two major pests, the red imported fire ant (*Solenopsis invicta*) and the Formosan subterranean termite (*Coptotermes formosanus*). The red imported fire ant is a pest in much of the southern United States. This ant is highly invasive and omnivorous, and the workers sting viciously, repeatedly, and in large numbers. These characteristics make the red imported fire ant one of the few insects that is a significant pest in medical, urban, agricultural, and ecological settings. Chemical controls at times have caused more ecological damage than the ants themselves and are not persistent; those in current use generally have some toxicity to humans and animals, which can be of particular concern in urban settings. Chemical insecticides will continue as the backbone for management of *S. invicta*, but this situation clearly calls for safe and environmentally friendly control methods as well. The Formosan subterranean termite causes \$5 billion per year in structural damage, is spreading, and is difficult to control.

Microbial control or “germ warfare” has been researched and used against insects for more than 100 years, because insect pathogens are harmless to non-target organisms, including humans, plants, wildlife, and pets. For example, *Thelohania solenopsae*, a type of insect pathogen called a microsporidium, infects only fire ants and will not even harm beneficial insects.

What was done: A combination of applied and basic research contributed toward potential biological suppression of the red imported fire ant, *Solenopsis invicta*, with the microsporidium *Thelohania solenopsae*. Laboratory analyses continued in a survey of ant samples collected randomly throughout the entire state of Louisiana, including every parish. The microsporidium infected 10% of 1328 colonies and 16% of 165 sites, and it was randomly distributed geographically. Ant social form was a strong predictor of infection: 84% of colonies were uninfected monogyne (single-queen), 2% were infected monogyne; 6% were uninfected polygyne (multiple-queen); and 8% were infected polygyne. Infected colonies were 40% less likely to have brood than uninfected ones, but the pathogen did not affect colony size. The first recorded epizootic of *T. solenopsae* in monogyne *S. invicta* was reported, which is important considering the high prevalence of monogyne populations. It provided preliminary evidence that the pathogen may give monogyne ants a competitive advantage over polygyne ants. The epizootic peaked at 63% prevalence in monogyne colonies, but it died out within two years. Also for the first time, monogyne colonies were artificially infected in the field, but this epizootic similarly died out within two years. *Thelohania* field trials in polygyne populations are still

spreading in massive epizootics 3-6 years after releases. Studies of the life cycle of *T. solenopsae* were continued in order to learn how to improve its transmission. There were indications that the megaspores, discovered previously in LSU AgCenter Insect Pathology, may function in vertical (parent-to-offspring) transmission. Detailed light and electron microscopic analyses indicated that cysts produced by this pathogen result from a single hypertrophied host cell and may aid horizontal transmission. A hypothetical life cycle, involving four spore types, was proposed for *T. solenopsae*, but it is complex and largely remains to be tested experimentally. Primed in Situ Synthesis (PRINS) was tested as a positive-control with a different microsporidium infecting a cell line; this technique is now being adapted to detect the almost-invisible, intracellular, developmental stages of *T. solenopsae* to help elucidate its life cycle.

The entomopathogenic fungi *Beauveria bassiana* and *Metarhizium anisopliae* were studied for repellency to the Formosan subterranean termite, *Coptotermes formosanus*. Data analyses are in progress for a complex study with five dependent variables, but the results to date indicate that fungal conidia are substantially more repellent to *C. formosanus* than fungal mycelium or germ tubes. This difference is especially strong in isolates of *M. anisopliae*, which is significantly more repellent than *B. bassiana*.

Impact: The statewide survey and field trials with *Thelohania* releases are the first steps in weakening populations of red imported fire ants throughout Louisiana. This microsporidium is intended to become a natural mortality agent of this important pest, not requiring further public funding after it spreads and is permanently established. The *Thelohania* life-cycle studies will help researchers learn how to infect ants by feeding them spores, which, in turn, will greatly simplify infecting ants in the field if augmentation becomes necessary, for example, against monogyne ants. The termite research is in an early stage, but its impact will be to either improve the efficacy of safe microbial insecticides or to provide a natural repellent against the Formosan subterranean termite.

Sources of funding: State of Louisiana, state of Texas, Multi-state (Regional Project S-301)

Federal Goal 4

Title of Research Project: Effects of Whole-Tree Harvesting and Site Preparation on Production of Loblolly Pine Plantations

Key Theme: Forest Crops

Dean, T. J., Professor, School of Renewable Natural Resources, LSU AgCenter

Issue: Loblolly pine plantations are important to landowners and industry

What was done: Compared to hand felling, conventional harvesting continued to exhibit a small but significantly negative impact on mean height four or five years after harvesting at three of the four installations. Of the two sites that included bedding as a site preparation treatment, only one

site exhibited a significantly positive height response. Seedlings receiving diammonium phosphate at time of planting were significantly taller than unfertilized seedlings, but the effect of fertilizer is confounded with herbaceous weed control at one of the sites. At this location, the mean height of the seedlings receiving both fertilization and herbaceous weed control were significantly shorter than the seedlings receiving just herbaceous weed control. Mean tree height was significantly increased at the three sites where herbaceous weed control was applied.

Impact: Installation of additional locations for the Cooperative Research in Sustainable Silviculture and Soil Productivity increases the cooperators knowledge on the effects of harvesting and site preparation on the soil properties and the growth rate of their plantations. This knowledge helps them comply with various stewardship programs and their own Sustainable Forestry Initiative. As the intensity of forest management increases, knowledge of the impacts of intensive forest management allows them to assess the economic impact various harvesting and site preparation practices may have, providing them with additional knowledge in considering management alternatives for profitability and sustainability.

Sources of funding: McIntire-Stennis; State; grants

Federal Goal 4

Title of Research Project: Genetic Influences on Longleaf Pine Wood Properties

Key Theme: Forest Crops

Shupe, T. F., Associate Professor; Stine, M., Associate Professor; School of Renewable Natural Resources, LSU AgCenter

Issue: Insufficient information exists on the genetics of this economically and ecologically important tree.

What was done: The process for removing increment cores from the experimental trees has been completed. Increment cores are currently being prepared for pending near-infrared scanning. Ten randomly selected trees have been felled and disks and bolts have been removed at set vertical locations. The bolts have been processed into samples for mechanical property testing and the disks have been refilled into fibers for analyses of chemical and anatomical properties. The mechanical property tests are completed and the data is being analyzed. Chemical and anatomical data has been recently initiated.

Impact: This project will determine relationships between genetic parameters, growth patterns, and wood properties. It also will help to predict the long-term effect of hurricane damage to longleaf pine trees. Understanding the relationships between these traits will assist geneticists in designing future tree improvement programs for longleaf pine and could lead to the increased use of longleaf pine in commercial forest plantations.

Sources of funding: McIntire-Stennis; grants

Federal Goal 4

Title of Research Project: Silviculture of Louisiana's Hardwood Resource

Key Theme: Forest Resource Management

Chambers, J. L., Weaver Brothers Professor of Forestry, School of Renewable Natural Resources, LSU AgCenter

Issue: Information on ecology and management of bottomland and wetland forests is insufficient for decision making and policy formulation.

What was done: A study was implemented to test site preparation methods and artificial regeneration of three oak species on four agricultural fields in the Lower Mississippi Alluvial Valley, Louisiana. Six years after establishment, few consistent differences were found in oak density between sowing methods (seed drill versus broadcast seeding), fall versus spring sowing, and sowing acorns versus planting oak seedlings. Results indicated that some degree of site preparation is needed to establish oak seedlings but few differences were found between site preparation treatments. These results indicate that no one prescription for oak regeneration fits all potential afforestation projects in the Lower Mississippi Alluvial Valley. Successful bottomland hardwood afforestation will require plans that include specific objectives, site evaluation, and a regeneration prescription prior to sowing the first seed or planting the first seedling. In a second study, silviculture textbooks state that intermediate treatments, such as thinning, are prescribed to regulate the growing space for the benefit of existing trees and not to create enough growing space to initiate new trees of desirable species. If new regeneration develops then it is considered a by-product of the intermediate treatment and is not to be managed, else the operation is a reproduction method, such as the shelterwood method, rather than a thinning. In bottomland hardwood management where oaks are the primary species being managed, new oak reproduction often initiates following a thinning operation, especially if the operation coincides with a good acorn crop. Given past difficulties in regenerating bottomland oaks, an opportunity exists to promote the development of this regeneration during future thinning operations where growth and development of desired overstory crop trees is still the primary objective. Results, following three years of crown thinning and low thinning in a 30-year-old bottomland red oak stand, showed few differences in the density of oak reproduction compared to unthinned plots, but an oak regeneration pool is developing. The lack of differences reflects the young nature of the stand - it is just entering an age to produce acorns. Future thinnings should enhance the establishment and development of oak reproduction despite the concurrent development of future midstory canopy species such as American hornbeam and deciduous holly. Therefore, a gray area exists in the even-aged silviculture of bottomland oak stands whereby oak regeneration objectives can coincide with the management of existing stands. This gray area gives foresters more options in sustaining bottomland oak stands. Four graduate students received funding from this project in 2002.

Impact: Results from this research indicate that bottomland oaks can be regenerated using

natural and planted seedlings. Additional treatments are needed to ensure the establishment and survival of this regeneration. For example, in a forest being naturally regenerated to oaks, competing midstory vegetation that impedes light reaching oak seedlings should be controlled. In agricultural fields being sowed with acorns or planted with oak seedlings, control of competing herbaceous vegetation will increase seedling survival.

Sources of funding: McIntire-Stennis; grants

Federal Goal 4

Title of Research Project: Morphological and Ecological Studies of Larval, Juvenile, and Adult Fishes in Freshwater Habitats

Key Theme: Natural Resource Management

Rutherford, D. A., Professor; Bryant Bateman, Professor; School of Renewable Natural Resources, LSU AgCenter

Issue: Understanding the total aquatic system is essential to development of management techniques

What was done: Atchafalaya River Basin (ARB) studies were initiated in 1992 after Hurricane Andrew, which killed more than 180 million fishes. LAB03253 studies examined aspects of the relationship between larval, juvenile, and adult fish assemblages and physicochemical characteristics in the ARB (e.g., dissolved oxygen (DO), habitat components, etc). These studies indicated that DO concentration, DO differential (surface DO-bottom DO), specific conductance, and current velocity were most strongly associated with fish abundance. Further analysis separated sites into green-water, brown-water, and black-water (hypoxic DO < 2.0 mg/L) habitats. Results of these studies indicate that water quality (particularly DO) was more important than physical habitat characteristics in determining fish abundance. To examine the physiological impacts of hypoxia on fishes in the ARB, we used RNA-DNA ratios in both field and laboratory growth experiments of bluegill (*Lepomis macrochirus*) from the ARB. In the field experiment, RNA-DNA ratios of bluegill from hypoxic habitats were significantly lower than ratios of bluegill from normoxic habitats (DO > 4.0 mg/L). In each of two laboratory experiments, fish were placed in aquaria to test the effects of hypoxia on RNA-DNA ratios. Additionally, bluegill were fed different rates to determine the effects of feeding level on RNA-DNA ratios. Results of the first experiment confirmed the sensitivity of RNA-DNA ratios to short-term changes in growth, as fed bluegill had significantly higher ratios than starved bluegill. In both experiments, RNA-DNA ratios were not significantly different in bluegill subjected to hypoxia. The study indicates that laboratory experiments were unable to adequately simulate increased bioenergetic demands and fluctuating DO levels in hypoxic areas of the Basin. Taxonomic objectives of LAB03253 included the species-level identification of larval *Morone*. Fish early life history is critical in recruitment, and any factor that reduces growth and survivorship will reduce production. Identification of life history stages is critical because all studies assume that specimens are correctly identified. We investigated the ability of geometric

morphological shape differences to differentiate laboratory-reared larval Morone chrysops, white bass, *M. saxatilis*, striped bass, and their hybrids. Geometric shape was described with Cartesian coordinates of 16 anatomical landmarks located along the mid-sagittal outline of laboratory-reared and field-collected larvae. Discriminant function analysis resulted in 100% separation of larvae based on geometric shape. Success dropped to 87% when more variable hybrid data were included in the discriminant function. Seventy and 87%, respectively, of field collected larvae and a randomly selected laboratory subgroup were correctly classified to taxon. Results suggest that taxonomic separation of early-stage larvae based on shape data is not affected by allometry, but is sensitive to larval nutritional condition and handling. Studies conducted under LAB03253 funded 11 graduate students 2-4 research associates, 14 refereed publications, six technical reports, and 13 other publications.

Impact: The Atchafalaya River Basin (ARB) is the largest bottomland hardwood swamp in North America and represents a poorly understood ecosystem. This area is highly productive with a high fish species diversity, often sought by recreational fishers. Historic water quality data indicates that hypoxic areas (dissolved oxygen < 2.0 mg/L) in the ARB are much larger today than during extensive surveys conducted in the 1970s. Because of these apparent changes in hypoxic conditions, we have designed a series of short-term studies to examine the potential impacts on the ARB biota. Alternatively, long-term management plans in conjunction with project sponsors, U.S. Army Corps of Engineers, Louisiana Department of Natural Resources, and U.S. Fish and Wildlife Service are being developed to restore historic connections between the Atchafalaya River and the extensive floodplain, and improve internal water circulation patterns in the ARB.

Sources of funding: State; grants

Federal Goal 4

Title of Research Project: Factors Affecting Production and Harvest of Fisheries Resources in Freshwater Louisiana Habitats

Key Theme: Natural Resource Management

Kelso, W. E., Associate Director; F. O. Bateman, Professor; School of Renewable Natural Resources, LSU AgCenter

Issue: Many poorly understood factors affect natural fisheries

What was done: A study was completed on the effects of hydrilla (an exotic submerged plant) on the growth and food habits of young-of-the-year largemouth bass in the Atchafalaya Basin. Bass inhabiting high-density hydrilla beds exhibited a delayed switch to fish prey and reduced growth relative to individuals collected in areas of sparse hydrilla cover. Effects of a drawdown on bass ecology reflected the results from the hydrilla coverage studies. Successful drawdown strongly inhibited hydrilla re-growth and resulted in an earlier switch to fish prey, with equivocal growth effects. A second project in the Basin is focusing on the influences of habitat position and water quality on the distribution of epiphytic macroinvertebrates. Preliminary results indicate

significant differences in the abundance and species composition of invertebrate assemblages inhabiting hydrilla and ceratophyllum (a native species) beds, as well as differences in abundance between edge and interior habitats within hydrilla stands. Differences in macro invertebrate abundance is likely related to water quality problems inherent in dense beds of submerged macrophytes, and differential effects of predation based on position within the bed. I completed a survey of coastal marsh fishing during 2001 by anglers in southern Louisiana parishes. Almost 60% of anglers fishing for bass reported fishing activity below the Intracoastal Waterway, with 80% averaging 1-10 bass per trip. Over 50% of anglers reported that 40% to 80% of the bass harvested in Louisiana coastal marshes were under 12 inches in length. Although 68% of the respondents perceived that the size of marsh largemouth bass had not changed in the last five years, 42% believed that marsh bass abundance had declined - 36% of these respondents believed that marsh loss and saltwater intrusion were responsible for the abundance declines. A majority of anglers favored a 12 inch minimum length limit and a 10-fish creel for marsh largemouth bass.

Impact: Data from these studies are critical to the effective, sustainable management of Louisiana's aquatic resources, whether management emphasis is focused on ecosystem processes such as the Atchafalaya Basin program, or on specific components of aquatic resource management, such as the production of invertebrate food resources or the harvest of sportfish by Louisiana anglers.

Sources of funding: State; grants

Federal Goal 4

Title of Research Project: Nutrient Inputs to Surface Waters from Animal and Crop Agriculture

Key Theme: Nutrient Management

Lewis A. Gaston, Associate Professor, Department of Agronomy, LSU AgCenter

Issue: Input of nutrients such as carbon, nitrogen, and phosphorus (P) from agricultural lands to surface waters may overly enrich the receiving water bodies with these nutrients, stimulating excessive growth of aquatic plants, algae and other microorganisms, and deteriorating water quality. Louisiana agriculture faces the challenges of preserving or improving water quality downstream from animal operations and in crop land areas.

Poultry is our major animal industry and the impact of poultry waste (litter) applied to crop, pasture or forest land on downstream water is a major environmental concern. Although several constituents of poultry litter may adversely impact surface water quality, P has received the greatest attention because it is typically the most limiting nutrient in freshwater. Thus, enrichment of freshwater bodies with P tends to induce eutrophication. The challenge Louisiana faces is to prevent this from happening. Current research is: (1) exploring alternative, beneficial uses for poultry litter, (2) verifying the environmental benefit of poultry and swine diet

modification on P loss from animal waste, (3) inventorying soils for their capacity to retain P against its extraction into runoff water, and (4) examining the potential of phytoremediation to reduce the level of P in soils that are overly enriched with it.

The Louisiana Department of Environmental Quality (LDEQ) has undertaken an exhaustive assessment of water quality in our approximately 500 river / stream segments. LDEQ findings show that many are impaired. Consequently, total maximum daily loads (TMDLs) have or will be prescribed for these. In some cases, runoff from crop agriculture seems the likely cause for impaired water quality. This is true for Bayou Plaquemine Brule in Southwest Louisiana. The TMDLs for Plaquemine Brule stipulate a 30 - 50 % reduction in oxygen-depleting materials such as organic carbon and ammonical nitrogen. It is thought that general adoption of best management practices (BMPs) by area producers of rice and soybeans, and beef cattle (pasture) and crawfish will remedy the problem. However, this must be demonstrated at the field and watershed scales.

What was done: Animal waste research area (1) continued projects that are tracking growth responses of pine trees to soil fertilization with poultry litter. Statistically significant responses were substantiated in another year of growth. Area (1) also included assessment of the benefit of poultry litter on preserving forest soil fertility where pine straw is removed for sale. Research area (2) examined amounts and forms of P in swine waste generated under conventional and phytase-amended (reduced P supplement) diets. This generalized earlier data on poultry diet modification. Examination of P retention by Louisiana coastal plain soils (research area 3) was extended to numerous on-farm locations. Variability in P retention among different soil types was high and appeared to be related to the concentration of amorphous iron in the soil. Hay harvest of bermudagrass, especially together with winter ryegrass (research area 4), continued to show promise for quickly reducing surface soil levels of P. Data from research station plots of bermudagrass were substantiated using on-farm hay harvest plots.

Water quality in Cole Gully (a sub-watershed of Plaquemine Brule) and at paired rice / row crop fields in its watershed was monitored during the reporting period. Tentative data suggest that implementation of BMPs for these crops will meet prescribed TMDLs. For example, prescribed levels of dissolved oxygen (5.0 mg / L from December through February and 3.0 mg / L from March through November) were met or exceeded in all Cole Gully samples.

Impact: Animal waste: Response of pine to litter fertilization is important because widespread use of poultry litter for forest fertilization would greatly expand the land area to which litter is applied. Pine straw harvest interrupts the nutrient cycling process and depletes a forest soil of essential nutrients. Use of poultry litter to replenish the soil with nutrients is both directly beneficial and also represents a continual sink for nutrients in poultry waste. Despite minor effect of diet modification (2) on reducing bioavailable P in animal waste, total P is reduced. The long-term benefit of this accrues with repeated land application of waste because initially soluble, bioavailable P is transformed into insoluble forms. Knowledge of spatial variability in P retention (3) may be used by producers to adjust rates of poultry litter application so as to minimize P loss in runoff. Correlation of P retention with easily measured soil properties would

make such site-specific management feasible. Phytoremediation of high levels of soil P by hay harvest (4) is consistent with on-going farm operations and may be more effective than other approaches proposed, such as amending the soil with aluminum or iron to reduce P solubility.

Rice / row crops: Besides addressing the immediate issue of the adequacy of BMPs for improving water quality in Cole Gully, the scope of this research (watershed scale) and its partnership with sister projects are new approaches to addressing water quality problems. Most future research on water quality will follow this pioneering approach.

Sources of funding: USDA and LDEQ

Federal Goal 4

Title of Research Project: Effects of Feeding Phytase to Swine and Poultry on Nutrient Availability and Phosphorus Loss to the Environment

Key theme: Nutrient Management

L. Lee Southern, Professor, Department of Animal Sciences, LSU AgCenter

Issue: Land application of swine and poultry wastes leads to the accumulation and potential runoff of phosphorus in soils, which can lead to eutrofication of water sources. Swine and poultry diets are formulated to achieve optimum economic returns for the producer. The nutrient levels in these diets are based on industry experience as well as levels suggested by the National Research Council (NRC; poultry, 1994; swine 1998). The levels of phosphorus in the combination of feedstuffs that make up swine and poultry diets are below the level used by the industry or recommended by NRC, resulting in the fortification of these diets with inorganic phosphorus. These diets contain excess total phosphorus for swine and poultry for three reasons: 1) the diets are over-fortified with phosphorus to provide a “margin of safety;” 2) the dietary ingredients used contain phosphorus in the form of phytic acid, which is nutritionally unavailable to swine and poultry; and 3) clear phosphorus requirements for swine and poultry have not been established for the genotypes of swine and poultry used in commercial farm enterprises.

Phytase is a dietary enzyme that can be added to swine and poultry diets that reduces the need for inorganic phosphorus fortification. Phytase fortification releases a portion of the unavailable phosphorus from phytate, and it has been shown to provide approximately 0.10% available phosphorus and 0.10% calcium.

What was done: Research was conducted to evaluate the effect of dietary phytase supplementation in swine and poultry diets on animal productivity and nutrient loss to the environment. The research focused not only on the improvements in calcium and phosphorus utilization, but also on the effects of phytase on energy, amino acid, and trace mineral availability. The results showed that dietary phytase improves the availability of calcium, phosphorus, amino acids, trace minerals, and energy in swine and poultry diets. Use of phytase

resulted in a 25 to 30% reduction in phosphorus in waste, and it decreased the amounts of amino acid, energy, and minerals that had to be included in these diets.

Impact: In areas of concentrated animal production where phosphorus levels in the soils are an important consideration for the land application of animal waste, the use of phytase will increase the amount of waste that can be applied to the land without exceeding the phosphorus standard. Diets also may be more economical because of the reduction in calcium, phosphorus, amino acids, and energy supplementation that is required.

Sources of Funding: State, Hatch, Multi-State, Industry, CSREES

Federal Goal 4

Title of Research Project: Optimizing Cotton Production Systems

Key Theme: Sustainable Agriculture

Donald Boquet, Professor, Macon Ridge Research Station, LSU AgCenter

Issue: Cotton production systems have traditionally involved intensive tillage practices for seedbed preparation and weed control. Although tillage is very effective in accomplishing the intended objectives, high costs for labor, equipment and fuel are becoming of greater concern to producers. Tillage also encourages accelerated decomposition of crop residue and soil organic matter, degrading soil quality. Crop and cover crop residue on the soil surface are effective mulches for conserving soil moisture. Tillage increases evaporative water loss, potentially causing long delays in planting. These concerns and concerns about agriculture's contribution to degradation of surface water quality and declining soil productivity have stimulated interest in Best Management Practices (BMPs) such as conservation tillage, winter cover crops and improved nutrient management. Increases in equipment, labor, and fuel costs in conventional tillage systems have also provided economic incentives for adoption of conservation tillage. To encourage long-term adoption of conservation tillage and cover crops and thereby achieve their maximum conservation and environmental benefits, optimal cultural practices must be identified that offer agronomic and economic advantages, not only for short-term, but also for long-term use. In the Mid-South, cotton is often grown in mono-crop culture but is increasingly grown in rotations with corn or soybean. Little is known about fertilization practices in rotations because emphasis of most previous research was on mono-cultured cotton.

What was done: Field studies were performed to evaluate main and interaction effects of tillage practices, cover crops, crop sequences, and fertilizer nitrogen rates on cotton growth and yield. Rain-fed cotton grown with no till produced higher lint yields with lower input costs than cotton grown using surface tillage practices. A winter wheat cover crop in combination with no till increased yields more than either practice alone. The optimal fertilizer nitrogen rate for lint yield was 50 kg per ha and did not differ among tillage practice and cover crops combinations. In irrigated cotton, the optimal nitrogen rate for lint yield production varied and was dependent

upon the previous cover crop. Optimal N rates following native vegetation, wheat and vetch were 78, 118 and 0 kg per ha, respectively. In rotations with corn, cotton fertilizer nitrogen requirements were reduced 30% to 40%.

Impact: The results from tillage and cover crop studies have increased the acceptance and implementation of sustainable and economic BMPs that are highly protective of water quality. Studies on fertilizer nitrogen identified optimal fertilizer N rates for cotton under many cropping systems, which will help to ensure that producers have information necessary to optimize nutrient efficiency and minimize nutrient leaching and runoff losses.

Sources of funding: State, Commodity Boards, Industry

Federal Goal 4

Title of Research Project: Enhancing Rice Production with Improved Fertility and Cultural Management Practices

Key Theme: Sustainable Agriculture

Jason A. Bond, Assistant Professor; John K. Saichuk, Professor, Rice Research Station, LSU AgCenter

Issue: This project is applied in nature and is designed to address production problems, improve agronomic practices by efficient utilization of inputs, and mitigate concerns regarding soil erosion and water quality. These objectives are accomplished by conducting research both on the research station and on-farm throughout the rice-producing areas of Louisiana. In 2004, research studies were conducted to determine the effectiveness of new fertilizer products, improve efficiency in fertilizer management, evaluate the effectiveness of conservation tillage practices in reducing soil erosion and improving water quality, and evaluate ratoon crop rice production practices in southwest Louisiana.

What was done: The efficiency of nitrogen fertilizer applied at various application timings was determined in water- and drill-seeded rice cultural systems. Depending on timing, resulting grain yields were affected by 10 to 15% from the most to least efficient application timings. A urease inhibitor was effective in increasing urea fertilizer efficiency when the time between its application and flood establishment is at least 5 days or when the soil surface is saturated at the time of application. Tillage experiments again demonstrated that reduced tillage practices are as effective as conventional tillage in reducing soil and nutrient loss in floodwater runoff and provide a slight increase in yield in a drill-seeded cultural system. Conservation tillage in water-seeded cultural systems has been effective in reducing pollutants but has been detrimental to yield. In rice ratoon crop experiments, a 6-inch main crop harvest height increased ratoon tiller production with no differences in ratoon grain yields compared with a 20-inch harvest height. Rolling of main-crop stubble decreased tiller production but had no effect on ratoon yields. A

water quality monitoring project demonstrated differences in the quality of water released from agricultural fields using Best Management Practices (BMP) or non-BMP management.

Impact: Rice producers benefit tremendously from the results of these research studies. Proper timing of inputs improves yields, decreases the cost of production, and minimizes any negative effect of nutrient management in rice on the environment. New products that conserve fertilizer inputs increase their efficiency and minimize loss to the environment. Reduced tillage practices have a real potential to decrease input costs and at the same time sustain production at economic levels and mitigate environmental concerns. Ratoon-crop production increases resource use efficiency per unit time and per unit of land area.

Sources of funding: Funds supporting these efforts represent a combination of Hatch, State, and private funding

Federal Goal 4

Title of Research Project: Fate of Applied Agricultural Chemicals and Plant Nutrients in Alluvial Soils as Affected by Sugarcane Management Practices

Richard Bengtson, Professor, Biological and Agricultural Engineering, LSU AgCenter

Key Theme: Water Quality

Issue: Improving water quality from sugarcane fields

What was done: The primary purpose of this project was to evaluate the effect of post-harvest residue (mulch cover) on the field with respect to surface water quality. This project evaluated three management strategies with primary focus on mulch residue and its effect on soil erosion, surface water quality, and crop yields. The treatments include (1) burning the mulch after harvest and cultivating in the spring; (2) sweeping the mulch off of the top of the row after harvest and cultivating in the spring; and (3) leaving the mulch on the field after harvest and cultivating in the spring. Treatment 1 is the common method by which sugarcane mulch is managed in Louisiana. Treatments 2 and 3 are proposed sugarcane residue management practices for use by Louisiana sugarcane farmers. Sugarcane plant population, yields, and quality of surface runoff water were measured for each treatment. The experimental site was at the Louisiana Agricultural Experiments Station's St. Gabriel Research Station located 20 km south of Baton Rouge. Six leveed plots 0.25 ha in size (nine rows spaced 1.8 m apart and 140 m long) and sloped 0.1% were located on a Commerce silt loam soil (Aeric Fluvaquent, fine-silty, mixed, non-acid, thermic) (Camp 1976 and Rogers et al. 1985). The sugarcane cultivar 555 was planted on September 19, 2001. To measure and sample surface runoff, a sump was installed on the low side of each plot. A float-controlled electric sump pump was installed in each sump to discharge the runoff through a water meter and into a surface drainage ditch. An automatic water sampler at each sump was used to collect runoff samples. Runoff samples were analyzed by the Department of Agricultural Chemistry for total solids, nitrogen, phosphorus, and

potassium.

The burned treatment increased biomass yields by 3.3% and sugar yields by 10.4%. There was a reduction in biomass and sugar yields from the swept and mulch treatments. There was 29,292 kg/ha soil erosion from the plots during the first year. The soil erosion for the second year was 64% smaller. The soil erosion from the burned treatment was 19% smaller than for the mulch. There was not a difference in nitrogen losses between the first and second years. During the second year, the burned results were 28% smaller than for the mulch. Phosphorus losses were 28% smaller during the second year. The burned results were 16% smaller than for the mulch. The potassium losses were 47% smaller during the second year. The burned results were 3% smaller than for the mulch.

Impact: The results of this project will provide sugarcane farmers with information on which management practices will improve the quality of runoff water flowing from their fields.

Sources of funding: Hatch

Federal Goal 4

Title of Research Project: Effects of Forestry BMP Implementation on Water Quality, Habitat, and Biota in the Upper Bayou Nezpique-Beaver Creek Watershed, Louisiana

Key Theme: Water Quality

Kelso, W. E., Associate Director; F. O. Bateman, Professor; Rutherford, D. A., Bryant Bateman, Professor; School of Renewable Natural Resources, LSU AgCenter

Issue: Understanding the effect of BMPs is critical resource management

What was done: Because of minimal timber harvesting activity in the Nezpique system, the study location for this project has shifted to Mill, Six-Mile, and Big Brushy Creeks in the Calcasieu River drainage. In the past year, we investigated the differences in stream macro invertebrate communities, water quality parameters, channel characteristics, woody debris, and microbial community dynamics in these three western Louisiana streams of differing land uses. Preliminary data analyses suggest macro invertebrate community dominance shifts from insects to non-insects as land use changes from low-intensity recreational use to high-intensity silviculture within the stream's watershed. We also observed increasing amounts of woody debris, decreasing complexity of channel characteristics, and decreasing water quality with increasing intensity of land use. These results are consistent with other land use studies. However, unexpectedly, microbial fecal coliform and heterotrophic plate counts did not appear to be related to land use, but instead appeared to be influenced most by point sources along the stream continuum and by wildlife activities. In our most severely impacted stream with extremely low (often <1.0 ppm) dissolved oxygen levels, we found several types of mayflies (Insecta: Ephemeroptera) that are typically considered .intolerant of low dissolved oxygen,

suggesting insects may not be as strongly influenced by water quality in these warm, 'low-gradient coastal plain streams. It appears that some characteristics of Louisiana streams are dependent on variable stream depths, horizontal interactions with the floodplain, and vertical interactions with the substrate (such as substrate oxygen demand) rather than upstream influences, within the constraints of land use activities in the watershed.

Impact: Successful implementation of effective forestry BMPs will help protect water quality and all living organisms inhabiting forested streams in Louisiana. Demonstration of BMP effectiveness will also have significant positive impacts on the Louisiana forest industry by minimizing mandatory regulations.

Sources of funding: McIntire-Stennis; grants

Federal Goal 4

Title of Research Project: The Ecology of Breeding Mottled Ducks and Prairie Nesting Ducks Wintering in Louisiana

Key Theme: Wildlife Science and Management

Rohwer, F. C., Associate Professor; Department of Renewable Natural Resources, LSU AgCenter

Issue: Understanding biology of ducks is essential to managing populations

What was done: At the continental scale, we judge waterfowl productivity by examining age ratios (juvenile/adults) of hunter killed ducks. High age ratios show good productivity, while low age ratios suggest poor production. To generate age ratios the US Fish & Wildlife Service asks about 10,000 hunters to each mail in one wing from each duck that they harvest. This is called the USFWS Parts Collection Survey. Experts then examine each duck wing and categorize it to species, sex, and age class. This process began in 1961 and is an annual part of efforts to manage waterfowl. Several years ago I initiated work to test the accuracy of the age ratios generated from the sample of wings provided by hunters. The test involved submitting a sample of known-age wings that were then categorized to age by the experts that annually examine wings. Hunter killed ducks were aged based on internal characters, including bursa presence or absence on all birds; penis development in males; and development of the ovary and oviduct for females. The wings from these known-age birds were then sent to the collection sites in the Mississippi and Central Flyways. Although waterfowl managers have used age ratios from these surveys since 1961, my work was the first test of the accuracy of this system. I have sent in over 6,800 test wings and discovered high error rates, even in species that were thought to be relatively easy to age. For instance, 88 of the 655 Mallard wings were incorrectly aged. Moreover, the errors are systematic, such that many adult Mallards are incorrectly classified as juveniles. In the Mallard sample, the actual age ratio was 0.39, but the age ratio from wing aging was 0.70. Similar biases in aging occurred for many other ducks. We have also used existing data to assess how biases in the sampling framework for the Parts Collection Survey might affect age or sex ratios. It is well

known that avid or serious hunters are more likely to reply to such survey requests than are occasional or sporadic hunters. Thus, I predicted that serious hunters that shoot a large number of ducks might selectively shoot males and adults, which would cause a sampling bias in the Parts Collection Survey. Analyses showed hunters that shoot many ducks (up to 300 per year) did not harvest sexes or ages any differently than did hunters who bagged very few ducks each year. Thus, the sampling framework for the Parts Collection Survey is unlikely to influence the vital rates that the survey is measuring. Three graduate students completed their graduate research and degree programs in 2002 while working on this project.

Impact: One of the most critical aspects of waterfowl management involves regulation of the harvest. Age ratios are one of the key inputs (along with habitat conditions, population size, and survival rates) to the Adaptive Harvest Models that are used by the US Fish & Wildlife Service to set annual regulations and to evaluate their impacts. Our discovery of a 20% bias in age ratios has had a huge impact on how the US Fish & Wildlife Service regulates duck harvest. Biased data inputs to harvest models had led to conservative harvest regulations. My discovery of biased age ratios has allowed the Service to promulgate regulations that were less restrictive.

Sources of funding: State; grants

Federal Goal 4

Title of Research Project: The Use of Soil Electrical Conductivity Management Zones for Variable Nitrogen Fertilizer Application to Sugarcane.

Key Theme: Precision Agriculture

H. P. Viator, Professor, Iberia Research Station and Robert Downer, Associate Professor, Dept. of Experimental Statistics, LSU AgCenter

Issue: Field management zones differing in attributes useful for variable rate fertilizer application (VRT) have been helpful in minimizing environmental insult of excess nutrients entering ground water and for lowering purchased inputs. Apparent soil electrical conductivity can articulate such management zones.

What was done: Apparent soil electrical conductivity (EC_a) differences were used to create distinct field zones for varying nitrogen fertilizer rates applied to sugarcane. Using EC_a as a surrogate for soil textural class, nitrogen fertilizer rates were applied based on Cooperative Extension's recommendations. The results were mixed. When field position (principally clay content) and levels of certain nutrients were taken into account, EC_a showed a positive effect on the yield response of sugarcane to varying rates of fertilizer nitrogen. But soil moisture ranging from extremely wet early in the growing season to deficient during the grand growth stage had the effect of lowering sugarcane yield in the EC_a zones with clayey soil. Because expectations were for the high clay content/high EC_a zones to be more productive, it suggests that EC_a delineated zones are not entirely satisfactory when growing conditions for clay soils are less than optimal from a water management standpoint. It also points to the need for a close examination

of the interrelationship of soil attributes when application prescriptions are developed for site specific work. Research is scheduled to continue.

Impact: Farmers understand the value of dividing large fields into smaller regions that are homogeneous for the purpose of fertility management. Using soil type, derived from soil surveys, to divide fields for VRT has been at times disappointing. Before fertilizer prescriptions can be written management zones must be identified based on soil parameters associated with varying productivity levels. EC_a has been effective in identifying distinct management zones for VRT. VRT is an environmentally friendly, economical approach to fertilizer management.

Sources of funding: State and American Sugar Cane League

Federal Goal 4

Title of Research Project: Relationships of Wildlife Species to Habitats, Wildlife Population Ecology, and Wildlife Response to Habitat Manipulation and Management

Key Theme: Wildlife Management

Chamberlain, M. J., Assistant Professor, School of Renewable Natural Resources, LSU AgCenter

Issue: The relationship between wildlife management and forest management is poorly understood

What was done: There are currently eight research projects operating under this program, either ongoing or recently completed. Specifically, two projects examining restoration of the Louisiana black bear are ongoing. One project being concluded is examining the feasibility of relocating adult females and their newborn cubs as a method to restore black bears throughout Louisiana. Field work has been completed and a thesis is currently being prepared. Results indicate that relocating female bears with cubs is an effective method for restoring the black bear to parts of Louisiana. The willingness of the female to leave the release site appears to be limited by the presence of cubs, thereby ensuring her acclimation to the release site. A second project has begun to expand this work and is examining ecology of female black bears relocated during the restoration efforts. A wild turkey research project is entering its second year on the Sherburne Wildlife Management Area. A graduate thesis resulting from the project will focus on effects of forest management on turkey habitat use and reproductive consequences of habitat selection in bottomland hardwood systems. Survival of female wild turkeys is higher than many estimates reported in the literature, but individual production is quite low. Hydrology appears to strongly influence space use patterns. Two bobwhite quail projects are ongoing, one examining landscape-level effects of forest management on bobwhite distribution and abundance using spatial technologies; the second examining effects of using selective herbicides to manage habitats for bobwhite at multiple spatial scales. The project examining landscape-level effects of forest management on bobwhite distribution is entering its third year. Bobwhite abundance is

significantly greater in landscapes with greater frequency of prescribed fire, and land management programs that include growing season burning appear to create the greatest net benefit to bobwhite in pine forests. The second project is entering its second year and is expected to produce a graduate thesis during 2004. An additional project just concluded focused on the feasibility and effectiveness of using predator management to improve reproductive success of waterfowl. A graduate thesis has been completed. Predator management was effective at increasing nest density and nest success, but was costly. Lastly, a project examining effects of red-imported fire ants on faunal communities is entering its second year; all pretreatment data have been collected.

Impact: Each of the above-mentioned projects has considerable relevance to stakeholders and citizens interested in natural resources. For instance, the black bear research project is unique in that a newly developed technique is being applied to a threatened species of critical importance to Louisiana. Our findings indicate that relocating females with newborn cubs is a successful technique to ensure colonization of the site by the female. The wild turkey is a vitally important game species to Louisiana, and effects of forest management on turkey reproduction are unknown in bottomland hardwood forest systems. Therefore, the wild turkey project will provide information needed to effectively manage turkey populations for the improved benefit of society. The fire ant research project has important implications to management of many wildlife species, as effects of fire ants on numerous wildlife communities are unknown. Both projects examining effects of land management on northern bobwhite have potential to improve bobwhite populations, which have declined steadily for the past 10 years.

Source of funding: McIntire-Stennis; State; grants

Goal 4 – Extension Program Summaries

- The extension education program Regeneration Alternatives was developed in conjunction with Best Management Practices (BMPs) in the growing and harvesting of timber. Regeneration Alternatives documents the financial contributions of forestry to the state, and as such is included in the BMPs curriculum for the Master Logger program. One hundred eight professional loggers, contractors, and natural resources professionals received educational credit for attending a workshop on BMPs.
- In five workshops held throughout the state, 226 participants attended presentations and received educational material on such topics as timber taxation, prescribed fire use, and forestry best management practices. Conducted by extension faculty with the Continuing Education in Natural Resources (CENR) program, the workshops were evaluated through use of an on-site survey. The survey was completed by 217 of the 226 attendees, with almost 70% of respondents stating that their knowledge was enhanced, and 74% indicating that previous knowledge was reinforced.
- With the Formosan subterranean termite continuing to be a serious pest problem in Louisiana, selected properties in New Orleans have been treated for this insect as a pilot test and an education program. Initially, meetings conducted by extension specialists were held for property owners describing the educational program, with additional meetings conducted for pest management professionals. The area treated has gradually widened, with 52 blocks, located in the French Quarter, now in the program. Property owners are adopting the technology, with numbers of termites reduced by 50% as compared with non-treated areas, saving money for stakeholders through a decrease in repairs and amount of insecticide required for treatment.
- The Louisiana Forest Products Development Center (LFPDC) worked to increase awareness and adoption of extension forest products programs to promote economic activity in the state. Extension faculty directing the program made 20 presentations to forest-sector development groups, including regional economic development meetings, association meetings, and legislator sessions. The key theme of the education program was opportunity for industry development and value-added manufacturing.
- Approximately 1,500 farmers, representing 1.5 million acres of land, are currently enrolled in the LSU AgCenter Master Farmer program. The educational program consists of three required phases: eight hours of environmental lecture, tour of a “model farm,” and development and implementation of a comprehensive farm conservation plan. The development of the program stemmed from serious concern that Louisiana agriculture’s pollution contribution was leading to increased water quality problems. The Master Farmer program has become widely recognized throughout the South, with initiation of a similar program in Texas, Arkansas, and Mississippi. Beginning this year, the Natural Resource Conservation Service has stated that it will award Master Farmer

graduates who are applying for cost share an additional two points in their ranking system.

- Master Tree Farmer was a seven-week short course education program broadcast via satellite across the Southeastern U.S., with the program originating from Clemson University. Extension state faculty and their counterparts from across the South collaborated on curriculum development. The program curriculum included wildlife management, environmental impact minimization, record-keeping, and both basic and advanced information on forest management. Evaluations received from the 80 Louisiana participants indicated that they expected to save approximately \$20,600, and earn an additional \$30,657, as a result of attending the program.
- 4-H Wildwoods Wandering Camp was developed to expose 4-H teens to characteristics of bottomland hardwood forested wetland ecosystems and the subsequent challenges related to their management within an agriculture-based economy. It was attended by 46 4-H teens, two science teachers, two adult volunteers, and two 4-H extension faculty. Educational sessions included classroom work and hands-on activities. The most popular activities were map and compass skills, and night maneuvers in the wildlife refuge.
- In meetings with poultry stakeholders, problems with broiler litter management, EPA regulations, and general management practices were identified. Additionally, in light of acts of terrorism toward the U.S. and the outbreaks of Exotic Newcastle Disease and Avian Influenza in this country, the need for poultry farm bio-security was identified by extension faculty and stakeholders. These management problems were addressed through on-farm demonstrations, producer meetings, and farm visits. These are continuing problems, which need frequent educational up-dates by extension faculty. The terrorism threat gives particular cause for the critical need for stakeholder education in this area.
- Extension faculty worked as a team to plan and implement state-wide educational forums for forest landowners, with the curriculum including forest management, governmental policy, tax regulation, and environmental requirement information. Forum subject-matter was identified through close contact and use of a stakeholder advisory committee, composed of private landowners, Louisiana Forestry Association, Louisiana Department of Agriculture and Forestry, and other conservation groups. Program participants, who were surveyed on-site, indicated a per-person dollar value of the educational forum at approximately \$2,800.
- Agricultural burning as a management practice has been approached as a two-prong policy: (1) to allow the use of fire as an accepted management practice consistent with good science, to maintain agricultural production on agricultural land, and (2) to protect public health by mitigating the effects of air pollution emissions on air quality and visibility. Extension faculty collaborated with other agencies and organizations to develop a training curriculum entitled “Louisiana Smoke Management Guidelines for

Sugarcane Harvesting.” About 2,000 producers attended the 2004 field day, which was a follow-up to the certification program begun in 2000. A total of 1,422 sugarcane farmers have attended the certification program since its inception.

- A state-wide educational program was designed to reach the target audience of all forest landowners—regardless of race, gender, or age—who previously have been under-represented or under-served in extension forest management programs. Particular emphasis was made on the inclusion of African Americans women and men and Caucasian women. These groups represent significant landholdings; thus providing education in forest management led to increased income as well as sustainable economic development for Louisiana. Problem areas identified by surveying participants included legal aspects of forestland, basic management information, and timber marketing. About 80% of the participants said that the program would help them make more money, and a majority said that they would use professional forestry assistance in the future.
- Due to the critical need to promote environmental stewardship in Louisiana, several extension faculty have served as watershed educators, each of whom conducts a comprehensive and focused educational approach that targets specific priority areas and groups within a specific watershed. Over 250 stream segments and many of the state’s lakes do not meet certain quality standards. As a result, Louisiana is establishing Total Maximum Daily Loads (TMDLs) that will set a maximum amount of pollutant a stream can carry and still meet the water quality standards. Thus, the primary charge of the watershed educators is to deliver educational programs on non-point water quality issues. Another huge issue that will warrant increased water quality attention is the deteriorating situation of Louisiana’s coastline. Watershed extension educators worked closely with the Master Farmer and Master Cattle Producer programs, providing classroom environmental training to over 1500 farmers.
- Two endangered species workshops were presented to 120 loggers in conjunction with Best Management Practices required by the Sustainable Forestry Initiative. Additional wildlife management programs included a Louisiana black bear habitat seminar and a symposium dealing with the habitat needs of the Eastern wild turkey. Eight education programs were conducted for 241 people on control and management implications of rodents nuisance wildlife. 4-H wildlife programming included the Outdoor Skills Shooting Sports Program and forestry 4-H youth activities associated with the Future Farmers of America Career Development Program, involving a total of about 5,000 youth.
- More than 7,000 people received wood products educational information by several means of program delivery, including workshop presentations, quarterly newsletter, on-site visits, e-mail, and telephone. About 120,000 people visited the extension natural resources website. Educational programs and materials are provided to a wide range of audiences, including producers and marketers of wood products, homeowners regarding wood-related issues, and wood craft hobbyists.

Total extension FTEs on Goal 4 programs were 19.36 for a total expenditure of \$1,551,433. A total of 136,057 educational contacts were made in Goal 4 programs.

Goal 4 – Extension Program Reports

Federal Goal 4

BEST MANAGEMENT PRACTICES, REGENERATION ALTERNATIVES

Key Theme: Natural Resource Management

Barry Crain, Extension Agent, Rapides Parish, LSU AgCenter

Program Description

Regeneration Alternatives is part of a program developed for use of Best Management Practices in the growing and harvesting of timber. Best Management Practices is 1 of 5 core curriculum courses professional loggers are required to complete if they produce raw materials for any member company of American Forest and Paper Association (AFPA). Satisfactory completion of the all core curriculum courses is required for Master Logger designation. In addition, Master Loggers are required to complete 6 hours of continuing education annually to maintain their status. Regeneration Alternatives documents the financial contributions of forestry to the state. Forestry is the #1 agricultural product in the state in terms of revenue production. Forestry is the second largest manufacturing employer in the state. The program emphasizes that non-industrial landowners control 62% of the forestland of the state. For the most part, these lands are managed poorly. The program covers silvicultural practices used to regenerate timber stands, increase timber growth, and provide greater rate of return on investment.

4.1 Stakeholder Input in Program: Member companies of AFPA work together to develop guidelines for Sustainable Forestry Initiative to meet public demands for wood products without compromising environmental quality. State Forestry Associations and representatives of member companies solicit assistance from state and federal natural resource agencies and universities to provide technical expertise. Committees meet on a monthly basis for updates on issues that need to be addressed.

4.2 Collaboration: In its role to represent member companies, the Louisiana Forestry Association collaborates with state universities, federal and state agencies involved with natural resource management, and input from forest landowners across the state.

Program Impact

During the current reporting period, 108 professional loggers, contractors, and natural resource professionals have received educational credit for attending workshop on Best Management Practices.

Source of Funds

Scope of Impact

Multi-function: It is estimated that 20% of the program is multi-function, valued at \$3,205 (0.2 FTE x 80,136 per FTE x .20).

Federal Goal 4

CONTINUING EDUCATION IN NATURAL RESOURCES

Key Theme: Professional Resource Manager Continuing Education

Leroy Shilling, Professor, School of Renewable Natural Resources, LSU AgCenter

Program Description

Since 1997, the LSU AgCenter has produced the Continuing Education in Natural Resources (CENR) program. This program is geared toward educating natural resource managers in Louisiana on a continuing basis. We provide them with the latest resource management information gleaned from research conducted throughout the country. Topics typically include forest management and economics, timber taxation, forestry best management practices implementation and impact, prescribed fire use, leadership development, and media relations.

Each year we send out a survey to natural resource managers in the state to solicit information from them regarding what topics and courses they would like to attend in the next year. Also, we have an advisory committee formed of leaders from industry and government to assist us in determining what topics, times, and locations should be used. All of this input is analyzed and our programs are developed from this input. Some of the issues identified by natural resource management professionals were: management and conservation of bottomland hardwoods, the use of prescribed fire, laws related to forestland management and use, integrating wildlife and forest management, and growth and yield modeling.

Program Impact

In FY 04, the CENR program included 5 workshops with 226 attendees. Of that total, 217 participated in surveys regarding program impact. Survey respondents valued these programs on average at \$6,493 per person per workshop, or a total value of \$1,408,961. On average, 69.5% of respondents stated that the workshops enhanced their knowledge of the topics, 73.5% stated that knowledge they already possessed was reinforced, and 68.5% of respondents stated that, as a result of the workshops, they were better prepared to work with their client groups.

Source of Funds

Renewable Resources Extension Act (RREA) funds

Scope of Impact

Multi-state: It is estimated that 30% of the program is multi-state, valued at \$43,273 (1.8 FTE x \$80,136 x .30).

Multi-function: It is estimated that 100% of the program is multi-function, valued at \$144,245 (1.8 FTE x \$80,136 x 1.0).

Federal Goal 4

THE LOUISIANA FOREST PRODUCTS DEVELOPMENT CENTER OUTREACH

Key Theme: Forest Crops

Rich Vlosky, Professor; School of Renewable Natural Resources, LSU AgCenter

Program Description

The Louisiana Forest Products Development Center (LFPDC) continues to execute an Outreach Action Plan (OAP) launched in 2003. The OAP is increasing both awareness and adoption of LFPDC generated research and extension activities, and is helping to promote economic activity in Louisiana. LFPDC faculty visited Louisiana forest products client companies and regional economic development entities to make presentations about the Center's activities and how the Center can work together with LCES faculty and staff in the field to promote sustainable forest products industry development Louisiana. One important part of the LFPDC outreach strategy are the collaborative partnerships forged with the LSU AgCenter's Community Economic Development (CED) and Extension Natural Resources teams. CED and ENR professionals are located around the state to serve the citizens of Louisiana in urban and rural economic development and natural resources information outreach.

The LFPDC seeks input from stakeholder groups on an annual basis at statewide stakeholder meetings and the LFPDC Advisory Board meeting. All input received from stakeholders is considered by the LFPDC to improve communication and implement outreach strategies.

Program Impact

Area agents, parish chairs and regional managers continue to be apprised of and participate in LFPDC awareness forums held in the state.

The LFPDC director made 20 forest-sector development related presentations across Louisiana at workshops, association meetings, regional economic development meetings, and to legislators.

The Director also participated in regional expositions where over 5,000 elementary students, middle years youth and adults learned about the importance of forest products to society and forest stewardship.

Source of Funds

Renewable Resources Extension Act (RREA) and state funds.

Scope of Impact

Multi-function: It is estimated that 30% of the program is multi-function, valued at \$24,041 (0.5 FTE x 80,136 per FTE x 0.5)

Federal Goal 4

FORMOSAN SUBTERRANEAN TERMITE

Key Theme: Integrated Pest Management

Dennis Ring, Professor, Department of Entomology, LSU AgCenter

Program Description

The Formosan subterranean termite continues to be a serious problem in Louisiana. Properties in New Orleans are being treated for this insect as a pilot test and an education program. Treatments were begun in an additional section of the French Quarter bringing the total number of blocks in the program to approximately 52. About 75% of the properties in the new area have come into the program. Other properties will be included in the program as requirements are met. Meetings describing the program and educational meetings were held with property owners. Continuous contact was also maintained with pest management professionals (PMPs). Several meetings were held with PMPs. New properties were approved, treated, and inspected. Treatments were maintained on properties already in the program. ARS and the New Orleans Mosquito and Termite Control Board are helping in the program. PMPs continue treatments of properties. Independent monitoring of the progress of the program was continued. Inspection of properties with infrared cameras and microwave devices was continued. Greater than 250 properties have been inspected. This aids the program in finding hidden termites. Additionally, 1073 trees have been inspected visually and acoustically for termites. Infested trees are being treated.

Program Impact

Virtually one hundred percent of the properties have been treated in the original treatment area. About 90% of the properties in the second area and about 75% of the properties in the third area

have been treated. Treatments out of the treatment area have increased to about 50 percent. Property owners are adopting the technology. The numbers of termites have been reduced by 50%, compared to non-treated areas. This will save money. There will be less repairs and less insecticide used.

Source of Funds

Federal funds

Scope of Impact

Multi-state: Collaboration with professionals from Texas, Hawaii, Florida, and Mississippi. Information from the National Technical Committee meeting was used to develop 20 % of the program. The dollar equivalent of multi-state work is \$108985 (6.8 FTEs x \$80,136 per FTE x .20)

Multi-function: Multi-function efforts (integrated extension-research) are estimated at 20% of the number of FTEs. The dollar equivalent of multi-function work is \$108985 (6.8 FTEs x \$80,136 per FTE x .20).

Federal Goal 4

MASTER FARMER PROGRAM

Key Theme: Water Quality

Carrie Castille-Mendoza, Coordinator Master Farmer Program, LSU AgCenter

Program Description

According to the Clean Water Act of 1972, agriculture falls into the non-point source pollution category, and consequently, is not formally regulated by government or any government agencies. Growing concern that agriculture's pollution contribution was increasing water quality problems in Louisiana caused the LSU AgCenter and Farm Bureau to create the Master Farmer Program. This voluntary program targets all agricultural producers to address environmental issues related to production agriculture. This is accomplished through completing three phases of the program, including 8 hours of environmental lecture, touring of a "Model Farm", and the development and completion of a comprehensive conservation plan. Agricultural producers are located across the state and so this program could not be offered at one centralized location.

After initiating the program in 2001, Phase I of the program has continued to be taught by watershed across the state. In 2004, 14 Master Farmer trainings were conducted in the Mermentau, Vermilion-Teche, Ouachita, Red River, Calcasieu, and most recently, the Pontchartrain watersheds. Approximately 192 agricultural producers enrolled in the program

during the past year. The “Model Farm” phase, Phase II, of the program, is currently in the developmental stage. Twelve farms were selected in five watersheds (Mermentau, Ouachita, Red River, Calcasieu, and Vermilion-Teche) to represent commodities in those areas of the state. Commodities represented are cotton, soybeans, rice, crawfish, cattle, poultry, corn, wheat, and sugarcane. Data will be collected over the next two years to show the effectiveness of specific Best Management Practices on these operations. These BMPs will vary by commodity, soil type, and location. This data will be used at a conservation field day to be held on the “Model Farm” after approximately one year. Sampling equipment was installed on 8 of the 12 farms by the end of 2004. Sampling is scheduled to begin in early 2005.

Program Impact

To date, more than 1500 agricultural producers are enrolled in the Master Farmer Program, representing approximately 1.5 million agricultural acres of land. Because the program is consistently promoted at field days, production meetings, and state-wide conferences, it is becoming a more widely recognized program throughout the South. Other states have acknowledged the beginning success of the program and have begun initiation in Mississippi, Arkansas, and Texas. Because of additional interest, a program template was begun in 2004 for use in the southern region of the United States.

Some state and federal agencies, along with numerous commodity groups, have shown tremendous support of the program since its inception. Many of these agencies, such as Natural Resource Conservation Service (NRCS), the Louisiana Dept. of Agriculture and Forestry (LDAF), and Louisiana Dept. of Environmental Quality (LDEQ) assist in the Master Farmer trainings that are conducted throughout the watersheds. The Natural Resource Conservation Service (NRCS) is very involved with the LSU AgCenter and the Master Farmer Program in a couple of ways. They assist in teaching the instructional portion of Phase I and are also involved in the development and implementation of conservation plans on producers’ operations. In late 2004, NRCS stated that they, as an agency, will award producers who are applying for cost share through EQIP, an additional 2 points in their ranking system. This will assist some producers in acquiring additional funding for BMP implementation on their operations.

The true impact of the Master Farmer Program may not be seen for several years. The growing success of the program throughout the state and even on a multi-state level shows that producers are becoming more aware of agriculture’s contribution to some of the state’s water quality concerns and how they are impacting that. These producers are also showing a proactive, versus reactive, approach to addressing their own farming operation’s contribution to these concerns.

The AgCenter is very interested and concerned with how producers are viewing the program. Evaluations are submitted by the producers at the end of the training sessions to give LSU AgCenter and Master Farmer personnel the opportunity to make improvements and changes to the program when needed. To date, all evaluations submitted by producers have rated LSU AgCenter personnel and the program itself at least a 4 on a scale of 1-5 for effectiveness.

Source of Funds

Because this is an educational program, a 319 grant proposal was approved in August, 2002 and is used to fund the Model Farm phase of the Master Farmer Program. This includes, but is not limited to, sampling equipment, supplies, batteries, tools, and travel expenditures for this phase of the program. A congressional earmark for an undisclosed amount of funds was also appropriated through the office of the Natural Resource Conservation Service. This additional funding provided sampling equipment for 12 Model Farms in 5 of the 12 watersheds in the state.

Scope of Impact

This program is consistently promoted at state-wide and multi-state conferences and meetings. A tri-state initiative with Arkansas and Mississippi has begun to initiate the Master Farmer Program in those states. Other states, such as Texas, Tennessee, and Florida have also contacted Louisiana about developing programs for their states. A template is currently being developed for use in the southern region. Distribution of Master Farmer brochures and copies of presentations also aid in the sharing of information to producers, industry, and for public awareness.

Currently, the program is taught on a watershed basis in Louisiana. Of the 12 watersheds, 6 have successfully implemented the program with the trainings being taught by parish. The remaining watersheds are scheduled to have the Master Farmer Program implemented by the end of 2006.

Federal Goal 4

MASTER TREE FARMER 2004

Key Theme: Forest Landowner Education

Mike Dunn, Associate Professor, Department of Agricultural Economics and Agribusiness, LSU AgCenter

Program Description

Master Tree Farmer 2004 was a seven-week short course program broadcast via satellite to sites across the southeastern United States. The broadcast originated from Clemson University. The goal of the program is to provide forest landowners with basic and advanced information and education regarding forest management, record keeping, environmental impact minimization, wildlife management, and economic opportunities.

Stakeholder Input in Program:

Actions taken to seek stakeholder input: Because this is a regional program, advisory committees were established both at the regional level and at the local level within each state. Process used: Regional and local stakeholder input through advisory committees.

How collected input was considered: Usually input collected from previous years' surveys was combined with the current year's stakeholder input to guide us in determining the content for this year's course.

Problems Identified: Some of the issues identified by participants in Master Tree Farmer were: more education on timber sale contracts, forestry best management practices, timber taxation, timber theft, and managing for wildlife on their lands. Master Tree Farmer 2004 addressed most of these topics.

Initiation and Progress of the Program: In Louisiana, four sites carried the program. Because it was a seven week program, it equates into 28 meetings. Mass media was used to advertise the program and, of course, the means by which the programs were delivered was through the use of satellite technology.

Collaboration: We collaborated with the following groups in producing the Master Tree Farmer 2004 workshop series: Louisiana Department of Agriculture and Forestry, Louisiana Department of Wildlife and Fisheries, Natural Resources Conservation Service, Louisiana Forestry Association, Society of American Foresters, Feliciana Forestry Association, Red Stick Forestry Association, Natchitoches Parish Forestry Association, Northeast Louisiana Forestry Association, Mississippi State University, Texas A&M University, University of Arkansas, Oklahoma State University, Auburn University, University of Tennessee, University of Georgia, University of Florida, Clemson University, University of Kentucky, Virginia Tech University.

Program Impact

Of the evaluations received from the program, respondents indicated that they expected to save \$1,648,000 (or approximately \$20,600 per person) and earn an additional \$2,452,600 (or approximately \$30,657 per person) as a result of participating in this program.

Source of Funds

Renewable Resources Extension Act (RREA) funds

Scope of Impact

Multi-state: It is estimated that 100% of the program is multi-state, valued at \$104,177 (1.3 FTE x \$80,136 x 1.0)

Multi-functional: It is estimated that 100% of the program is multi-functional, valued at \$104,177 (1.3 FTE x \$80,136 x 1.0).

Federal Goal 4

NATURAL RESOURCES AND ENVIRONMENTAL EDUCATION (4-H YOUTH)

Key Theme: Natural Resources Management

Michele Abington-Cooper, Assistant Professor, 4-H Youth Development, LSU AgCenter

Program Description

The 4-H Wild Woods Wanderings Environmental Program was developed to expose 4-H teens to the characteristics of bottomland hardwood forested wetland ecosystems and the challenges related to their management within an agriculture-based economy. The curriculum for the camp was developed by an Advisory Committee of professionals from agencies and associations involved with funding, managing, and conducting the camps: the LSU AgCenter; U.S. Fish & Wildlife; NRCS/Northeast Delta R.C.&D.; Louisiana Department of Parks, Recreation and Tourism and the Tensas River Refuge Association. The camps, which draw 4-H members and volunteers from throughout Louisiana, were initiated in 1995.

Two sessions of this camp were held in the summer of 2004, reaching 46 4-H teens, 2 science teachers, 2 adult volunteers, and 2 4-H Agents. The camp was held at the Poverty Point State Commemorative Area near Epps, Louisiana, which is one of the most important archaeological sites in the United States, and on the Tensas River National Wildlife Refuge. At the beginning of the six-day camping session, participants take a pre-test and are also given a real-life public policy issue to solve: "The reduction of flooding of agriculture lands from the Tensas River in Madison Parish." Throughout the camping session, participants study: how man has utilized the lands in what is now northeast Louisiana from as far back as 4000 years, water quality, soil science, wildlife and hardwood forest management, row crop agriculture and the environment; stream monitoring and management. These lessons are taught by extension specialists and researchers of the LSU AgCenter, U.S. Fish & Wildlife, Louisiana Department of Environmental Quality, Poverty Point State Commemorative Area, LSU interns, and 4-H volunteers from both Louisiana and Mississippi. Peer teaching of 4-H members is also used as groups of member participants prepare a lesson to teach the rest of the participants. Each lesson is designed to build upon the previous one, and much hands-on participation is encouraged. The lessons, as well as newsletters received by campers each day of the camp are also designed to give participants the information/knowledge needed to solve a public policy issue. Each group of campers presents their "plan" at a mock meeting of the Madison Parish governing body (Police Jury). The next morning these plans are critiqued and campers learn how the Tensas River Basin Commission is actually addressing this issue. Campers take a post-test and complete an evaluation of the camp before leaving for home.

Program Impact

For campers in 2004 a new type of evaluation was used. A total of 41 questions identifying terms, practices and concepts related to environmental topics common to the bottomland hardwoods ecosystem were addressed by youth participants. Students were asked to identify prior knowledge and post-knowledge by multiple choice answers. Four (4) possible answers were given for each of the questions tested, and were identical for each of the 41 questions given. Students identified pre- and post-knowledge or understanding by selecting the possible answers listed:

A. Never heard of it B. Know something about it C. Know quite a bit about it D. Knowledge and experience with application

Analysis of the data collected assigned numerical information for the possible answers. Values assigned to the data were as follows:

A = 1 B = 2 C = 3 D = 4

Based on the numerical assignment, data could be analyzed as:

- 1-2 = Little or no knowledge or understanding of the term, practice or concept
- 3 = Substantial knowledge or understanding of the term, practice or concept
- 4 = Knowledge/understanding and experience applying the term, practice or concept

RESULTS

Answers to the 41 questions in the pre-assessment resulted in a score of 1.873403

Answers to the 41 questions in the post-assessment resulted in a score of 3.029036 This is an increase of 1.16 toward substantial knowledge or understanding and experience applying the term, practice or concept.

The average ranking for all activities during the week was 4.39 on a Likert scale of 1-5, with 5 being the highest score. The average ranking for curriculum activities was 4.23. The most popular activities were Night Maneuvers at the Tensas National Wildlife refuge and map and Compass Skills. The Public Policy Activity average ranking was 4.32.

In answer to the question, "Would you participate again?", the reply was 4.89.

Throughout the years of conducting this camp, 4-H agents, volunteers, and campers have reported a significant increase in student science and math scores, career changes, and greater environmental awareness after attending Wild Woods Wanderings.

Source of Funds

EPA 319 funds channeled through the Louisiana Department of Environmental Quality and Northeast Delta R.C. & D. as well as Smith/Lever funds. The Tensas River Refuge Association provided funds for the food for the camp as well as Advanced Camp.

Scope of Impact

Multi-state: One specialist and one 4-H agent attended both camps full-time as well as two 4-H agents who attended for one week each. In addition, another 4-H agent utilized about three days preparing and delivering the daily newsletters. Two U.S. Fish & Wildlife agents participated in both camps, one full-time and one half-time. Five LDEQ scientists participated for a half-day each, a NRCS Soil scientist for a half-day, and two professionals from Poverty Point for a day and a half each. Two 4-H Volunteers from Mississippi and Louisiana attended both camps full-time. The Advisory Committee met three times during 2004. Planning and preparation time for the two 4-H professionals and U.S. Fish & Wildlife was 12 days each. Planning time for other agency personnel averaged 4 hours each. 30% of one state FTE, 15% of 2 parish FTEs and 10% of 20 parish FTEs of programming in this area are a direct result of collaborative efforts between Louisiana 4-H national, and multi-state cooperative efforts. The dollar equivalent of multi-state work is \$208,353 (1 FTE x \$80,136 per FTE x .30) plus (2FTEs x \$80,136 per FTE x .15) plus (20 FTE x \$80,136 x .10).

Dr. Bob Hutchinson, LSU AgCenter's Director for the Northeast Region of Research and Extension and Dr. Mike Liffman, Team Leader for the Watershed Education team serve as advisors for the program.

Federal Goal 4

POULTRY

Key Theme: Agricultural Waste Management

Theresia Lavergne, Assistant Professor, Animal Science Department, LSU AgCenter

Program Description

In meetings with poultry stakeholders, problems with broiler litter management, EPA regulations, and general management practices were identified. Also, various problems in the processing portion of the industry have been identified during meetings with complex managers. Relations with the state regulatory agencies and integrators have been developed. Meetings and farm visits with producers were conducted to familiarize producers with Poultry Best Management Practices (BMP), Comprehensive Nutrient Management Plans, EPA proposed regulations and Total Maximum Daily Loads (TMDL), and the Phosphorus Index. The Louisiana Department of Environmental Quality, Natural Resources Conservation Service, Louisiana Department of Agriculture and Forestry, Louisiana Farm Bureau Federation, EPA, and the LSU AgCenter were involved as speakers and supporters of these producer meetings.

Additionally, in light of the acts of terrorism towards the United States and the outbreaks of Exotic Newcastle Disease and Avian Influenza in the United States, the need for poultry farm biosecurity education was identified by the LSU AgCenter and poultry stakeholders. Thus,

poultry producers and poultry integrators were familiarized with biosecurity practices and biosecurity plans. The Louisiana Department of Agriculture and Forestry, the USDA, and the LSU AgCenter were involved.

On-farm demonstrations of in-house broiler litter pasteurization have been continued. Methods of pasteurizing broiler litter for reuse, within broiler houses, have been developed. The required litter moisture and temperature necessary for optimum pathogen reduction were evaluated. Pilgrim's Pride, House of Raeford, and the LSU AgCenter are involved in these demonstrations.

Program Impact

Producers are improving their waste management and dead bird disposal practices. Producers are improving their awareness of EPA regulations, TMDL's, and poultry BMP's. Producers are obtaining analyses of soil and litter samples in preparation for writing Comprehensive Nutrient Management Plans. The NRCS is receiving increased inquiries for nutrient management plans by producers. Producers are improving overall management practices.

Producers are aware of biosecurity practices and are beginning to ensure that biosecurity programs are implemented on their farms.

Source of Funds

Smith Lever 3 b, c

Scope of Impact

Some of the ideas and material for these programs are the result of attendance at the International Poultry Exposition held in Atlanta, GA; the Poultry Science Association Annual Meeting in St. Louis, MO; and the Annual Meeting of W195 (Water Quality Issues in Poultry Production and Processing) in The Netherlands, Europe.

Forty percent of the poultry program is a result of these meetings and materials, the dollar equivalent is \$125,653. (3.92 FTE's x \$80,136 per FTE x .40)

Researchers and extension specialists collaborated on the development and training of agents and producers for a 100% multi-functional effort. The dollar equivalent of multi-function work is \$314,133. (3.92 FTE x \$80,136 per FTE x 1.0)

Federal Goal 4

REGIONAL FORESTRY FORUMS

Key Theme: Forest Landowner Education

Ricky Kilpatrick, Area Agent; Steve Hotard, Area Agent; Barry Crain, Area Agent; Tom Strawn, Area Agent; Brian Chandler, Area Agent, Forestry, LSU AgCenter

Program Description

Each year Louisiana's area forestry agents produce high-quality educational forums for landowners in their region of the state. The forums focus on providing forest landowners with the latest technical, policy, tax, and environmental information related to management of forest-related resources on private lands.

Stakeholder Input in Program:

Area forestry agents create an advisory committee comprised of stakeholders from a variety of sources, such as private landowners, the Louisiana Department of Agriculture and Forestry, the Louisiana Forestry Association, and other conservation groups

Process used: Advisory committees provide the area foresters with their suggestions regarding relevant topics to be covered in forums.

How collected input was considered: All input received from stakeholders are considered by the area foresters in producing forums.

Problems Identified: Some problems identified this year included using herbicides and fertilizers in young pine stands, how to make market timber, what the future holds for wood utilization, particularly small diameter wood and biofuels, government programs, and many others.

Initiation and Progress of the Program: The regional forums are held annually on an ongoing basis.

Program Impact

What follows are examples of impacts in various Louisiana regions. In northwest Louisiana, the area forester there has seen survey results that show that 64% of participants say they will immediately adopt new forest management practices as a result of the forum, while another 18% say they will adopt new practices in the near future. Participants in the forum in northwest Louisiana stated a per person dollar value of the forum at \$2,808. In 2004, 202 people attended the forum, bringing the total stated dollar value impact of the program to \$567,216.

Additionally, follow up contacts with forum participants were made three months after the forum. Of that information obtained, 57% of participants had already adopted practices valued at \$69,500, while another 24% said they would adopt practices within the year. In southeast Louisiana, 105 landowners attended the regional forum. Returned surveys indicated that 98% had increased their knowledge on a 1 – 5 Likert Scale from 3.32 to 3.8. Participants there indicated that the value of the forum to them was \$2,860 per person, for a total forum value of

\$300,300. In northeast Louisiana, the forum and other workshops there resulted in 125 participating landowners indicating the educational programs were beneficial and that they resulted in a better understanding of natural resource management. This represents an ownership of over 15,000 acres. These landowners indicate that they expect a monetary increase of over \$650,000 from the improved utilization of their resources as a result of attending the programs in northeast Louisiana. In central Louisiana, forest landowners and resource managers from 25 different parishes and 3 different states attended. Survey respondents indicated that 68% rated the program as excellent. Attendees stated that they were responsible for forest management on 2.4 million acres of land. The program value was assessed by survey respondents to be worth \$163,893. This puts an estimated value of area forestry agents' regional forestry forums at almost \$1.7 million.

Source of Funds

Renewable Resources Extension Act (RREA) and state funds.

Scope of Impact

Multi-state: It is estimated that 35% of the program is multi-state, valued at \$119,202 (4.25 FTE x \$80,136 per FTE x .35).

Multi-function: It is estimated that 35% of the program is multi-function, valued at \$272,462 (4.25 FTE x 80,136 per FTE x .80).

Federal Goal 4

SUGARCANE BURN MANAGEMENT

Key Theme: Air Quality

Benjamin L. Legendre, Professor, Sugar Research Station, LSU AgCenter

Program Description

In recent years, agricultural burning policy recommendations were prepared by the U.S. Department of Agriculture (USDA) Agricultural Air Quality Talk Force that would help farmers implement provisions of the Clean Air Act while retaining the valid use of fire as a management tool. Task force members included representation from agricultural producers, air quality researchers, agricultural industry representatives, medical researchers and state air quality and USDA staff. The policy addresses two goals: 1) to allow the use of fire as an accepted management practice, consistent with good science, to maintain agricultural production on agricultural land; and 2) to protect public health and welfare by mitigating the effects of air pollution emissions on air quality and visibility. The Louisiana sugarcane industry has been proactive in its efforts to improve air quality by developing the Certified Prescribed Burn

Manager Program, which is administered by the Louisiana Department and Forestry (LDAF). The LDAF, the American Sugar Cane League of the U.S.A., Inc. (ASCL) (Louisiana sugarcane commodity group based at Thibodaux, LA) and the LSU Agricultural Center developed a training curriculum entitled, "Louisiana Smoke Management Guidelines for Sugarcane Harvesting." Although the training was voluntary, over 1,400 sugarcane producers and their employees attended training sessions since 2000, representing over 99% of the sugarcane farming entities in the state. Further, the LSU Agricultural Center along with the ASCL provided additional educational materials to the general public through the printed media (newsletters and publications) as well as TV and radio. Further, local power companies have funded educational programs on the proper protocol for burning under high voltage electric transmission lines. Extension agents received additional training from specialists and, in turn, conducted training at sugarcane grower meetings and field days in most of the cane growing parishes (counties). The LSU Agricultural Center is cooperating with other agencies, namely the ASCL and the USDA's Agricultural Research Service, to develop economically feasible alternatives to agricultural burning (burning in standing cane or residue) to include the selection of sugarcane varieties that shed their leaves, mechanical and biological removal of residue following green cane harvest, use of conservation tillage as well as developing value added products from the crop's residue. An effective residue management program that reduces nutrient runoff could also have a positive impact on water quality as well as air quality since there would be no need to burn the extraneous material before the harvest or the residue after harvest. Other research initiatives have shown that the residue left on the field following green cane harvesting may help suppress weeds and offer some freeze production during the winter months although most data have shown a reduction in yield in the subsequent stubble (ratoon) crop of 10 – 15% if the residue is not removed. Other research initiative have tested biological agents that could be used to speed up decomposition of the residue further reducing the need to burn or adding stabilized urea (nitrogen source) to aid in the decomposition of the residue during the winter months without loss of yield in the subsequent stubble crop. Collaborators in developing protocol and policy with regards to burn management that help to support the effort include the Florida Sugar Cane League, the Rio Grande Valley Sugar Growers, Inc., USDA-NRCS, Louisiana Department of Environmental Quality, Environmental Protection Agency, the USDA Forest Service, the National Weather Service and Entergy.

Program Impact

Louisiana is not the only state, nor is sugar production the only industry, facing the challenges posed by burning as an agricultural management tool. Every industry that uses burning recognizes that a cost-effective mechanism for reducing or eliminating open field burning is a high priority research topic. A total of 1,422 producers and/or their representatives have attended the Certified Prescribed Burn Manager Program training sessions since 2000. Further, as many as 2,000 producers and/or their representative attended the field day presentations during the summer of 2004 where additional training on smoke management was given. The ASCL provides monthly reminders to its producers regarding burn management in its publication, *The Sugar Bulletin*, which is mailed to most producers within the state. It appears that the overall training programs have continued to work exceptionally well with the number of

complaints by the general public steadily declining to only one complaint during the 2004 harvest. Further, there were no reported power outages caused by burning in close proximity to high voltage electric transmission lines. The LDAF and ASCL continued to follow up all complaints with a letter to the growers cited for improper activities with regards to their burning practices. Since 2000, numerous studies have been completed in an attempt to improve the efficiency of harvesting operations without the need to burn. During the 2004 harvest season it is estimated that over 90% of the crop was harvested green. As a result of this program, the Louisiana sugarcane industry has received excellent feedback from the communities on their attempt to improve air quality for all its citizens.

Source of Funds

Smith -Lever 3 b, c (federal funds)

Scope of Impact

Although this program on sugarcane burn management was established for Louisiana, the sugarcane industries of Florida and Texas have requested various educational materials that have been shared with research and extension personal in these states for possible distribution to their producers. Further, a local energy company has provided funding for the production of videos for use in future training.

Sugarcane Burn Management: Multi-function (integrated research-extension) efforts are estimated at 15% of the total number of FTEs expended in the program. These efforts include research-extension collaboration in agent training, formulations of recommendations, publications, and field visits during the sugarcane harvesting period. The dollar value of this multi-function effort = [.15 (estimated % of program) x 2.5 (FTEs devoted to sugarcane burn management program) x \$80,136 (\$ equivalent of 1 Extension professional FTE)] = \$30,051.

Federal Goal 4

UNDERSERVED FOREST LANDOWNER OUTREACH PROGRAMS

Key Theme: Natural Resources Management and Conservation

Mike Dunn, Associate Professor, Department of Agricultural Economics and Agribusiness, LSU AgCenter

Program Description

In FY 2003 a multi-state, multi-function program was developed as a vehicle for outreach to traditionally underserved forest landowners. This effort was spearheaded by Mississippi State and Louisiana State University. The target audience was all forest landowners, regardless of race, sex, or age, who were previously under-represented or underserved in Louisiana

Cooperative Extension Service forest management – related education and outreach programs in the past. However, special emphasis was placed on those demographic groups most underserved on an historical basis, including African American women and men, and Caucasian women. These groups represent significant landholdings in Louisiana; therefore, educating these groups regarding opportunities for good, proper, sustainable forest management leads to more income for these groups as well as sustainable economic development for Louisiana. The outreach techniques used for these workshops are unprecedented in the history of forest landowner extension/outreach in Louisiana. The programs were so successful in 2003 that we have decided to continue them through 2004 and into the future.

Stakeholder Input in Program:

Step 1: We initially conducted focus group sessions in each of the four representative areas of Louisiana. The focus groups were designed to be representative of underserved landowners in the area. An external facilitator (someone not affiliated with the LSU AgCenter) conducted the focus group sessions in order to insure there was no bias introduced into the sessions. The focus groups discussed possible problems in the past that had led to poor participation by underserved forest landowners and how that may be avoided in future workshops. Further, discussion was conducted regarding potential questions that might be asked of underserved forest landowners if a survey were conducted. Step 2: We conducted a random sample of forest landowners in twenty Louisiana parishes. Questions were asked that represented feedback solicited from the focus groups plus generic demographic information. The main purpose of the survey was to examine differences between focus group responses of underserved forest landowners versus responses made by randomly selected forest landowners to see if there any potential challenges to overcome in conducting underserved forest landowner workshops. For example, we were concerned regarding location of the workshops. If we had historically held workshops in non-neutral or unfriendly locations for underserved forest landowners because we had solicited input from fully served forest landowners, then we ran the risk of failure by not obtaining that information from the outset. Step 3: We organized local advisory committees responsible for assisting the agents with workshop coordination and implementation. The local advisory committees for the most part represented leadership among the underserved communities. They provided invaluable insight into how and where to hold meetings. Further, it was deemed very important to solicit local speakers to the extent possible to speak to workshop participants, especially when those speakers would be representative of the underserved audience. Step 4: The workshops were held in accordance with all input we had garnered through the first three steps of this process.

Process used: Advisory committees and focus groups.

Problems Identified: basic forest management information, legal aspects of forestland, complications arising from many owners of small properties, and timber marketing.

Initiation and Progress of the Program: In FY 04 there were four underserved workshops held in Louisiana. Plans are to continue these programs indefinitely.

Program Impact

Evaluation results from the workshops indicate that 66% of participants fit into the category of traditionally underserved landowners. In central Louisiana, participants indicated that they owned 7,000 acres of forestland. Eighty-three percent of survey respondents indicated that they felt the workshop would help them make more money. Sixty-seven percent of respondents indicated that they had not used professional help in the past but said that as a result of this workshop they would use professional help in the future. Ninety-six percent of the audience indicated that the workshop and materials were very beneficial. Survey respondents indicated that they estimated the value of the workshop to them was \$22,778 per person, or \$1,298,346. In northeast Louisiana, participants indicated that there was more to natural resource ownership than they realized and indicated they would seek further assistance in the management and marketing of their resources. In northwest Louisiana, 16 attendees said they would develop a written forest management plan in the near future. Participants indicated they owned over 5,000 acres of forestland. Seventy percent of those attending felt that they would increase their timberland income as a result of the workshop. Evaluations from the underserved meeting in southeast Louisiana indicated an increase in knowledge regarding forest management (on a 1 – 5 Likert scale) from 3.17 to 4.33. One hundred percent of respondents indicated that the workshop would help them save or earn more money and plan to use a professional forester. Sixty-seven percent indicated that they would seek to obtain a written forest management plan in the near future. Attendees on average estimated the value of the program at \$6,662 per person.

Source of Funds

Renewable Resources Extension Act (RREA) and state funds.

Scope of Impact

Multi-state: It is estimated that 75% of the program is multi-state, valued at \$168,286 (2.8 FTE x \$80,136 x .75).

Multi-function: It is estimated that 75% of the program is multi-function, valued at \$168,286 (2.8 FTE x \$80,136 x .75).

Federal Goal 4

WATER QUALITY

Key Theme: Water Quality

Mike Liffman, Associate Executive Director, Department of Agricultural Economics and Agribusiness, LSU AgCenter

Program Description

Because of the importance of environmental issues in Louisiana, the LSU AgCenter created a Watershed Education Initiative in 2001. Several extension faculty members were reassigned as watershed educators, and in 2002, the program was launched to assist in the conservation and restoration of the state's aquatic ecosystems and protection of human health. The program's basic organizational premises are that most water quality and related problems are best solved at the watershed level and that, by definition, watersheds do not conform to any political boundaries, such as parishes or states.

Louisiana has 12 major watersheds or river basins composed of several hundred smaller subwatersheds. The Ouachita and Red River basins, for instance, are considered major ones that drain numerous smaller tributary rivers and bayous that eventually flow into the Mississippi River system above Baton Rouge. In fact, the Mississippi River has the world's second largest drainage basin, encompassing 48 percent of the mainland United States. Waters from 30 states and two Canadian provinces pass through the state as they drain to the Gulf of Mexico through the Mississippi River system.

Unfortunately, more than 350 stream segments and many of the state's lakes have been listed as impaired, meaning that the waters do not meet certain quality standards set by the state. As a consequence, Louisiana is establishing so-called Total Maximum Daily Loads (TMDLs) that will set a maximum amount of a pollutant that each water body can receive and still meet water quality standards.

Thus, the primary charge of the watershed educators is to deliver educational programs on nonpoint water quality issues. Since the outset, these educators have conveyed information to numerous audiences on how watersheds function and how water and pollutants move through them. As with all extension efforts, these educators promote a high level of key stakeholder involvement and actively work at integrating solutions that make use of the expertise and authority of government agencies.

An emerging issue that will require considerable attention in the future is the EPA Phase II storm water regulations that require that operators of small construction sites—one to five acres—including roads and highways, develop and implement storm water management plans. In addition, 24 Louisiana towns and cities and 14 parishes (counties) will need to develop storm

water permits. Another significant issue that will warrant increased water quality attention is the deteriorating situation of Louisiana's coastline. Hydrological modifications are considered the key concern of coastal basins. When levees are built, canals are dredged, or simply cut through natural ridges, the natural flow of water is changed with consequent negative impacts on water quality.

Program Impact

Considering the magnitude of the overall challenge, all watershed educators use a comprehensive and focused educational approach that targets specific priority areas and groups within the watersheds. The educational campaigns have initially targeted several audiences, notably agricultural and aquacultural producers, marinas and recreational boaters, municipal and parish officials and planners, business and industry, rural and urban residents, and youth. Watershed educators have, for example, worked closely with the Louisiana Master Farmer and Master Cattle Grower certification programs. They provide a classroom-style environmental stewardship training for the participating producers which entails an overview of the environmental regulatory climate, and information on how the agricultural community and society at large can benefit from good stewardship practices.

More than 1500 agricultural producers are enrolled in the Master Farmer Program, representing approximately 1.5 million agricultural acres of land. In 2004, fourteen Master Farmer trainings were conducted in the Mermentau, Vermilion-Teche, Ouachita, Red River, Calcasieu, and most recently, the Pontchartrain watersheds. Watershed educators also assisted with the second phase of the Master Farmer (Model Farms) program and in 2005 will be aiding in the water quality monitoring aspects. Twelve farms were selected in five watersheds (Mermentau, Ouachita, Red River, Calcasieu, and Vermilion-Teche) to represent commodities in those areas of the state. Also, in 2004, over 110 persons were as certified Master Cattle Producers. A similar program was undertaken for 60 dairymen in the Pontchartrain basin.

Environmental stewardship education for youth groups continues to be the focus of several watershed educators. Approximately 1,500 young Louisianians received water education at 4-H and environmental camps, weekend sessions, special events and club meetings. Special summer programs such as "Wild Woods Wandering" in the Tensas River Basin, "Marsh Maneuvers" in coastal Louisiana, "Island Retreat" in the Vermilion-Teche basin, and "4-H Summer Camp" in the lower Red River near Pollock have provided in-depth water quality education to future leaders from throughout the state.

Less intensive but awareness-building sessions like Earth Day, State Fair and other sessions where water education is conducted with the Ground Water Model and Enviroscope are good introductory experiences for both youth and many adults. Water well protection and testing programs continue to provide information to private well owners and homeowners/householders through Farm*A*Syst and Home*A*Syst.

Watershed educators also work closely with the LSU AgCenter's Experiment Station, the Callegari Environmental Center, and other researchers on projects to help verify the effectiveness of certain agricultural best management practices. A current project in the Mermentau Basin will evaluate the quality of the water that is discharged from rice fields that use newer management techniques, such as no-till drill seed planting and maintenance, versus the traditional rice planting and maintenance that is often referred to as "mudding in." Data are being analyzed and will be reported in 2005.

Municipal and parish governments are also an important audience for watershed educators. Geographic Information System (GIS) technology is being used in the Calcasieu River and Vermilion-Teche river basins to advise local governments regarding land use effects on water quality, and how agricultural and aquacultural land use practices can help reduce pollutant inputs. Two watershed educators are implementing a Louisiana NEMO program, an acronym for the Nonpoint Education for Municipal Officials program established at the University of Connecticut in the early 1990s.

In addition, one educator is demonstrating the watershed implications of using GIS and precision-ag obtained data to determine sugar cane and aquaculture acreages. Smaller actual acreages are being calculated using this technology versus the traditional planimetered approach.

Education on pesticide safety, handling, and use was provided to producers in order for them to obtain their pesticide certification license. Sprayer calibrations and spray plane fly-ins provided additional water protection by making sure that ground application equipment and spray planes were working properly. Training sessions were conducted on proper use, timing, and selection of herbicides to minimize the introduction of the materials in surface waters. Nutrient management demonstrations were conducted for 120 poultry producers to provide information on litter testing, soil testing techniques, and applicator calibration to prevent ground or surface water degradation from litter applications.

Source of Funds

Funds were obtained from Smith-Lever, state sources, USDA-CREES 406 grant, Sea Grant, and EPA Section 319 funds.

Scope of Impact

Multi-state: Multi-state efforts are 40% of one FTE on the Regional 406 USDA-CREES grant in addition to 0.5 FTE of other activities and education programs supported by the grant. Over 1.25 FTE are supported by the EPA Section 319 grant which is a multi-function and multi-state (research-demonstration) project. The dollar amount of multi-state work is \$ 465,590 based on 5.81 FTEs at \$80,136 and the value of the multi-function work is \$100,170 based on 1.25 FTEs at \$80,136.

Federal Goal 4

WILDLIFE EXTENSION/OUTREACH

Key Theme: Wildlife Management

Don Reed, Associate Professor, Idlewild Research Station, LSU AgCenter

Program Description

Wildlife conservation and management is one of the most important aspects of natural resource management in Louisiana. The LSU Ag Center has one FTE dedicated to developing and implementing wildlife-related extension/outreach programming.

Stakeholder Input in Program:

Input is received from field agents and other groups pertaining to wildlife management issues

Process used: Our wildlife specialist participates in advisory committee meetings around the state as well as maintaining verbal contacts with various wildlife related organizations.

How collected input was considered: All input received from stakeholders are considered by the wildlife specialist to improve communication and implement outreach strategies.

Problems identified: Identifiable problems include nuisance wildlife control, wildlife management issues, endangered species issues, and the need to educate youth regarding awareness of wildlife management and its importance.

Initiation and Progress of the Program: Wildlife management education is an ongoing process and is integral to all resource-related management extension/outreach programs.

Program Impact

4-H youth activities: 4-H youth received training in the conservation and management of timber and wildlife resources through the 4-H Wildlife Habitat Evaluation 4-H University contest and various other parish programs at refuges and wildlife management areas throughout the state.

The conservation and management of bats along with other endangered species and species of concern, training in life skills through the 4-H Outdoor Skills Shooting Sports Program, and forestry education activities associated with the Future Farmers of America Forestry Career Development Program were other youth related activities for this reporting period. A total of approximately 5,000 4-H youth were directly impacted in these programming areas.

Wildlife Management Activities: Programming efforts in this area directly impacted a large number of the individuals who are considered either consumptive or non-consumptive users of our states wildlife resources. Seven specific wildlife management programs were conducted during the reporting period. They included the following: 1. A Louisiana black bear habitat management seminar was conducted to give landowners information on the legal requirements to be followed when these animals were located on lands they controlled. 2. The annual Ark-La-Miss wildlife management symposium which dealt with the habitat needs of the Eastern Wild

Turkey. One hundred and fifteen individuals attended the symposium. Knowledge gained by individuals was reflected in an average pre-program test score of 84 percent and a post-program test score of 93 percent. 3. A wildlife management presentation was made on the regionally broadcasted Master Tree Farmer II program originating from Clemson, South Carolina. This program reached thousands of landowners and wildlife enthusiasts across the southeast. 4. A Feliciana Forestry Association field day was attended by 45 landowners. The program involved a pond management presentation. 5. A spring deer management program was held at the Idlewild Research Station in which 150 attendees received information on breeding date determination in white-tailed deer, warm season food plot establishment, and aging techniques by tooth wear and replacement. Ninety percent of the attendees said that they received new and important information from the program. 6. A dove field day was held at the Idlewild Research Station in which attendees were presented with management activities to keep abreast of the legal requirements for planting dove fields in regards to attracting these migratory birds. 7. Two separate wildlife food plot seminars were held in which over 150 individuals received information on the latest techniques for attracting and holding white-tailed deer on an area.

Nuisance Wildlife and Rodent Control Programs: Eight programs dealing with the control and management implications for rodents and nuisance wildlife impacted 293 individuals in the reporting period. Two hundred and forty one of these individuals received educational information as part of their licensing requirements for pesticide application in various rural and urban settings. The average value of the information received by these individuals was reported at \$55,000 due to the ability to continue with their control programs after having received the necessary certification training.

Endangered Species Program: The Sustainable Forestry Initiative (SFI) requires that loggers attend a specific number of hours of continuing education programs. As part of this SFI initiative two endangered species programs were presented at separate Best Management Practices (BMP) workshops. One hundred and twenty individuals attended these programs.

Source of Funds

Renewable Resources Extension Act (RREA) and state funds.

Scope of Impact

Multi-state: It is estimated that 25% of the program is multi-state, valued at \$88,751 (4.43 FTE x \$80,136 x .25).

Multi-function: It is estimated that 75% of the program is multi-function, valued at \$266,252 (4.43 FTE x \$80,136 x .75).

Federal Goal 4

WOOD PRODUCTS OUTREACH PROGRAMS

Key Theme: Forest Crops

Todd Shupe, Associate Professor, School of Renewable and Natural Resources, LSU AgCenter

Program Description

Wood products specialists work with area and county agents, state and federal agencies, and other natural resource stakeholder groups to disseminate important information related to the production and marketing of wood products, as well as providing information to homeowners regarding wood-related issues and to hobbyists engaged in the production of finished wood products or crafts.

Stakeholder Input in Program:

Input is received from field agents and other groups pertaining to wood products issues. In addition, the LSU AgCenter Forest Products Development Center (FPDC) holds an annual stakeholder input session. Much of the input related to extension and outreach in the area of wood products is gathered through the FPDC. Specialists gather all input data and consider which programs to implement based on this stakeholder input.

Problems Identified: Lumber drying, business management, causes and control of wood decay, and marketing.

Initiation and Progress of the Program: This is an ongoing program and serves as an integral component of all natural resource-related extension/outreach activities.

Program Impact

More than 7,000 people received wood products educational information by either attending workshops, receiving a quarterly newsletter, on-site visits, email or telephone correspondence. In 2004, approximately 120,000 people visited the Extension Natural Resources web site www.lsuagcenter.com/enr to gain information. The Louisiana Dry Kiln Club Newsletter is issued quarterly to an international database of over 1,000 recipients. The average value of the 2004 workshops and presentations to the individuals who attended was \$12,000. Approximately 2/3 of the participants are now planning business expansions either for hiring additional employees or acquiring additional equipment and/or facilities.

Source of Funds

Renewable Resources Extension Act, State, Federal funds.

Scope of Impact

Multi-state: It is estimated that 50% of the program is multi-state, valued at \$44,075 (1.1 FTE x \$80,136 per FTE x .50).

Multi-function: It is estimated that 60% of the program is multi-function, valued at \$52,890 (1.1 FTE x \$80,136 per FTE x .60).

Goal 5

LSU Ag Center Goal 5 is to enhance economic opportunities and quality of life for families and communities.

Goal 5 - Research Project Summaries

- Processors have shown an increasing interest in using solid processing waste as potential useful raw materials for development of value-added functional food ingredients. Adding value to crawfish shell waste would minimize pollution problems and offset costs involved in disposal of processing by-products or waste, and additionally maximize the processors' profits. Chitosan is a biopolymer that can be produced from crawfish shell waste. Chitosan's inherent antimicrobial and film-forming properties make it ideal for use as a biodegradable coating material that can improve weight retention, lower vapor transmission, and prolong shelf life of foods. Researchers evaluated physicochemical properties of crawfish chitosan edible films, and attempted to develop antimicrobial films that are less sensitive to humidity from crawfish chitosans. Development of new value-added functional ingredients from processing will enhance the competitiveness of the Louisiana crawfish industry. Results of this research will be useful for crawfish processors seeking knowledge of the technology for developing value-added functional ingredients.
- The purpose of this research is to develop defensible parameter estimates for empirical models that can be used in explaining changes in the behavior of shrimp fisherman in relation to economic stimulus and/or potential management measure. Expected benefits will accrue to stakeholders, peers, policy/decision makers, and government through improved understanding of the economic information that management agencies can use in the regulatory process to help identify benefits and costs of alternative management scenarios and to identify changes in shrimp harvesting behavior that can be expected in response to economic stimuli. To the extent that knowledge developed in this study is incorporated into the management process, benefits to the Louisiana gulf coast fishery can be enhanced.

Goal 5 – Research Project Reports

Federal Goal 5

Title of Research Project: Value Addition to Wastes from Louisiana Crawfish Processing Plants

Key Theme: Adding Value to Agricultural Products

Witoon Prinyawiwatkul, Associate Professor, Department of Food Science, LSU AgCenter

Issue: Large quantities of solid wastes are generated from crawfish processing plants. With increasingly more stringent environmental regulations, processors have been searching for alternative income-generating ways of handling crawfish processing wastes. It is no longer practical to discard processing wastes especially when a significant amount of valuable raw materials can be recovered and used to produce value-added functional ingredients. The magnitude of this resource as value-added products suggests a strong economic potential with impact on the crawfish industries.

What was done: Crawfish shell waste is an abundant and unexploited resource for chitosan extraction. Chitosan is a biopolymer that can be produced from crawfish shell waste. Chitosan's inherent antimicrobial and film-forming properties make it ideal for use as biodegradable coating material that can improve weight retention, lower vapor transmission, and prolong shelf life of foods. Traditional chitosan production involves: deproteinization (DP), demineralization (DM), decolorization (DC), and deacetylation (DA). Process modification of chitosan production affects film properties. We evaluated physicochemical properties of crawfish chitosan edible films. Effects of process modification of chitosan production and film-casting solvents on physicochemical properties of films were evaluated. Four chitosans were prepared from traditional (DPMCA) and modified process [excluding either DP, DC or both DP & DC]. Degree of deacetylation (DD), molecular weight (Mw), and viscosity of chitosans were determined. Film-forming ability of chitosan solution (1% w/v) in 1% acetic, ascorbic, formic, lactic, and/or malic acid was evaluated. Color, transparency, swelling, adsorption and tensile mechanical properties of films were evaluated. Triplicate experiments were conducted. Data were statistically analyzed ($\alpha=0.05$). Chitosans varied in Mw (3,584-10,168 Da), DD (82-83%), and viscosity (8-48 cP). Film-forming ability of chitosan was poor when ascorbic, lactic or malic acid was used as a film-casting solvent; chitosan-ascorbate film was very brittle, chitosan-lactate and chitosan-malate films were highly hydrophilic. All chitosans exhibited excellent film-forming ability with acetic or formic acids, resulting in flexible and transparent films that resemble plastic films. Process modification of chitosan production and film-casting solvents significantly ($p<0.05$) affected color, transparency, and tensile strength of films. Film-casting solvents did not affect degree of swelling of films. Process modification of chitosan production did not affect adsorption of chitosan-acetate films. The most desirable film was prepared from non-deproteinized chitosan formed with acetic acid; this film possessed tensile strength of 135.8 MPa, elongation of 37.16%, and modulus of 3384.8 Mpa. The sorption behavior of crawfish

chitosan films varies depending on the type of chitosan used, film casting solvents and plasticizer. We attempted to develop antimicrobial films that are less sensitive to humidity from crawfish chitosan. Effects of chitosan production protocols, film-casting solvents, and plasticizer contents on sorption behavior of chitosan films were investigated. Chitosan (1% w/v) was dissolved in 1% acetic, ascorbic, formic, lactic and/or malic acid, and cast with and without glycerol (a plasticizer) at a ratio of 1:0.1, 1:0.2, 1:0.3, 1:0.4 and 1:0.5 (chitosan:glycerol, w/w). Films that are minimally hygroscopic were screened and equilibrated with saturated salts of known water activity (0.112-0.927) at 25°C. Equilibrium moisture content (EMC) at different water activity values was used to fit six sorption isotherm models. Triplicate experiments were conducted. Chitosans varied in Mw (3,584-10,168 Da), DD (82-83%), and viscosity (8-48 cP). Flexible and transparent films could be prepared from chitosans with acetic or formic acid and without a plasticizer. Chitosan-acetate films maintained lower EMC compared to chitosan-formate films. The type of chitosan used significantly influenced sorption isotherms of chitosan-formate films, but not those of chitosan-acetate films. Among models tested, the Guggenheim-Anderson-de Boer, Oswin, and Caurie models could be accurately used to predict sorption behavior of chitosan-acetate and chitosan-formate films with R^2 of 0.93-0.98. This study demonstrated feasibility of developing antimicrobial packaging films that are less sensitive to humidity. Another study was devoted to investigate antimicrobial efficacy of chitosan coating against *Listeria monocytogenes* in fresh salmon. Contamination of *Listeria monocytogenes* (LM) in salmon is of major concern to the seafood industry. Salmon can be contaminated with LM during processing and LM can multiply during refrigerated storage. Coating of salmon fillets with chitosan (an inherent antimicrobial) with or without added antimicrobial agents may suppress microbial growth, thus enhancing safety and shelf life of salmon fillets. Four 1% chitosan solutions (in 1% acetic acid) were prepared from high (1,100 kDa, HMw) or low (470 kDa, LMw) molecular weight chitosan with or without added nisin (10 mg/10 ml chitosan solution). Salmon fillet portions (5g) were inoculated with an overnight decimally diluted culture of LM, and then coated with chitosan solution. Control coating solutions were nisin (10 mg/10 ml sterile PBS), 1% acetic acid, and/or no coating. Samples were incubated at 4C and bacterial counts determined at days 0, 2, 4, and 8. Samples were spread-plated onto UVM agar plates, incubated at 37C for 48 h and CFU/g determined. Three separate experiments were conducted. Data were statistically analyzed ($\alpha=0.05$). All chitosan-coated salmons (except LMw-nisin at day 8) had significantly lower LM counts compared to that of the non-coated salmons throughout the 8-day storage. At day 0, the HMw-nisin coating caused a 2-log CFU/g reduction from the initial 6.7 log CFU/g of LM inoculated onto the salmon surface. No significant difference in CFU/g (ca. 6-6.2 log) of LM was observed in salmon coated with LMw-nisin, HMw, or HMw-nisin after 8 days. Nisin alone was not effective against LM after 4 days of storage. This study indicated that chitosan coatings (LMw and HMw) might be an alternative for the control of LM on the surface of fresh salmon fillets during refrigerated storage.

Impact: Processors have shown an increasing interest in using solid processing waste as potential useful raw materials for development of value-added functional food ingredients. Adding value to crawfish shell waste would minimize pollution problems and offset costs involved in disposal of processing byproducts or waste, and, at the same time, maximize the processors' profits. Development of new value-added functional ingredients from processing

wastes will not only enhance the competitiveness of the Louisiana crawfish industries, but also enhance the state's economic development. The information obtained from this research will be useful for crawfish processors who wish to adopt the technology for developing value-added functional ingredients.

Sources of funding: State, Hatch, USDA Aquaculture Special Grants

Federal Goal 5

Title of Research Project: Modeling the Temporal and Spatial Supply Dynamics of the Gulf of Mexico Shrimp Fleet for Use in Fishery Policy Development

Key Theme: Natural Resources Management – Marine Fisheries

Richard F. Kazmierczak, Jr., Associate Professor, Department of Agricultural Economics and Agribusiness, LSU AgCenter

Issue: The Gulf of Mexico shrimp fleet generates revenues of more than \$400 million at dockside, representing in excess of 60% of revenues generated by the entire commercial fishing industry in the region. The revenues generated by the shrimp fleet, however, come at a substantial cost to society. These costs include the direct costs of harvesting with an overcapitalized industry and the indirect costs associated with bycatch. Shrimp harvesting bycatch has, in particular, been identified as a primary contributing factor to the overfished status of the Gulf red snapper stock and lower stock levels of other commercial and recreational species, such as king mackerel. There also is an increasing concern that traditional trawling techniques result in habitat degradation in areas of the Gulf susceptible to heavy fishing pressure. Hence, benefits that might accrue from these fisheries, if otherwise properly managed, may be significantly less than those which could be achieved under different management policies. The dearth of information regarding how shrimp fishermen respond to economic and/or regulatory (dis)incentives, however, makes analysis of the impacts of potential management measures speculative, at best. The purpose of this project is to develop defensible parameter estimates for empirical models that can be used in explaining changes in the behavior of shrimp fishermen in relation in economic stimulus and/or potential management measures.

What was done: Several sub-goals designed to achieve the objectives of this project were accomplished during this time period. These include the following:

Data from various sources was combined to develop a comprehensive database that could be used for econometric modeling of the Gulf of Mexico shrimp fishery. These data sources included the National Marine Fisheries Service's (NMFS) shrimp landings files (SLF), vessel operating units file (VOUF), and the U.S. Coast Guard's *Merchant Vessels of the United States* characteristics data files. Data verification and validation analysis was conducted on the merged files, particularly with reference to apparent anomalous data. Data anomalies were discussed with the personnel at NMFS Galveston office and dealt with appropriately. A number of previous NMFS published statistics on the Gulf shrimp fishery were also duplicated to ensure

that the converted dataset was accurate. The data was then imported and converted into a PC-SAS dataset.

General statistical analyses (coherence and distribution properties) of the data were conducted and will be further pursued simultaneous with the development of effort and spatial allocation models. A fourth dataset is being obtained (NMFS shrimp observer dataset) that will be used in the detailed analysis of spatial effort allocation in the shrimp fishery, and should also provide the ability to model the sequential-spatial, or temporal-spatial, effort decisions within trips. This can then be compared against the modeled allocation decisions for the fleet as a whole.

As part of the modeling effort, a statistical analysis of the fleet characteristics and its potential use in econometric estimation was conducted and presented for peer review at the 2004 World Fisheries Congress. This presentation is currently in peer editing for publication as a book chapter under the following citation:

Kazmierczak, Jr., R.F., W.R. Keithly, Jr., H. Diop and J.M. Nance. "The Potential Effects of Panel Data Attrition and Refreshment On Effort Calculations in the Gulf of Mexico Shrimp Fishery." *In Reconciling Fisheries with Conservation: The Challenge of Managing Aquatic Ecosystems*, B. Ward and D. Schmidt (eds.). American Fisheries Society and Allen Press, Inc. A number of additional presentations were made in 2004 that related to this project in whole or in part. These included:

Keithly, Jr., W.R., R.F. Kazmierczak, Jr. and H. Diop. 2004. "Coping With An Increasing Import Base: A Case Study of the Southeast U.S. Shrimp Processing Industry." International Institute of Fisheries Economics and Trade Biennial Conference, Kagoshima University, Japan, July.

Diop, H., W.R. Keithly, Jr., R.F. Kazmierczak, Jr. and R.F. Shaw. 2004. "Relationship Between Early Life Stages of Louisiana White Shrimp and Subsequent Landings." World Fisheries Congress, Vancouver, Canada, May.

Larkin, S., W.R. Keithly, Jr., C. Adams and R.F. Kazmierczak, Jr. 2004. "Alternative Valuation Methods and Buyback Programs: Implications for the Atlantic Fishery." Invited paper, Southern Agricultural Economics Association Meeting, Tulsa, Oklahoma, February.

Future research in this project also is being conducted in conjunction with Texas A&M University and the Marine Policy Center, Woods Hole Oceanographic Institution, Massachusetts, under a joint competitive grant project funded by NOAA's Marine Fisheries Initiative (MARFIN). Results will be used to provide information to help policy-makers, producers, and researchers determine the feasibility and impacts of various fishery management policy options, particularly with respect to the Gulf of Mexico shrimp fishery.

Impact: The expected benefits from the outcomes of this research project will accrue to stakeholders, peers, policy/decision makers, and government through improved understanding of

the economic information that management agencies can use in the regulatory process to help identify benefits and costs of alternative management scenarios and to identify changes in shrimp harvesting behavior that can be expected in response to economic stimuli. To the extent that the information developed in this project is incorporated into the management process, benefits to society from the Gulf of Mexico fishery can be enhanced.

Sources of funding: State, Hatch, Multi-State, competitive grants

Goal 5 - Extension Program Summaries

- Producer meetings and workshops were held throughout the state on various farm and financial management issues. Fifteen meetings were held, with about 450 farmers attending. Over 150 enterprise budgets were developed for the major agricultural commodities in the state. These budgets are some of the most widely requested and utilized publications in the area of farm financial management. The budgets are made available through parish extension offices as well as the LSU AgCenter web page. Additionally, about 25 farmers were provided one-on-one assistance in developing individual farm plans.
- After the Louisiana Department of Social Services determined the need for public awareness of the need for quality child care, extension faculty responded by developing a multi-media public awareness campaign called Be Child Care Aware. It included weekly news articles, weekly radio public service announcements, brochures, displays, and an information internet site. The child care awareness material has been used by 68 local newspapers and 63 radio stations.
- Extension faculty designed the Louisiana Child Care Provider Training program for child care providers in center-based and family-based settings, to assist them in obtaining required hours of continuing education. Based on stakeholder input, extension faculty conducted 375 training sessions and awarded 8,950 three-hour child care training certificates. Results from an external program performance audit revealed that 98% of respondents said that the training was relevant and they were satisfied with the program. The educational sessions were conducted in 45 of Louisiana's 64 parishes.
- Extension faculty developed three state-wide programs which are currently addressing parenting education skills for at-risk audiences. The Parents on Probation or Parole program delivered information on skills in parenting and financial management to 427 prisoners and parents on parole. Four-hour workshops, entitled Children in the Middle, were developed to help parents avoid putting their children in the middle of conflict. Extension faculty collaborated with the Louisiana Department of Social Services to develop the Parents Preparing for Success program, teaching parenting skills to work-eligible families. The five-lesson, 15-hour program reached 2,500 parents with children under the age of 12.
- The character education program provided educational materials, guest speakers, and train-the-trainer sessions for 4-H clubs, schools, workplaces, sports programs, prison & probation programs, and governmental agencies. Each of Louisiana's 64 parishes has an extension faculty member who is the character education coordinator. Public school districts, as well as some private and parochial schools, used the 4-H character education materials. Adults and youth were trained by extension faculty to teach the character education curriculum. Through the school initiative, more than 2,200 students and 3,450

adults received training preparing them to teach; they, in turn, taught 230,000 students in school settings and 12,300 in settings outside of school.

- As a part of the Collaboration for After-School Education program, extension faculty provided after-school assistance either through training of paid after-school staff or direct educational delivery to 1,843 youth in grades K-12. The school enrichment initiative was developed as the result of extension parish focus forum stakeholder groups identifying the need for safe and educational programs for youth during the after-school hours. The program is a collaborative effort between the LSU AgCenter and Southern University. Surveys conducted with trained after-school staff indicated that youth are demonstrating increased knowledge of the material presented, including food safety, health, nutrition, and etiquette. Additionally, 70% reported positive change in youth attitudes since inception of the after-school program.
- Results of programs in economic development included (1) Louisiana residents increased their understanding of economic development alternatives and implementing community development plans, and initiated local capacity-building and development of their communities; (2) community leaders and volunteers developed leadership skills, resulting in community projects, such as a retirement center and a community playground; (3) entrepreneurship workshops promoted business efforts, with participants learning time management and how to write a business plan. (4) tourism continued to be a strategy for rural areas, with about 2,000 people in 12 parishes taught the importance of infrastructure in attracting tourism, retirees, and new business; (5) with many rural employers having difficulty finding qualified employees, extension faculty held workforce preparation workshops, resulting in about 1,400 adult & youth participants learning such skills as workplace ethics and communications.
- Free Enterprise is now a required course for high school graduation, with extension collaborating with several other agencies instrumental in the legislative mandate to require the course. To equip Free Enterprise teachers with the knowledge to teach the material, extension faculty conducted 18 six-hour training sessions that reached 207 high school teachers. The Free Enterprise teachers received instruction in money management, spending and credit, and saving and investing. Additionally, over 20,000 individuals and families were influenced by face-to-face extension programs on budgeting, identity theft, and other aspects of financial management. Ninety-eight percent of participants said that they would make a plan on when and how to use credit.
- Forest taxation workshops, held on a state-wide basis, focused on the major tax laws that affect private forest landowners. The program provided to about 155 forest landowners, land management professionals, and certified public accountants knowledge of recent tax law changes, changes in tax forms, and benefits of using tax laws to reduce tax payment on forest lands. Two nationally known forest taxation professionals conducted the workshops, and participants surveyed indicated that the value of the workshop was

\$2,694 per person. A considerable majority said that the workshop met or exceeded their expectations.

- Several extension faculty across the state reported that up to 75% of telephone calls in the growing season are related to home horticulture questions and problems. To help more effectively disseminate this educational information, an LSU AgCenter lawn and garden web site was developed and up-dated regularly. Another extremely valuable means of educating the public are graduates of the Louisiana Master Gardener (LMG) program. The program trained 407 new volunteers and retained 802 senior members. These volunteers donated 38,304 hours of service to their parish home horticulture program, valued at \$658,446.
- The Louisiana Arborist Continuing Education Program is an on-going educational initiative that meets state licensing requirements for professional tree care workers in the state. This extension program, conducted in collaboration with the LSU Department of Horticulture and the licensing agency, the Louisiana Department of Agriculture and Forestry, included six workshops, with 651 participants. Local and nationally-known speakers covered topics related to on-the-job safety and professionalism.
- More than 2,100 youth were enrolled in 4-H leadership projects, which focused on improving leadership skills, developing their ability to facilitate group decision-making processes, and learning to feel more confidence in their leadership roles. Leadership training also equipped 7,658 adult volunteers with the leadership tools to work successfully with 4-H youth in cooperation with extension faculty. Community service projects are closely interwoven with youth leadership, as evidenced by the Mend a Heart With 4-H project. Louisiana 4-H members collected and delivered to hospitals 2,000 teddy bears for children who are victims of tragedies such as automobile accidents and house fires.
- A 16-member state-wide youth workforce preparation team was developed to guide the educational effort directed at youth work readiness skills. The group coordinated the distribution of teaching resources used to guide youth in developing positive behaviors such as punctuality, regular attendance, honesty, dependability, neat appearance, and follow-through on task completion. Extension faculty across the state delivered workforce preparation programs, workshops, and clinics to over 20,000 youth.

Total extension FTEs on Goal 5 programs were 165.84 for a total expenditure of \$13,289,754. A total of 2,431,305 educational contacts were made in Goal 5 programs.

Goal 5 – Extension Program Reports

Federal Goal 5

INCREASING FARM PROFITS THROUGH IMPROVED MARKETING AND FARM MANAGEMENT

Key Theme: Agricultural Financial Management

Kurt Guidry, Associate Professor, Gene Johnson, Professor; Gerald Giesler, Professor; John Westra, Assistant Professor; Ken Wegenhoft, Professor; Mike Salassi, Professor; Ken Paxton, Professor; Department of Agricultural Economics and Agribusiness, LSU AgCenter

Program Description

During a 7 year time period spanning from 1998 to 2004, Louisiana agricultural producers have had 5 years in which weather events has caused significant economic damage. Coupled with the weather related reduced production has been extremely low commodity prices. The financial difficulties resulting from this time span has continued to place renewed emphasis on farm financial management. In order for producers of agricultural commodities to remain viable in an increasingly competitive market place, they must continue to improve skills and capabilities in efficient and effective farm management. Several programs have been continued to provide producers with the needed tools to continue to improve their competitive position.

Traditional programs have continued to stress improved farm and financial management by producers. Producer meetings discussing costs of production, workshops introducing proper record keeping, farm record books and inventory books, and one-on-one farm consultations continue to be a large component of program actions. Producer meetings stress issues such as renting versus owning equipment, the cost of field activities, and comparisons of conventional versus genetically modified varieties, among others.

The traditional farm and financial management programs that have been offered were combined in a new Master Cattle Producer program. Record keeping and marketing components were developed and taught as components of the Master Cattle Producer program. The Master Cattle Producer program is a curriculum based educational effort designed to increase producer skills and knowledge of the beef industry and environmentally friendly production methods. The record keeping component of the program is designed to teach physical record keeping and analysis plus financial record analysis using the Standardized Performance Analysis developed jointly by Texas A&M University and the National Cattlemans Beef Association. The marketing component is designed to teach market structure, price determination, price discovery, grades and standards, factors affecting prices and price patterns

Individual farm consultations continue to be a valuable service provided through programming efforts. During the reporting year, individual assistance was provided to producers in developing farm and financial plans. Extension economist and county agents work one-on-one with producers in analyzing their current farming operation and looking for ways to increase profitability through changes in management, improving marketing strategies, and consolidating debt.

Farm record keeping continues to be a focus of program efforts. Parish and regional workshops on computerized record keeping continues to be conducted. In addition, farm record books and inventory books have continued to be made available through the AgCenter webpage.

One of the most utilized activities conducted each year continues to be the development of enterprise budgets. Economists develop cost and returns budgets for all of the major agricultural commodities in the state. These budgets are made available through parish extension offices as well as through the AgCenter webpage. These budgets are used extensively throughout the state by county agents, producers, age lenders and other local and state agencies. In addition to the traditional commodity budgets, projects on costs of production for goat production, sweet potato packing, and dairy production were conducted. The information from these projects are used by decision makers to affect policy and marketing conditions that affect these industries.

In addition to the crop enterprise budgets, another highly utilized publication is the Louisiana Agricultural Summary. The Agricultural Summary is a compilation of statistics of major and minor Louisiana plant, animal, wildlife and fisheries enterprises. This information is widely used and is considered the most comprehensive statistical information about the agricultural industry.

Another activity conducted was the development of damage estimates caused from a excessive rains that fell in a one month period from May to June. A survey of every parish in the state was conducted to determine the amount of production loss as well as any reductions in quality. Using this information, estimates of economic losses by parish, and by commodity were developed. A final report was prepared and was disseminated to media outlets, governmental officials, and other state and federal agencies to stress the critical nature of the damage. These estimates help, in part, secure federal aid to the producers of the state.

Program Impact

Farm Management/Record Keeping/ Master Cattle Producer - Each year producer meetings and workshops are held throughout the state discussing various farm management and financial management issues. During the reporting year, an estimated 15 meetings with an estimated 450 producers took part in these meetings. In addition, with the development of the Master Cattle Producer program, 5 locations have been selected and meetings scheduled to present the Master Cattle Producer curriculum. In addition, 61 producers took part in the FSA borrowers program which provides farm and financial education. Finally, during the reporting year, 40 requests were made for farm record books with 127 books being made available.

Individual Farm Financial Plans – During the reporting year, approximately 25 producers were provided assistance in developing farm financial plans. For most of these producers, the program was able to assist in developing plans that, in part, helped them qualify for the needed financing for the upcoming crop year. For other producers, plans were devised to help transition them out of production agriculture. Without this assistance, the majority of these producers would have not gotten the required financing needed and would have been forced out of production agriculture.

Enterprise Budgets/Ag Summary – Each year, more than 150 enterprise budgets are developed for the major agricultural commodities in the state. Every year, these budgets are one of the most widely requested and utilized publications developed. These budgets are utilized not only by extension personnel but also by local agricultural lenders, local and state government agencies and national agricultural risk management centers. These budgets form the benchmark of most of the farm management work done by extension. The Louisiana Ag. Summary publication provides production information and economic impacts at both the farm gate and value added levels for every commodity grown in the state. The Ag Summary provides information on 44 different livestock enterprises, 19 wildlife and fishery enterprises, and 93 crop and forestry enterprises. The Ag Summary is used widely within the agricultural and lending industry as well as policy makers.

Disaster Estimates/Assistance – During a two month period, Louisiana agriculture was hit with a tropical storm, a hurricane, and two weeks of flooding rains. With low commodity prices already causing severe financial strain, the impact of these weather events was heightened. In an effort to garner support for federal assistance, estimates of the economic losses from these weather events were developed. It was estimated that economic losses surpassed \$232 million. These estimates were used extensively by legislators to stress the need for federal assistance. Due in part to the estimates developed by the LSU AgCenter, over 50 of the 64 parishes in the state were designated by the USDA as a disaster area. This designation then makes those producers eligible for loan interest emergency loans and direct disaster payments from USDA.

Source of Funds

State and Federal Funds (Smith-Lever 3b+c)

Scope of Impact

Multi-state: Extension economists participate in the Southern Region Farm Management, Marketing, and Ag Policy committees, the Beltwide Cotton conference, the National Rice Outlook conference, the Tri-State Soybean Forum, the Delta Farm Management meetings, and regional and national association meetings. In addition, extension economists have been involved in regional workshops discussing farm record keeping and analysis software. It is estimated that 20% of the program is multi-state, with a value of \$33,657 (2.10 FTE x \$80,136 x .2).

Multi-function: The development of disaster estimates, the development of enterprise budgets, and the development of the Louisiana Agricultural Summary are done in consultation from production specialist within appropriate fields from both research and extension. It is estimated that 50% of the program is multi-function, with a value of \$84,142 (2.10 FTE x 80,136 x .50).

Federal Goal 5

BE CHILD CARE AWARE

Key Theme: Child Care/Dependent Care

Rebecca White, Associate Professor (Family Development), and Cheri Gioe, Extension Associate, School of Human Ecology, LSU AgCenter

Program Description

Issue: The importance of quality child care

Stakeholder Input in Program. The Louisiana Department of Social Services determined the need to develop awareness among the public about the need for quality child care for Louisiana Children. State and federal TANF funds were designated for a public awareness campaign on quality child care and a request for proposals was released in the summer of 2003. An Extension family development specialist met with LSU AgCenter Communications and Information Technology specialists to determine capacity to conduct this public awareness campaign. In response to the agency request, the LSU AgCenter responded with a proposal to conduct a multi-media public awareness campaign called Be Child Care Aware.

Problem: Every day in Louisiana, thousands of children are left in child care arrangements by their parents. Research indicates high quality child care is a critical issue for improving developmental outcomes and the quality of life for children. Many parents do not know what to look for when seeking quality child care for their children. Care providers also need to know indicators of quality child care. The need for increased awareness about the importance of the parental role in selecting and monitoring for quality care for their child cannot be understated. When parents and caregivers ensure quality early care of children occurs, children are more likely to experience positive child development outcomes.

Initiation and Progress of the Program. The LSU AgCenter was awarded a contract to conduct the Be Child Care Aware public awareness campaign to develop a greater consciousness among the public of the importance of quality child care to the development of young children. This mass media campaign was launched in October 2003 and included weekly awareness newspaper articles, weekly radio public service announcements, awareness brochures for the public and child care providers, educational displays, multi-media presentations and an informational internet site (see www.lsuagcenter.com/news).

Program Impact

The Be Child Care Aware public awareness campaign was launched in November 2003. Weekly news articles about quality child care issues are sent to the 68 local newspapers that can be used as feature expert articles. Weekly radio public service about child care concerns are sent to 63 radio stations to be aired for public information. Informational brochures for parents and child caregivers have been developed and 200,000 are being distributed to parents and child care providers working in Class A child care centers and to family day home child care providers who are registered with the Department of Social Services to participate in the Child Care Assistance Program. Informational displays have been developed and are being placed with the brochures at health units, libraries, medical clinics, pediatricians' offices, family doctors' offices and other public places throughout Louisiana.

A multi-media presentation was presented to child care providers who participate in the LSU AgCenter's Child Care Provider Training Program. Additionally, a website was developed (www.lsuagcenter.com/childcare) featuring information for parents, caregivers and the public. Early response to the brochures have been positive with child care center directors ordering copies to distribute to parents to increase their awareness of quality child care indicators.

Source of Funds

La Department of Social Services grant funds

Scope of Impact

Louisiana program, Extension program

Federal Goal 5

BUILDING BETTER CHILD CARE THROUGH UNIVERSITY OUTREACH AND EXTENSION EDUCATION

Key Theme: Child Care/Dependent Care

Rebecca White, Associate Professor, and Diane Sasser, Associate Professor (Family Development), School of Human Ecology, LSU AgCenter

Program Description

The LSU AgCenter conducts the Louisiana Child Care Provider Training Program for child care providers in center-based and family-based settings to assist them in obtaining required hours of continuing education. Twenty-one (21) LSU AgCenter faculty members conducted the program reaching child care providers from 45 of Louisiana's 64 parishes.

Stakeholder Input:

Family and Consumer Sciences (FCS) agents specializing in family development determined by consensus to focus on this professional effort.

All child care providers have been contacted in 45 of 64 parishes across Louisiana with information regarding the program. Continual input is sought from all participating child care providers to ensure the program is relevant and useful for their professional work.

The Louisiana Legislative Auditor conducted an external program audit of the Louisiana Child Care Provider Training Program. A survey indicated 98.4% of the child care providers thought the training they received from faculty with the LSU AgCenter was relevant to their work. The final report from the legislative auditor suggested ways to improve the program, particularly program evaluation. Numerous child care providers in over 45 parishes have requested that Extension FCS agents provide training opportunities locally.

Based on the above input, the Louisiana Child Care Provider Training Program was continued by Extension Family and Consumer Sciences faculty members in FY 04. Faculty members conducted 375 sessions and awarded 8950 three-hour child care training certificates.

Problem. Child development researchers have noted that high quality child care is a critical issue for improving developmental outcomes and the quality of life for children. Although quality of child care is critical, research indicates that most child care is poor to mediocre. Child care provider knowledge of child development and best practices with children is inadequate. Often, child care providers have only a high school education at best and have never had a course in high school in child development.

Child care providers trained in child development and appropriate care practices often provide higher quality care than providers who are not trained. More importantly, children benefit from the higher quality of care provided.¹

It is estimated there are over 15,000 child care providers in Louisiana. The state of Louisiana through the Department of Social Services requires all child care providers in licensed centers or who are registered family child care homes to obtain various amounts of continuing education annually.

Child care providers have repeatedly stated that they need access to trainings that are offered locally. Extension FCS agents located in communities across the state are able to provide local trainings options. Child care providers have identified topics that are the most relevant for them to improve the quality of their care for children. Based on stakeholder input, the Louisiana Child Care Provider Training Program is offered locally throughout Louisiana covering topics identified by researchers and child care professionals as most relevant and critically needed.

Initiation and Progress of the Program. The Louisiana Child Care Provider Training Program was initiated in 2001 and was continued in FY 04. FCS state administration and state family development specialists worked to develop a strong relationship with new leadership within the LA Department of Social Services who are responsible for oversight of the licensing of child

¹ Burchinal, M. R., Cryer, D., Clifford, R. M., & Howes, C. (2002). Caregiver training and classroom quality in child care centers. *Applied Developmental Science*, 6, 2-11.

care centers and registered family child care home centers and for implementing the Louisiana Child Care Assistance Program. Four state family development specialists and twenty-one (22) FCS agents implemented the program. Regularly, training announcements were sent to child care providers' at all state licensed child care centers and registered family child care home centers.

Program Impact

With 21 FCS agents reporting, 375 educational classes were conducted for child care providers throughout Louisiana. Over 8950 three-hour training session certificates were awarded to child care providers who participated in three-hour training sessions offered by the LSU AgCenter.

An external program performance audit conducted by the state Legislative auditor in the Fall of 2003 found 98.4% of the child care providers who responded to a survey thought the training they received from faculty with the LSU AgCenter was relevant to them and they were satisfied with the program.

A general internal program performance evaluation was conducted with all participants to assess: knowledge gained, intent to adopt recommended practices, participant satisfaction with training, and solicit ideas for improving the program. With almost all participants reporting, it was found that:

Participants were overwhelmingly satisfied with the program (over 99%).

Participants indicated they gained knowledge of child development (92%), specific activities that would help children develop (95%), ideal caregiving styles (92%), and their importance as an early teacher of young children (95%).

Participants indicated they would implement recommended child development practices – choosing activities that help children's development (94%), practicing best caregiver style (94%), communicating in a positive manner (93%), and use learned activities that would help children in their care develop (94%)

In response to the state legislative audit, a focused evaluation is being conducted with a sample of program participants. The evaluation design is mixed method and will determine gains in knowledge of childcare providers and adoption of recommended practices. The impacts from a purposefully selected portion of the total curriculum for the Louisiana Child Care Provider Training Program is being assessed. The Right from Birth training is a four-part, research-based² series for child care providers covering child development and appropriate care practices for infants 18 months and younger. Four 12-question pre-test and 12-question post-test were administered before and after each of the four trainings. Pre-test scores were compared to post-test scores utilizing paired-sample t-tests; participants had statistically significant knowledge gain as a result of the four sessions. Summary data appear below.

² Ramey, C. T., & Ramey, S. (1999). Right from Birth. NY: Goddard Press.

Session	Percent Correct		Percentage Difference	Statistical Significance
	Pre-test	Post-test		
1 (n = 70)	57%	80%	+23	p < .001
2 (n = 57)	64%	74%	+10	p < .008
3 (n = 164)	78%	93%	+15	p < .001
4 (n = 114)	72%	80%	+8	p < .001

These preliminary outcomes indicate that child care providers are benefiting from the Right from Birth Training. Training such as Right from Birth may help prevent children from experiencing developmental problems, help with school readiness, and promote positive mental health.¹

Currently, research (survey and telephone interview) is being conducted to determine if participants have adopted recommended practices with children in their care.

Source of Funds

Smith-Lever funds, state funds, parish funds, associated program fees.

Scope of Impact

State Specific, Multi-Function Program

Integrated research-extension efforts were expended in development of curriculum materials and evaluation of programs. With 10% devoted to this multi-function project in the dollar equivalent = [10% x 4.78 FTEs spent on the child care program x 80,136] a total program cost of \$ 38,305.

Federal Goal 5

BUILDING STRONG FAMILIES

Key theme: Parenting

Diane Sasser, Associate Professor, and Rebecca White, Associate Professor, School of Human Ecology, LSU AgCenter

Program Description

Parenting Education Skills for at-risk audiences

Input from program stakeholders gathered from statewide strategic planning, advisory councils and personal contacts indicated a need for parenting skills education particularly for parents with young children, single and divorcing/divorced parents, and parents with other risk factors.

Research data and Louisiana demographic statistics were consulted to design and dedicate programming in response to needs identified by stakeholders. The following audiences and key factors were identified:

Project 1. Louisiana leads the nation in the rate of incarceration per capita. Many of those incarcerated are parents. Implications for children, particularly those under 3 years of age whose parents are incarcerated, are negative circumstances and environments which ultimately result in poorly function brains, poor school performance, and difficulty processing social cues. Research supports these risk factors as contributors to characteristics associated with criminal behavior thus continuing a cycle of incarceration with the next generation. The response by Family and Consumer Science faculty resulted in a collaboration with the Louisiana Department of Corrections to offer parenting education, financial management skills, communication skills and preparation for entering the work of work delivered to parents who were incarcerated or on probation/parole.

Project 2. Children who experience conflict in their environments and modeled by their parents tend to pattern their relationships in the same manner. Divorced or divorcing parents tend to place their children in the middle of their conflicts. Studies indicate negative affects which have lasting consequences on children whose parents divorce are most frequently caused by the conflict itself. Therefore, parents who can communicate and co-parent successfully can save their children's mental health. Divorce education workshops which included communication-building and child development information resulted from the identification of the need for this information by stakeholders.

Project 3. Statistically, children whose parents have low educational attainment and low income often do not receive enriched learning environments, proper nutrition and appropriate caregiver interactions due to the lack of knowledge of the importance of early brain development. The LSU AgCenter Family and Consumer Sciences faculty partnered with other entities throughout the state in an effort referred to as the STEP program. The Strategies to Empower People (STEP) Program is the result of the Personal Responsibility and Universal Engagement Act of 2003 passed by the Louisiana Legislature. The purpose of the STEP program is to provide opportunities for work-eligible families of Family Independence Temporary Assistance Program (FITAP) to receive job training, employment and supportive services to enable them to become self-sufficient.

Initiation and Progress of the Program

Project 1. Through state and special grant funding, LSU AgCenter Family and Consumer Sciences faculty established links with local offices of Louisiana's Department of Corrections to deliver classes to prisoners and to parents who were on parole. Workshops were conducted in

various prisons, in half-ways houses and in other venues to improve parenting skills, financial management skills, communication skills and preparation for entering the work of work. The effort, referred to as *POPPs* (Parents on Probation or Parole), was an effort in transitioning the prison to their communities. The targeted number of participants for this effort was 350. The actual participation was 427.

Project 2. Six parishes received support from the judicial system within their respective districts to deliver 4-hour workshops entitled *Children in the Middle* to help parents avoid putting their children in the middle of their conflicts. The court systems identify and refer divorcing couples to LSU AgCenter faculty who then organize workshops for couples and their children. The parents and children attend the workshops in tandem but in different meeting rooms.

Project 3. *Parents Preparing for Success (PPSP)* is the parenting project targeting work-eligible families of Louisiana's FITAP program. The collaboration with the Louisiana Department of Social Services included partners in job readiness and education (GED and literacy efforts). Partial funding for this effort was received from the Louisiana Department of Social Services. There are fifty-three sites throughout the state through which the PPSP workshops were conducted in five-lesson 15 clock-hour sessions. Educators from each of the sites met on a quarterly basis for continuing education and training. There were 2500 parents with children less than 12 months of age reached in the fiscal year.

Program Impact

Project 1.

Participants showed increased knowledge of positive parenting skills as assessed through post-tests.

84% (n=16) worked through ethical dilemmas using some of the information taught during the POPPs effort.

27 POPPs participants established long and short-term goals

Participants reported the mock job interviews as the most helpful portion of one of the classes
Home visits by probation officers revealed most of the participants were incorporating information on communication and child guidance in their homes after class participations. The officers reported seeing a difference in the children as well.

Project 2

76% (n=20) of participants in Bossier parish reported in post-tests better management of conflict as a result of participation in *Children in the Middle* classes

98% (n=263) of participants in a Bossier parish class report they no longer use their children to carry messages to their ex-partners thereby avoiding putting their children in the middle of their conflicts.

Project 3

78% of participants referred by Offices of Family Support completed all 5 classes of parenting education skills training

98% (n=656) make changes which would allow them to pay monthly bills on time

78% reported talking with and spending more time with their children

98% created and used a spending plan

Comments included "I didn't think I needed parenting classes, but I have learned better..." "I was always taught that you can spoil a child by picking him up when he cries. Now I'm glad I do. Thank you for a good lesson." "I opened a checking account."

A participant in Calcasieu parish asked the educator at the end of the series of lesson if she could hug her. "You changed my life," she said amidst tears and hugging the educator.

38995 program participants in the entire STEP program. Of these, 6541 or 17% were placed in paid employment relieving the welfare load.

Source of Funds

State and Federal (Smith-Lever 3 b, c)

Scope of Impact

Project 1: Multi-state: Mississippi, Georgia, Florida, Tennessee, Kentucky, Texas, South Carolina are working together on curriculum and efforts on brain development in children. The next phase in the project is to put training materials to be used by each of these states on a shared web site.

5% of the project is as a result of multi-state meetings and materials. Since 4.8 FTEs were devoted to the effort, the dollar value of the multi-state effort = $[\.05 \times 4.8 \times 80,136] = \$19,233$.

Projects 2 & 3: Multi-function: The family development program area faculty worked with family, child and consumer science faculty of the School of Human Ecology in preparation of curricula, evaluations and training as well as recommendations and implementation of programs which resulted in research-extension collaboration. It has been determined that 10% of these two projects were multi-function efforts. Since 4.8 FTEs were devoted to the effort, the dollar value of the multi-function effort = $[\.10 \times 4.8 \times 80,136] = \$38,465$.

Federal Goal 5

CHARACTER EDUCATION

Key Theme: Character Development

Sara Williams, Extension Associate, 4-H Youth Development, LSU AgCenter

Program Description

The Louisiana character education program is in its eighth year. The major parts of the program are providing quality materials and resources and providing training for those who implement the

program across the state. Adults and youth are trained to present our Character Education materials in schools, after school programs and other settings outside of school. Schools and community organizations are encouraged to allow older youth to serve as character teachers for younger youth.

The success of the program lies in the diversity of groups served, positive behavioral changes occurring, the number of 4-H and non-4-H members reached, the involvement in great numbers of school personnel and community volunteers, development of needs-specific educational materials, diverse community collaborations, legislative and gubernatorial support and funding, limited funding from out-of-state sale of materials, youth serving as mentors and trainers and youth reaching out to adults. Each of 64 Louisiana parishes has a character education coordinator who is a LSU AgCenter employee. Public school districts, as well as some private and parochial schools, use 4-H character education materials. In schools where the program is integrated and implemented school wide, an on-site coordinator works with the parish coordinator to keep the program pervasive in the school.

The Program provides research-based, educational materials, guest speakers, consultants and train-the-trainer sessions for schools, workplaces, sports programs, prisons and probation organizations, governmental agencies, youth development organizations and other groups and individuals interested in youth and character development. The program began focusing first on creating classrooms of character, then schools of character, and is now focusing on reaching other youth and adult. The program is delivered through 4-H clubs, schools and community partners. One additional focus for this year has been development of curriculum to be used with youth and adult pardon and parole groups and individuals within juvenile and adult prison. A priority is to provide materials and services to be used in programs that address young offenders before they are adjudicated.

Educational materials used are developed by 4-H personnel assigned to the character education program. Activities are based on six universal character traits--trustworthiness, respect, responsibility, fairness, caring and citizenship and also focus on a seventh component, decision making. The materials are designed for youth or adult instructors, tied to the Louisiana Content Standards Benchmarks, and are age specific for pre-K to 12th grade youth. All descriptions of materials also apply for those designed for sports, workplace, and both youth and adult prison and probation populations.

Materials:

A Tool Box of Ideas for Helping Elementary Students Exercise Character in Schools and *A Tool Box of Ideas For Helping Secondary Students Exercise Character In Schools*: Both provide successful ideas and activities for integrating character education into school programs.

Cafeteria Character, School Bus Character, Student Character and School Staff Character: Individual summaries of the behaviors expected of students and school personnel.

Exercising Character In Schools and Exercising Character in the Community: Two sets of activity-based lessons for each pillar of character and decision making in kits designed for five age groups: ages 4-6, 6-9, 9-11, 11-13 and teenagers.

Sports Ethics Handbook: Handbook for P.E. classes, school sports and community sports programs.

Workplace Ethics: Activity-based lessons for high school and workplace settings.

Showing Character: Activity-based lessons for use in the livestock exhibiting community

A Guide For Getting Your Community Involved In Character Education: A manual for helping communities organize and establish active character coalitions.

Principal's Principles, a curriculum piece for use within the state, provides a brief statement about building good character and following character traits to be read by the principal every school day, was provided to school principals for the 2000-2001 and 2001-2002 school years. A new, two volume, edition was provided for every school superintendent and every principal in the state for the 2003-2004 school year.

A character education evaluation project began with the opening of schools, Fall, 2004. The project is being implemented during the 2004-2005 school year. The graduate assistant hired to execute the work within schools is well qualified with MMSW and LCSW degrees

A growing number of collaborations have allowed us to broaden and diversify our audience.

2003-2004 Community Collaborations:

Head Start programs, community recreational sports programs, LSU Athletic Department, LSU Shreveport Department of Continuing Education

Police departments - city, parish and state; Drug courts - juvenile and adult

Workplaces, chambers of commerce, civic organizations - youth and adult

Governor's Office-program support.

Louisiana Legislature provided \$300,000 funding for character education

Louisiana Department of Education, Louisiana Department of Public Safety and Corrections, Louisiana Workforce Commission, Louisiana School-to-Work Office and regional consortiums, Louisiana Network of Health and Safety Stakeholders Coalition, Louisiana Safe and Drug Free Communities - state, regional and parish personnel

Youth C.A.N., a project of Career Builders and Louisiana Works Workforce Commission

After School programs

Program Impact

Two fulltime employees in 4-H Youth Development serve as trainers and curriculum developers for the program. They train older youth to teach lessons to younger youth. That process allows the older students to experience planning and delivering lessons in a classroom setting. It also challenges them to become character ambassadors and role models for younger students

Program results are based on reaching traditional and non-traditional 4-H audiences, diversity of groups served; positive behavioral changes occurring; development of needs-specific educational materials; diverse community collaborations; legislative and gubernatorial support and funding;

minimal funding through out-of-state sale of materials; youth serving as mentors and trainers, youth reaching out to adults, and the increasing demand for services, curriculum development and collaborations.

For the 2003-2004 school year, sixty-seven public school systems, and some private schools and home-school groups participated in the program. Through the school initiative, in the 2003-2004 school year more than 2,200 students and 3,450 adults received training to prepare for teaching; they, in turn, taught 230,000 students in school settings and 12,300 in settings outside of school.

Source of Funds

State

Scope of Impact

Louisiana only

Federal Goal 5

COLLABORATION FOR AFTER SCHOOL EDUCATION

Key Theme: Children Youth and Families at Risk

Debbie Hurlbert, Instructor, 4-H Youth Development, LSU AgCenter

Program Description

Stakeholder Input in Program

State focus forums identified the need for safe and educational programs for youth during afterschool hours in local communities.

State faculty work in collaboration with national afterschool initiative teams to identify need and best practices.

Numerous youth development agents have received requests for local school and community groups for assistance in developing or strengthening afterschool programs.

Focus groups were conducted in several parishes indicating a desire for increased afterschool programming and collaboration.

Based on the above input, the Collaboration for After School Education was continued in FY04. Youth development agents have provided afterschool assistance either through training of paid afterschool staffs or direct delivery to 1843 youth grades K – 12.

Problem (s) Identified.

Working parents want a safe, nurturing environment for their children while they work. Research has shown that school-age children are especially vulnerable for at-risk behaviors between 3:00 – 6:00 p.m. when left without adult supervision. Further, research has found children who attend quality programs have better peer relations, emotional adjustment, grades, and conduct compared to their peers who are not in a programs. In 1999 the Mott Foundation and J.C. Penney's conducted a nationwide survey that found:

Many children are alone and unsupervised in the after-school hours.

Violence among youth is increasing.

Children spend after-school hours watching television.

Lack of structured activities for children in the after-school hours.

92% of American voters feel there should be some type of organized activity or place for children and teens to go after school.

Initiation and Progress of the Program.

In 2001 Louisiana Cooperative Extension Service, through a school enrichment effort, provides ongoing support to after school educational programs in targeted communities via establishment of 4-H Adventure Clubs, a Youth Educational Support YES program administered by Southern University Agricultural Research and Extension Center, and staff development activities. This program is providing community and staff development along with four pilot community projects to help build the community and family supports necessary to provide quality after school programs. The three communities piloting these enrichment programs are in Terrebonne, DeSoto, Iberville and Washington Parishes. The goals of this initiative are to (a) enhance the quality of child care through child care providers training, parent education and improved learning environments and (b) enable youth to develop life skills.

The program involves a collaborative effort between LSU AgCenter and Southern University Agricultural Center. After school collaborations and partnerships for all community sites involve serving on key out-of-school time advisory and planning groups, including Louisiana Department of Education After School Child Care Advisory Council, Terrebonne Parish MOVE Advisory Board, East Baton Rouge I CARE Advisory Council, and East Baton Rouge ARC. Memorandums of Understandings (MOUs) have been established with two after school programs (Terrebonne Operation MOVE I and MOVE II) for two consecutive years. Collaborations exist with two military units (a base and station) to implement 4-H after school programs. Faculty have worked with DeSoto Parish community and school partners to build a new community center. Extension faculty will be housed at the center. In DeSoto Parish forty six children in grades K- 6th participated in the CYFAR YES program. Thirty-six children in the 4th grade involved in high-stakes testing receive intense tutorial programming in math and language arts by Southern University CYFAR staff. The children participating in this tutorial after school program were identified by school administrators. These 36 students have repeated a grade more than one time.

In Terrebonne 750 youth are enrolled in MOVE I and II After school programs with 415 participating daily in eight school sites were supported indirectly by CYFAR staff during the year. The MOVE after school program conducted by CYFAR collaborator Terrebonne Parish School District depends heavily upon CYFAR collaboration and contributions of staff training and curriculum.

Program Impact

Child Outcomes

In DeSoto Parish, 10 of the 36 youth participating in the YES tutorial program conducted by Southern University Agricultural Center who had either failed or scored in the lowest passing percentile in the Louisiana Educational Achievement Program LEAP standardized test in 4th grade, passed this summer. The YES tutorial program in helping these 10 students pass the LEAP test, prevented them from having to repeat the fourth grade.

A survey conducted with tutorial students revealed that 100% believed they learned math skills like subtraction, multiplication and division. Seventy percent (70%) of the youth indicated that the program helped them with the LEAP test this spring and summer. Eight five percent (85%) of the youth indicated that as a result of this program, they now can solve reading problems, multiply, divide and subtract better than before. In interviews with teachers of the YES tutorial students, four teachers provided comments stating that the youth participating in the YES program showed improvement in math and science.

Youth Outcomes

In Terrebonne Parish a survey conducted with 238 MOVE youth participants found:
68% participates in 4-H Adventure clubs
83% enjoyed their 4-H club experience
80% agreed or strongly agreed they were given opportunities in 4-H they might not have had otherwise
85% indicated 4-H helped them pass their achievement tests

In Washington Parish 45 of 45 youth increased their knowledge of skills in workforce preparation through evidence of successful mock job interviews, completion of individual resumes and passing basic job knowledge and skills assessment.

Surveys conducted with CYFAR trained after school staff indicated youth are demonstrating increased knowledge and skills of the material presented including nutrition, food safety, disaster preparedness, health, leadership, and etiquette (based on staff observations of youth responses to questions and skills demonstrated). Further, 70% reported that they had observed positive changes in youth attitudes as a result of the 4-H component of the MOVE afterschool program. Specific changes and benefits of the 4-H component of the MOVE program noted by staff members include: greater awareness of the importance of taking care of the environment.

In working with Terrebonne Parish partners after school programs have secured renewed funding from the Louisiana Department of Education for Terrebonne MOVE I (\$620,000) and MOVE II programs.

Source of Funds

Smith-Lever 3 b, c (federal funds), Children and Families at Risk and 21st Century Community Learning Center grant funds

Scope of Impact

Collaborative effort with Southern University Agricultural Center, State Department of Education, parish community organizations.

Multi-state impact – Collaboration and networking with other CYFAR funded projects through planning and presenting national conferences. Distribution of after school lesson plans through online sources [<http://www.louisiana4h.org/TeacherResources/>] and workshop presentations.

In FY 2004 3 FTEs were utilized on the Collaboration for After School project for a total program cost of \$240,408 (3 FTEs x \$80,136 per FTE).

Federal Goal 5

ECONOMIC DEVELOPMENT – LEADERSHIP AND TRAINING

Key Theme: Economic Development

Deborah Tootle, Associate Professor, Department of Agricultural Economics and Agribusiness, LSU AgCenter

Program Description

In recent years, rural development practitioners have come to realize that traditional economic development strategies are generally inadequate in today's fast-paced economy. Most of the traditional models are either based on urban models or do not take into account today's spatial division of labor. Traditional economic development models typically rely on the identification of perceived needs in rural areas and concentrate on importing these "needed" resources into the rural area. A more realistic approach for today's economy is to build local capacity. Most rural communities have unique resources (i.e., land, labor, talent, existing economic activity, natural resources) on which a viable local economy can be built.

Participants in LSU AgCenter community forums, advisory boards, and local stakeholder meetings indicated they need assistance in developing their social, civic, physical and entrepreneurial infrastructures for economic development. In the past year, the LSU AgCenter

and LCES provided educational civic engagement and leadership programs and workshops (Strategic Adult Leadership, Community Leadership and Economic Development, and Take Charge) throughout the state. CED area agents, along with county agents, helped communities implement strategic plans developed in these workshops through follow-up meetings with local working groups organized during the workshops.

Program Impact

- More than 70 community leaders and volunteers in West Carroll Parish developed and used skills in community collaboration and cooperation. Together, with \$609,000 from state grants and \$1.4 million from the North East Education Development (NEED) Foundation and donated work, they built the Thomas Jason Lingo Community Center in Oak Grove. This multipurpose facility will serve as a civic and education center, and will house the NEED Foundation, the West Carroll Parish office of the LSU AgCenter, and an LSU AgCenter rural development outreach center as well.
- Fifty-five community leaders participating in Community Conversations in West Carroll Parish learned about the rural development opportunities associated with the organization of an e-village and regional resource center.
- More than 1,500 volunteers in St. Bernard Parish worked together to raise over \$160,000 and contributed over 4,500 hours of volunteer service to create a 12,000 square foot community playground and a 200 seat amphitheater in Chalmette's Torres Park. The 18-month project is the largest community development project completed by St. Bernard Parish.
- Residents in communities surrounding Fort Polk learned about its impact on the Louisiana economy. Fort Polk has the second largest payroll in the State. Community members organized an effort to protect the military base from realigning or closing in 2005.
- Community members of Vernon Parish organized a marketing team for the parish. The team is learning how to market their community to business and industry and putting together marketing materials.
- Almost 300 educators in technical colleges in Lake Providence, Tallulah and Winnsboro and two parish school systems in North Louisiana learned critical leadership skills in meeting management, conflict resolution, effective parent-teacher conferences, and communications.
- Nearly 75 community members in Claiborne and Vernon parishes learned and adopted parliamentary procedure as a means of conducting parish and community meetings.
- More than 90 residents of the towns of Dubach, Cullen, New Roads, and Thibodeaux participated in the CED Take Charge civic engagement program. They developed and began implementing strategic plans for improving economic and social well-being in their communities. Among other things, Dubach is in the process of developing a retirement center and has received a \$2,500 grant to promote retirement development. Cullen has been active in getting its unwed mothers into post secondary education. New Roads is promoting tourism as a means of attracting new residents to their community.

Thibodeaux participants earned 24 hours in continuing education credits for leadership skills.

- Over 250 Cottonport residents gained information on ways to improve their community while participating in the Governor's Small Towns Program.
- Community volunteers in the 12-parish South Central Region realized the need for civic engagement and expanding community volunteer networks and resources. They developed a strategic plan for training additional volunteers in a Master Volunteer program.
- Over 400 adults and youth have attended meetings and special events in Claiborne Parish on the Sparta Aquifer surface water issues. They learned about water conservation, irrigation, water quality and its impact on economic development. As a consequence, several different groups in Claiborne are working on water conservation and recreational activity projects.
- Twenty-five Ouachita Parish business owners completed a 10-week Community Leadership and Economic Development course. They learned about economic conditions and trends in Ouachita Parish and practiced leadership skills. They developed a strategic plan for economic development.
- Twenty-two Master Gardeners in South Central Louisiana learned meeting management and leadership skills.
- Forty-one Franklinton Parish residents learned community development process skills in a Community Leadership and Economic Development class. As a consequence, the downtown revitalization committee began to clean up vacant store fronts and is researching the possibility of establishing a farmer's market near the town square. They are holding quarterly contests to recognize the business with the most attractively decorated exterior based on the themes selected by the committee.

Source of Funds

State, Federal (Smith-Lever 3 b, c)

Scope of Impact

Multi-state: Approximately one quarter (25%) of the teaching materials and information used in the Louisiana program can be attributed to information and training from the states of Mississippi and Missouri. A total of 6.76 state and parish FTEs were devoted to the Economic Development: Building Local Capacity Program. With the dollar equivalent of 1 extension professional at \$80,136, the dollar value of the multi-state effort = $[(25\%) \times (6.76 \text{ FTEs}) \times \$80,136] = \$135,430$.

Multi-function: Approximately one fifth (20%) of the information used in this program is based on experiment station findings. A total of 6.76 state and parish FTEs were devoted to the Economic Development: Building Local Capacity Program. With the dollar equivalent of 1 extension professional at \$80,136, the dollar value of the multi-function effort = $[(20\%) \times (6.76 \text{ FTEs}) \times (\$80,136)] = \$108,344$.

Federal Goal 5

ECONOMIC DEVELOPMENT-PROMOTING BUSINESS

Key Theme: Economic Development

Deborah Tootle, Associate Professor, Department of Agricultural Economics and Agribusiness, LSU AgCenter

Program Description

In LSU AgCenter community forums and stakeholder meetings, participants identified business development, retention, and expansion as a major issue. Many rural communities have been hard hit by the closing and relocation of manufacturing plants and the subsequent closing of local businesses. Many small business start-ups fail within a very short time. Residents of rural areas report difficulty in obtaining assistance for enterprise development. Although there are many opportunities for small business development in urban areas through the Small Business Assistance Centers, the Louisiana Department of Economic Development and universities, many rural residents wanting to go into business are not yet ready to seek help from these sources. The CED Team has assembled a very basic, elementary level entrepreneurship program (based on the Exploring Entrepreneurship program developed at the University of Tennessee) that begins with whether or not someone should be in business and progresses through the development of a business plan. Once clientele have completed the entrepreneurship workshop, they are prepared to obtain assistance from other State sources. In addition to the entrepreneurship program, CED Team members, along with county and extension agents are helping producers and natural resource managers understand and incorporate financial management and alternative enterprise development into their operations.

Program Impact

- Residents in rural areas learned about entrepreneurship by participating in entrepreneurship workshops organized by CED and partners. Nearly 50 potential entrepreneurs and entrepreneurs from St. Charles and Tangipahoa parishes have participated in a new entrepreneurship training program “Starting A Business... Is It For You?” and have learned what an entrepreneur is, whether entrepreneurship is an appropriate vocation, how to write a business plan, time management principles, how to evaluate business ideas, financial management and finding resources. Displaced homemakers in NE Louisiana are learning how to start their own businesses. Southern Mutual Help Association in Iberia Parish is partnering with CED in providing entrepreneurship training to local shrimpers.
- Twenty-eight parishes in Louisiana have been declared Federal Renewal Communities. More than 650 business owners in the NW and Central regions of the state learned about the Renewal Community federal tax incentive program through CED programs. Many of these business owners, such as a veterinarian in NW Louisiana are taking advantage of

the federal tax credits offered. The veterinarian and his partner are completing a \$110,000 expansion to their clinic and are getting a \$77,000 tax deduction. During the construction phase of the addition, 30 local construction workers have been employed and one full time employee has been hired by the veterinary clinic.

- Beef cattle producers in SW and Central Louisiana are learning new management and alternative marketing practices. Of the 550 producers learning these new practices, 50 have adopted and used these alternative marketing practices, decreasing their marketing costs and increasing profitability. Goat producers in North and Central Louisiana are looking at adopting a similar program.
- Members of the secondary wood products industry in NW Louisiana participated in a focus group to identify barriers and opportunities facing the industry in Louisiana.
- More than 300 farmers and business owners throughout the State (including 50 limited resource farmers) learned about rural development opportunities within the 2003 Farm Bill and the availability of USDA funding for value-added product development. Community leaders, elected officials, and DOTD are working with LSU AgCenter to identify and develop value added uses for cotton gin trash and other agricultural refuse.
- Over 100 business owners in North Louisiana learned about e-business through the Delta E-Commerce program housed at LA Tech. Delta E-Commerce assists rural businesses in developing websites and provides free internet service for one year. A third of those learning about the Delta E-Commerce program are now marketing their businesses electronically.
- Nearly 100 fruit and vegetable farmers in North Louisiana learned new marketing strategies to increase their agricultural sales.
- The media in SE Louisiana participated in the “Strawberry Industry Media Tour” and generated publicity for Louisiana strawberry producers through 4 news articles, 3 television shows and 1 radio show.

Source of Funds

State, Federal (Smith-Lever 3 b, c)

Scope of Impact

Multi-state: Nearly two-thirds (60%) of the materials and information used in the Louisiana program can be attributed to information and training from the states of Mississippi, Missouri, Tennessee and Arkansas. A total of 3.86 state and parish FTEs were devoted to the Economic Development: Business Program. With the dollar equivalent of 1 extension professional at \$80,136, the dollar value of the multi-state effort = [(60%) x (3.86 FTEs) x (\$80,136)] = \$185,595.

Multi-function: Approximately one fifth (20%) of the information used in this program is based on experiment station findings. A total of 3.86 state and parish FTEs were devoted to the Economic Development: Business Program. With the dollar equivalent of 1 extension

professional at \$80,136, the dollar value of the multi-function effort = [(20%) x (3.86 FTEs) x (\$80,136)] = \$61,865.

Federal Goal 5

ECONOMIC DEVELOPMENT-TOURISM

Key Theme: Economic Development

Deborah Tootle, Associate Professor, Department of Agricultural Economics and Agribusiness, LSU AgCenter

Program Description

Tourism emerged during the 1998 LCES community forums as an economic development strategy with which communities needed assistance. Tourism, with a particular emphasis on natural resource based tourism, continues to be a major rural development strategy for rural areas in this state. In the past year, the CED Team has provided technical assistance and educational programming through a variety of programming efforts and initiatives. Programming efforts include (a) Frontline Worker Training, a program which is designed to train front-line workers in the hospitality industry to interact positively with tourists and other visitors, (b) the First Impressions program, which is a visitor infrastructure awareness program that helps community members become aware of how their communities are perceived by outsiders, and (c) Natural and Cultural Resource Mapping, in which participants learn to identify and create an inventory of those resources in their communities that attract tourists. The CED Team has been instrumental in developing the Delta Outdoors and Wildlife Association and several agritourism ventures. CED is working with the Atchafalaya Trace Commission (Louisiana Dept. of Culture, Recreation and Tourism) to develop tourism based economic development opportunities (including tax credits for tourism related businesses) in the southern part of the state. In addition, the CED area agents, along with county, extension, and Sea Grant agents provide seminars on tourism opportunities.

Program Impact

- Approximately 50 landowners in NE Louisiana have increased their knowledge about economic development opportunities associated with natural resource based and recreational tourism. They organized the Delta Outdoors and Wildlife Association. The Association has conducted tours for other interested landowners and the press, and completed a marketing package with a web site, brochures, a trade show exhibit and video. Association members have participated in trade shows throughout the South. As a result of the increase in recreational activity, more than 100 Louisiana residents in Central and North Louisiana have increased the value of marginal farm lands or opened/expanded some form of business that is based on natural resource and recreational tourism.

- Farmers are becoming aware of the value of agritourism and learning how to diversify and set up profitable agritourism operations. Several new agritourism sites have opened up in the State. One of these farms, which until very recently had been a struggling dairy operation, is now a successful outdoor classroom for school field trips. It draws students from a 100 mile perimeter. This facility, which opened in the Fall of 2003, grossed approximately \$20,000 in its first two months of operation. Other farmers, including a dairy farmer in Ohio, have been contacting the LSU AgCenter for assistance with similar projects.
- The town of Gibsland in Bienville Parish formed a Farmers' Market. It opened in 2002 with 30 members and reported over \$6,000 in sales its first year. Eight members have been authorized by USDA to accept Farmers' Market Nutrition Program coupons for senior citizens. Coupons totaling \$1,600 were distributed in Bienville Parish. One third of the members report an increase in agricultural sales, with two of the members reporting selling over \$800 of produce in a day.
- Nearly 2,000 community leaders and members in 12 parishes throughout the state have learned the importance of a well maintained visitor infrastructure in attracting tourists, retirees and new businesses. In the past year, community leaders and members in 6 of these parishes have undertaken an assessment of their visitor infrastructure through the LSU AgCenter's First Impressions program. Community leaders and members in at least 4 of the 6 parishes have already begun to correct problems and make infrastructure improvements.
- More than 300 community leaders and elected officials (including Governor Kathleen Babineaux Blanco and her staff) learned principles and impacts of agritourism, ecotourism and the role of natural resource based amenities in attracting retirees and other visitors through conferences and tours throughout the State.
- Community members in 19 parishes in Central and North Louisiana have mapped natural resource assets in their parishes; most of these parishes are using this information to put together publicity materials to attract visitors to their communities and organize heritage tours.
- In East Carroll Parish, 15 diverse community leaders have begun working with the Kellogg Foundation in using cultural tourism to promote economic stability.
- Several hundred community volunteers collaborated to organize a number of festivals and cultural events that brought in significant tourist dollars in communities throughout the state. These included the Daylily Festival in Vermilion Parish, the Butterfly Festival in Claiborne Parish, the Catfish Festival in Winnsboro, and Poverty Point Trade Days in Delhi.
- Rural communities are becoming more aware of national programs, such as the Main Street Program, to revitalize downtown areas. Volunteers and professionals from Union, Lincoln and Morehouse Parishes worked together to help Madison Parish become a Main Street Community. In Vermilion Parish, the Main Street coordinator in Abbeville wrote and received a \$100,000 grant for renovation of an old movie theater. Claiborne Parish historic district committee members received training and accreditation as a certified community. The town of Homer adopted an ordinance preserving the downtown district.

- Rural communities are becoming more aware of the potential for national and state Parks and Heritage Areas to bolster their natural resource and culturally based tourism efforts. In 2001 over 500 community leaders and members in the 13 parishes in the Atchafalaya Trace Heritage Area identified economic development opportunities and developed strategic plans for developing ecotourism. Most of the parishes are now in the process of implementing these strategic plans. Claiborne Parish (Lake Claiborne State Park) is marketing tourist attractions through roadside kiosks and publicity materials. Vermilion Parish (Palmetto State Park) is developing birding trails to tie in with the Greater Gulf Coast Birding Trail, which will eventually stretch from Texas to Florida.

Source of Funds

State, Federal (Smith-Lever 3 b, c)

Scope of Impact

Multi-state: Approximately two-thirds (67%) of the information and materials used in the Louisiana program can be attributed to information from many other states. The bulk of the information comes from Mississippi, Oklahoma and Wisconsin. A total of 3.86 state and parish FTEs were devoted to the Economic Development: Tourism Program. With the dollar equivalent of 1 extension professional at \$80,136, the dollar value of the multi-state effort = $[(67\%) \times (3.86 \text{ FTEs}) \times (\$80,136)] = \$207,248$.

Multi-function: Approximately one quarter (25%) of the teaching materials and information used in this program is based on experiment station reports. A total of 3.86 state and federal FTEs were devoted to the Economic Development Tourism Program. With the dollar equivalent of 1 extension professional at \$80,136, the dollar value of the multi-function effort = $[(25\%) \times (3.86 \text{ FTEs}) \times (\$80,136)] = \$77,331$.

Federal Goal 5

ECONOMIC DEVELOPMENT-WORKFORCE PREPARATION

Key Theme: Economic Development

Deborah Tootle, Associate Professor, Department of Agricultural Economics and Agribusiness, LSU AgCenter

Program Description

Louisiana residents participating in community forums, stakeholder meetings and advisory groups repeatedly report the need for workforce preparation training for both adult and youth audiences. These observations are reinforced by a national USDA study on rural manufacturing

across the United States that found rural employers are experiencing considerable difficulty in hiring and maintaining a suitable workforce. Employers in the Mississippi Delta states report that employees and prospective employees do not have an understanding of the basic workforce skills and appropriate workplace behaviors that enable them to function in the workforce. To address this problem, the CED Team works with a wide array of partners and clients (other LSU AgCenter faculty, colleges, parish school systems, major employers, State and local governments) to teach basic, appropriate workforce skills and behaviors.

Program Impact

- Almost 1,400 adult and youth participants throughout the state have learned about ethics and appropriate workplace behaviors as well as skills in exploring careers, customer relations, working with difficult people, communication, team building, professional development, and management.
- Federal, state and local partners in Lincoln Parish have developed the “Leap Into Work” workforce training program. This program targets chronically unemployed young adults between the ages of 17 and 32.
- The town of Cullen has entered a partnership with the Bossier Parish Community College to participate in the MOMS program which provides free tuition, books, child care and transportation to unwed mothers living in subsidized housing. Twenty-seven unwed mothers in the Cullen area are now enrolled in post-secondary education as a result of the MOMS program.
- 4,300 4-H members throughout the state learned how to develop and market a retail product.

Source of Funds

State, Federal (Smith-Lever 3 b, c)

Scope of Impact

Multi-state: Approximately two-thirds (67%) of the information and materials used in the Louisiana program can be attributed to information from many other states. The bulk of the information comes from Mississippi, Oklahoma and Wisconsin. A total of 3.86 state and parish FTEs were devoted to the Economic Development: Tourism Program. With the dollar equivalent of 1 extension professional at \$80,136, the dollar value of the multi-state effort = $[(67\%) \times (3.86 \text{ FTEs}) \times (\$80,136)] = \$207,248$.

Multi-function: Approximately one quarter (25%) of the teaching materials and information used in this program is based on experiment station reports. A total of 3.86 state and federal FTEs were devoted to the Economic Development Tourism Program. With the dollar equivalent of 1 extension professional at \$80,136, the dollar value of the multi-function effort = $[(25\%) \times (3.86 \text{ FTEs}) \times (\$80,136)] = \$77,331$.

Federal Goal 5

FAMILY ECONOMICS

Key Theme: Family Resource Management (FRM)

Jeanette Tucker, Associate Professor, School of Human Ecology, LSU AgCenter

Program Description

Research indicates that almost one-fifth of all Louisiana families and one-third of all children live in poverty. The median income for families is 76% of the national average and many families are transitioning from public assistance. Many Louisiana families are living on the “financial edge” with high debt loads and little or no savings. Over 29,000 Louisiana families filed for bankruptcy in 2003, suggesting a great need for improving personal financial literacy. Today’s teenagers, in adulthood, will be required to take more responsibility for managing their finances than people of any previous generation; yet, Louisiana high school seniors scored only 46% on a nationwide test of personal financial literacy. There is a critical need for homebuyer education, since Louisiana has a low rate of home ownership and many lending institutions require homebuyer education.

Data from a needs assessment completed by 200 Louisiana citizens was analyzed to determine critical financial education needs. Parish clientele were queried, local advisory councils consulted, and Family Resource Management (FRM) specialization agents shared input from clientele and stakeholders to guide program direction and development. Specific problems that were identified include: Financial literacy for youth; debt reduction and credit management; basic budgeting and money management skills; and issues of poverty and working poor.

LSU AgCenter Family Resource Management Faculty partnered with the Louisiana Jump\$tart Coalition for Personal Financial Literacy. This group was instrumental in the initiation, introduction and passage of legislation mandating that Free Enterprise, a required course for high school graduation include instruction in income, money management, spending and credit, and saving and investing, beginning in the 2004-2005 school year. Other significant collaborators included Louisiana Bankers Association, Louisiana Credit Union League and Money Management International.

To build the capacity of Free Enterprise teachers to deliver this information to their students, AgCenter FRM faculty conducted 18 separate six-hour training sessions that reached 207 Free Enterprise teachers in FY04. The National Endowment for Financial Education’s High School Financial Planning Program® provided the basis for the workshops. Louisiana Jump\$tart Coalition partners provided teacher stipends, and shared technical information and resources. Over \$50,000 in financial contributions, grants and in-kind donations were generated for this program.

Almost 38,000 Louisiana citizens participated in face-to-face programs addressing family resource management issues. Most of these clients were low to moderate income. Issues addressed included debt reduction and credit management, transitioning from public assistance to self-sufficiency, budgeting, saving, goal setting, identity theft and youth financial literacy. Extensive mass media programming effort including television, radio, newspaper and newsletters were also utilized.

Teams of extension agents and local partners conducted Extension's 12-hour Your Path to Home Ownership program in five parishes reaching 142 families.

Program Impact

- High School Financial Planning Program workshops conducted in the past two years reached 407 Free Enterprise teachers who will, in turn, reach approximately 35,691 students annually. Participants' self-assessment of their preparation to teach high school students about money management increased 36% from 3.36 before the session to 4.56 after completing the session. "I learned to teach finance at a student level," was a recurring statement by workshop participants. Pre- and post-test evaluations are being conducted with a sample of students taught by workshop participants to determine program impact on students.
- 1533 students gained experience in money management and decision making by participating in hands-on "Real World" simulation activities. Over 100 volunteers were recruited and trained to assist in the implementation of these programs. 90 of 96 (93%) of participants in one session reported that the session was useful, helpful, and would help their future.
- As a result of participating in AgCenter Debt reduction and credit management programs clients obtained credit reports, worked to clear discrepancies and improve their credit scores. At least one client reported that credit management programs saved her from bankruptcy. 64 of 79 (81%) participants' clients in one credit program obtained copies of their credit reports.

Surveys of a sample of credit management program participants revealed the following intentions:

- 61 of 66 (92%) indicated they will make a plan to reduce debts
- 58 of 59 (98%) of participants indicated they will make a plan of when and how to use credit
- 126 of 130 (96%) of participants indicated they will comparison shop for the best available sources of credit
- 130 of 141 (92%) of participants indicated they will check their credit reports and correct any problems on it.

- Over 20,000 individuals and families were impacted by face-to-face AgCenter programs on goal setting, budgeting, saving, identity theft and financial management. Twelve volunteer mentors have been trained in a formal goal setting process to assist families moving from public assistance to self sufficiency. One participant reported moving from public assistance to self-sufficiency. At least two homeless families were moved off the streets and into stable housing as a result of Family Resource Management programming efforts. Over 4,300 individuals participated in programs on preventing identity theft. As a result of participating in Identity Theft Programs, 105 of a sample of 375 (28%) clients reported they had checked their credit reports for identity theft; an additional 25 of 110 (23%) reported they had had their Social Security number removed from their drivers license.

Surveys of a sample of program participants revealed the following intentions:

- 104 of 113 (92%) of participants indicated they will keep track of their spending for one month
- 468 of 474 (99%) of participants indicated they will make changes so they can pay monthly bills on time
- 144 of 148 (97%) of participants indicated they will build a fund for unexpected expenses

- Over 3,000 parents that are recipients of public assistance have learned to set goals, budget, address cash crises, learned to survive on their own and meet transportation and childcare needs by completing six hours of financial resource management training. The training is partially funded through the Department of Social Services Parents Preparing for Success grant. Many participants commented: “I should have had this class earlier, I will use this information.”

Surveys of a sample of program participants revealed the following intentions:

- 245 of 254 (96%) indicated they will file for an Earned Income Tax Credit
- 406 of 421 (96%) of participants indicated they will make and use a spending plan
- 293 of 313 (94%) of participants indicated they will set financial goals and priorities
- 255 of 300 (98%) indicated they will use a six-step decision making process.

- In FY04 the Your Path to Home Ownership program taught 142 people how to better manage their finances, overcome their personal obstacles to home ownership, avoid costly mistakes during the home buying process and protect their investments. In prior years this program helped over 933 prospective homebuyers. The majority are low- or moderate- income households. At least 5 families have bought homes this year as a result of this program. One prior participant was selected by Habitat for Humanity to purchase a Habitat built home.
- The family economics specialist developed curricula and conducted training for IDA Collaborative of Louisiana financial educators. Of 1,031 limited resource families who

completed twelve hours of financial education training, 617 purchased assets (340 homeowners, 166 higher education, and 111 entrepreneurships).

Source of Funds

Smith Lever 3 b, c

Scope of Impact

In FY04 11.74 FTEs were spent on family resource management education resulting in 38,991 contacts. Based on an FTE cost of \$80,136, the total cost of the program was \$940,796.

Multi-state: Family Resource Management faculty collaborates with and has shared programs with extension educators and financial educators across the nation. Presentations were made to the Association for Financial Counseling and Planning Education, 21st Century Families Conference, National Jump\$tart Leaders Meeting, and Naval ROTC Curriculum Coordinators representing 46 states. Collaborative programs are underway with Arkansas and Mississippi. It is estimated that 50% of the program effort is attributable to multi-state work in the acquisition and sharing of information. The dollar equivalent of this share of the program is \$470,398 (11.74 FTEs X \$80,136 x .50).

Multi-function: It is estimated that 30% of the program effort is attributable to collaborative work between research and extension in recommendations, curriculum development, agent training and presentations to clientele. The dollar equivalent of this share of the program is \$282,238 (11.74 FTEs x \$80,136 per FTE x .50).

Federal Goal 5

FOREST TAX ISSUES FOR FOREST OWNERS

Key Theme: Agricultural Financial Management

Ricky Kilpatrick, Area Agent; Steve Hotard, Area Agent; Barry Crain, Area Agent; Tom Strawn, Area Agent; Brian Chandler, Area Agent; Mike Dunn, Associate Professor; Department of Agricultural Economics and Agribusiness, LSU AgCenter

Issue: Taxation issues and principles are complex and many landowners and tax prepares are not confident and/or unfamiliar with the many tax laws which can affect the financial returns afforded from natural resource management and marketing.

Program Description

Day-long forest taxation workshops were offered as part of a series of state-wide programs. These workshops focused on the major tax laws that apply to forest landownership. Two

nationally known forest taxation professionals presented the information and answered questions. This in-depth workshop provided an excellent opportunity to become aware of the many tax forms used in filing, the new tax law changes, and benefits of utilizing the laws to reduce taxes paid. Participants also received the Tax Handbook for Forest Landowners.

Stakeholder Input in Program:

Actions taken to seek stakeholder input: Actions taken to seek stakeholder input: Regional Advisory /Program Planning committee identified taxation as important and a main topic for educational efforts.

Process used: Regional Advisory /Program Planning Committee, and Area Extension Program Planning Meeting.

Input from stakeholders and Extension foresters were considered and program planned.

Problems Identified: See Issue

Initiation and Progress of the Program: Regional clientele were made aware of workshop through newspapers, mail-outs, and radio. Speakers were contacted and workshops date set by Extension Foresters.

Program Impact

Approximately 155 forest landowners, land management professionals, and certified public accountants attended the five tax workshops held in the state in FY 04. Of those responding to our evaluation, a vast majority stated that the workshop met or exceeded their expectations. The forestland acres represented at the workshops totaled approximately 22,000. Participants valued the workshops at approximately \$2,694 per person, for a total program value of approximately \$417,570.

Source of Funds

Renewable Resources Extension Act (RREA), state and federal

Scope of Impact

Multi-state: It is estimated that 35% of the program is multi-state, valued at \$11,219 (0.4 FTE x \$80,136 per FTE x .35).

Federal Goal 5

HOME LAWN AND GARDENING/URBAN GARDENING

Key Theme: Home Lawn and Gardening/Urban Gardening

Thomas J Koske, Professor, Horticulture Department, LSU AgCenter

Program Description

Random sampling of stakeholders statewide in town meetings indicated a priority to receive LCES help and advice in home gardening to better succeed against the elements in producing home landscaping and vegetable production. County agents in urban/suburban parishes are swamped with home horticulture calls and demands. Some agents report 75% of telephone calls received in the growing season relate to home horticulture. Some people wish to receive in-depth horticultural study beyond production agriculture as well as an opportunity to provide a community service in that area. A louisianalawnandgarden.org Web site was developed and regularly updated to enhance accessibility to AgCenter consumer horticulture information.

The Louisiana Cooperative Extension Service developed and implemented a recurring, volunteer education and service, consumer horticulture program called Louisiana Master Gardeners (LMG). The program follows traditional Master Gardener format patterned after that of most states. This support group enhances and extends the efficacy of the AgCenter's educational effort for the home horticulture clients. The AgCenter-generated program interacts with Habitat for Humanity, garden foundations, parish beautification programs, schools, food banks, plantation organizations, local master gardener associations, and the Master Gardener programs of other states.

Program Impact

Louisiana has an estimated 344,919 home vegetable gardens with a projected annual production value of \$103,475,700. There are also countless home landscapes requiring maintenance and development. Most of these gardens/landscapes are found in areas enhanced by LMG programming since 37% are found in the three major metro areas of the state. In FY 2004, the LMG program trained 407 new volunteers and retained 802 senior LMGs. These volunteers gave 38,304 hours of service (18.4 paraprofessional equivalent) to their parish home horticulture programs valued at \$658,446 (\$17.19/hour).

LMGs in urban /suburban areas significantly assisted with local extension educational efforts and with area garden shows that attracted about 20,000 home owners in search of garden information. LMGs in St. John parish planned, organized and conducted two local Spring Garden Shows to bring local business and homeowners together. Most LaTerre LMGs (75%) have participated in at least one community service project, but all LMGs are also targeted for advanced gardening knowledge and personal development. East Baton Rouge LMGs helped over

11,000 citizens with plant problems in just two of their Plant Health Clinics. LaTerre LMGs coordinated a gardening seminar series at the Houma Spring Garden Show that promoted AgCenter landscape BMPs to 3,500 local residents while St. Tammany's LMGs planned and conducted a plant show with landscape BMP seminars for 1500 local residents. LMGs in Northwest Louisiana hosted a garden tour to demonstrate BMPs to 1,100 participants. Northwest area LMGs have been producing a 30 minute, weekly educational garden show delivered twice a week on cable television to the ARK-LA-TEX region. A Junior MG program in Pointe Coupee used LMGs to help 77 JMGs improve LEAP scores.

Source of Funds

State, Federal (Smith-Lever 3b+c) funding for professional LCES staff; volunteers pay for training materials and pledge volunteer program hours. LMG associations generate grant money for their parish AgCenter programming efforts. LMG volunteers donated at least \$15,014 in personal mileage and unreimbursed expenses. LaTerre LMGs received a grant for \$2,000 towards AgCenter home horticulture programs.

Scope of Impact

The ideas of AgCenter's LMG program come from regional and nationwide master gardening programs, conferences and workgroups (90%). Training materials were designed from southern region master gardening programs and adapted for Louisiana use (75%). A total of 22.2 FTEs of professional staff time was expended in home produce gardens and home grounds and lawn programming.

Multi-state: Of the 22.2 professional FTEs, 75% (16.7 FTEs) was home lawns and gardens work through development and implementation of the LMG program and represents multi-state influenced work. The dollar equivalent attributable to this multi-state activity is \$1,338,271 (16.7 FTEs x \$80,136 per FTE).

Multi-function: Multi-function work of research and extension collaboration in consumer horticulture, both instate and between southern states, is 50% or 11.1 professional FTEs. This is equivalent to \$889,510 (11.1 FTEs x \$80,136 per FTE).

Federal Goal 5

LOUISIANA ARBORIST CONTINUING EDUCATION PROGRAM

Key Theme: Workforce Safety

Hallie Dozier, Assistant Professor, School of Renewable and Natural Resources, LSU AgCenter

Program Description

The Louisiana Arborist Continuing Education Program is an ongoing educational program that satisfies state licensing requirements for professional tree care workers in Louisiana. Each year the program leader organizes and coordinates five to six workshops featuring local and national speakers/trainers who deliver educational programming on a variety of arboriculture topics related to on-the-job safety and professionalism. Arborist licensees must attend at least one of these workshops each year to maintain his or her state license. The goal of the program is to improve on-the-job safety and professionalism among tree care workers in Louisiana to improve tree care for tree owners across the state.

Stakeholder Input in Program:

Actions taken to seek stakeholder input: We recruited twelve professional arborists and urban forestry specialists from across the state to serve as an advisory committee. The advisory committee met in December 2002 to discuss critical needs among professional arborists, training/education needs and to provide a list of potential speakers/trainers.

We also used a grant from the Louisiana Department of Agriculture and Forestry to launch a program evaluation program. From September 2003 through May 2004 we collected baseline surveys from workshop participants. These instruments collected data on safety practices, professional behaviors, demographics and queried participants about training needs they have for future programs. We designed the instrument primarily to collect baseline data against which we will compare follow-up data. Preliminary data indicate that our audience is not thoroughly familiar with current industry standards for safety or for tree care.

Process used: see above.

How collected input was considered: see above.

Problems Identified: In addition to recommendations from our steering committee, we reviewed current industry literature and talked to industry leaders about pressing issues among professional tree care workers. The two main problems identified were on-the-job safety (arboriculture is in the top five most dangerous occupations in the nation) and lack of professionalism among arborists. We also asked our survey respondents to list potential education topics they would like to see in our program. Participants identified new safety,

removal and pruning techniques; information about new equipment; up-to-date tree care information; and information about legal issues in tree care as topics they would like to see addressed in the program. We have used these inputs to plan our workshops.

Initiation and Progress of the Program: The program was initiated in October 2002 and is ongoing. Since the initiation of the program, we have held 18 workshops. In FY 2004 we hosted seven workshops for licensed arborists (651 participants) plus a two-day pre-exam review course for tree care workers seeking a license (7 participants). Workshops were held across the state. We advertised the workshops through the list of licensees (500 ±50) and we advertise the workshops to Louisiana State University, Louisiana Tech and Southern University forestry students, agricultural extension agents and maintenance workers employed by the Louisiana Office of State Parks via e-mail.

Collaboration: This program collaborates with the Louisiana Department of Agriculture and Forestry, the licensing agency, and the program is coordinated through the LSU School of Renewable Natural Resources and the LSU Department of Horticulture.

Program Impact

Currently we have data that indicate that the majority (73%) of workshop participants rated the overall workshop as excellent or good, 97% said they felt they had benefited from the workshop, 84% said they would work more safely due to what they had learned during the workshop and 91% said they would work more professionally because of the workshop. Actual changes in behavior, however, will be measured with direct on-the-job observations, scenarios and follow-up questionnaires during FY 2005 and FY 2006.

The commercial and residential tree care industry is made up primarily of small companies with an average of five full-time employees. This industry is influenced by very high cost of business (e.g., liability insurance, equipment). Thus small tree care company owners may find it difficult to provide themselves or their crews with adequate professional or on-the-job training simply because of the cost of training or loss of productivity. This year program partnered with the Louisiana Capital Area Red Cross to provide basic CPR and First Aid training. Over 150 participants learned important life saving skills during the training. Ninety percent of them passed the exam and became CPR and First Aid certified, including several who opted to take the exam orally because of difficulty reading. One participant in particular overcame his reluctance to take the test, and passed after a lengthy oral examination – possibly the first achievement of this kind in his adult life. Another participant who works for a municipal parks systems reported that the experience had “planted the seed” of safety on the job for him. He reported that he intends to instigate a safety program for all grounds and maintenance crews for his city’s parks system. Overall, most of the participants had never had training of this kind, and many of those who had learned CPR and First Aid had done so 10 years or more before this workshop. Clearly, this kind of educational programming will have a positive impact on the participants’ lives.

Source of Funds

Self-generated funds (\$32,680), the Louisiana Department of Agriculture and Forestry (\$25,000), Renewable Resources Extension Act, and State Funds.

Scope of Impact

Multi-state: It is estimated that 5% of the program is multi-state, valued at \$7,212 (1.8 FTE x \$80,136 x .05).

Multi-function: It is estimated that 50% of the program is multi-function, valued at \$72,122 (1.8 FTE x \$80,136 x .50).

Federal Goal 5

LEADERSHIP TRAINING AND DEVELOPMENT

Key Theme: Leadership Training and Development

Janet Fox, Associate Professor, 4-H Youth Development, LSU AgCenter

Program Description

The Louisiana 4-H program is committed to developing leadership skills in both youth and adults. Club and parish 4-H programs offer training focused on building leadership skills. The State 4-H Leadership Conference is planned and implemented by teens focusing on developing leadership skills. More than 100 youth serve on one of four statewide youth leadership teams including the Executive Committee, Fashion Board, Food and Fitness Board, and the Technology Team. 4-H youth serve as representatives on the Louisiana 4-H Foundation Board, Statewide 4-H Advisory Committee and statewide committees.

Volunteers are the backbone of Cooperative Extension programs. In FY 2004, 7,658 adult volunteers and 4,177 youth volunteers served the 4-H program, a total of 11,835. Direct volunteers, individuals who work directly with youth, were made up of 4,638 adults and 2,439 youth. Indirect volunteers were comprised of 2,479 adult volunteers and 1,192 youth. Middle management volunteers, volunteers who direct other volunteers, were comprised of 632 youth and 483 adults. Using Independent Sector figures reported in 2000 that the average volunteer gave 15.5 hours per year and the 2002 Louisiana value of \$13.74 per hour, Louisiana 4-H volunteer hours are worth \$2,520,499.95 annually to the 4-H program. Volunteers are equipped with tools to work successfully with youth through training and support from parish, area, state and regional events.

Louisiana youth totaling 2,315 are enrolled in 4-H citizenship projects. More than 37,472 4-H youth were involved in at least one community service project, and 9,968 participated in service learning projects benefiting more than 308,833 youth and adults.

Program Impact

More than 2,100 Louisiana youth were enrolled in 4-H Leadership projects. More than 8,108 served in club officer or parish leadership posts, and 6,404 4-H youth served as a committee chair and/or coordinated an activity. Some 8,301 4-H youth planned a 4-H club program, an increase of more than 9% over last year. Sixty-five percent of Claiborne Parish and 75% of Bienville Parish 4-H clubs demonstrated knowledge of proper parliamentary procedure by conducting and managing 4-H club meetings. Ninety percent of Orleans Parish youth who participated in an indepth training reported the ability to facilitate group decision-making processes while 85% improved leadership skills.

As a result of the State 4-H Junior Leadership Conference, youth indicated the following: 89% increased their knowledge of leadership; 87% developed skills as leaders; and 86% were motivated to expand their leadership role in 4-H. Participants share the following: "...Junior Leadership Conference was challenging and fun." "I learned a lot I did not know." "The workshops were thought-provoking." "It was very enlightening." "It was a great learning experience." "This was my first year and I thought it was awesome."

For the first year, Louisiana 4-H University featured an in-depth Leadership Academy. As a result of the academy, participants reported: 82% identified their leadership strengths and weaknesses, and increased their knowledge of decision-making processes; 86% increased their communication skills; 91% could identify different approaches to resolve conflicts peacefully and increased their leadership skills; 96% were more aware of how to build trust within a group; and 100 % improved their decision-making skills. Comments included: "I learned a lot that I plan to take back to my parish." "Since this is my first year in 4-H, I have learned leadership and how to trust people."

Funded through a grant from National 4-H Council provided by the Land O' Lakes Corporation, Louisiana 4-H YA'LL (Youth and Adults Learning Leadership) program built leadership skills through positive youth/adult partnerships and service learning in which MINORS have MAJOR leadership roles in their community. Through identification of community needs, four sites built positive youth and adult relationships and performed service learning projects: Assumption Parish – agricultural awareness; Cameron Parish - coastal erosion; Catahoula Parish - wildlife habitat reestablishment; and DeSoto Parish – litter reduction. Overall, the Louisiana 4-H YA'LL grant reached more than 2,700 rural youth and 350 adults in educational program efforts. As a result of the project, 86% of the youth leaders increased their knowledge of leadership and felt more confident in their leadership ability while 80% developed their skills as a leader.

Parish staff and volunteers conducted several leader training experiences. According to survey results of over 225 4-H volunteers from Avoyelles, Cameron, Evangeline, Lafayette, Vermilion

and Vernon parishes, 97% of the participants were re-energized about 4-H, felt their 4-H programs will be enhanced and were motivated to expand their roles. Ninety-five percent broadened their knowledge and developed their skills as leaders. Sixty percent planned to use what they learned during 4-H Leader Forum reaching an average of 115 youth and 18 adults.

“Great new ideas to expand myself and my club to bigger and better opportunities” was just one of the positive comments regarding the State 4-H Leader Forum. As a result of the State 4-H Leader Forum, 100% of the participants were re-energized about 4-H and felt their 4-H programs will be enhanced. Ninety-four percent indicated they broadened their knowledge, developed their skills as leaders and were motivated to expand their roles in 4-H. Volunteers responding to the survey reached an average of 133 youth and 72 adults giving an average of 20.9 hours per month.

“Learned a lot” “It was informative.” Were comments describing the Southern Regional 4-H Leader Forum. According to a follow-up survey, 100% of the leaders were re-energized about 4-H, increased their knowledge of youth development, and were motivated to expand their roles in 4-H. Ninety-three percent broadened their knowledge of new projects and areas and developed their skills as volunteers. The volunteers who attended reached on average 110 youth and 53 adults.

As a result of 4-H service and service learning projects, nearly 50% of Iberia 4-H members reported an increase in confidence in their abilities in performing community service projects. Sixty-five percent of Orleans 4-H members increased community pride and awareness through the Clean Sweep Project. Seventy-five percent of Iberia 4-H Junior Leaders learned how needy and alone the nursing home residents were. DeSoto 4-H members picked up 10 tons of litter in the parish. More than 700 youth and adults from West Baton Rouge, Jefferson, West Carroll, Lincoln, East Feliciana and East Carroll Parishes raised \$90,616 to benefit local causes. More than 351 youth from Allen, Avoyelles, Beauregard, Caddo, Calcasieu, East Baton Rouge, St. John, West Carroll and West Feliciana parishes have taught 10,632 youth on a variety of topics.

With Louisiana having the second highest illiteracy rate in the nation, literacy is a major Extension effort. The New Orleans Hornets joined Louisiana 4-H collecting 1,600 books that benefited children in the New Orleans. More than 5,000 children from Concordia, St. Bernard and Plaquemines Parish have benefited from Extension’s literacy efforts.

Louisiana was ranked fourth in the nation as food insecure. In summer 2004, LSU AgCenter’s Grant Walker 4-H Educational Center campers from 63 parishes conducted a Hunger Project grew vegetables and collected 3,593 pounds of food. In the fall of 2003, 18,352 4-H youth and adult volunteers donated 1,753 hours to collect 80,684 pounds of food, 411 boxes of food and 212 food baskets. The hours of community service had an economic benefit of \$28,994.62, according to the \$16.54 per hour designated by the Independent Sector. Using an average with the Consumer Price Index of .663 cents per pound, the food donated was worth \$53,493.92. Project coordinators leading food drive efforts indicated the following: 94% knew more about hunger needs in their community; 83% knew more about the negative effects of hunger; and 87% understood the problems of people who face hunger. The 4-H CAN Fight Hunger Campaign

comments included: “This project is really needed and can really make a positive impact on those involved as well as those who receive help.” “I believe this project will help all students become aware of the hunger problem in our area.”

Through the “Mend a Heart With 4-H!” project, Louisiana 4-H’ers collected 2000 teddy bears to give to children who are victims of tragedies such as a car accident or a house fire. These stuffed animals were collected and delivered to the children's center at Our Lady of the Lake Hospital and the Baton Rouge Fire Department.

Source of Funds

Leadership Training and Development programs are supported by user fees, Smith-Lever and Louisiana 4-H Foundation Funds.

Scope of Impact

Educational program and service efforts sponsored and led by Cooperative 4-H staff, members and volunteers reached all parishes in Louisiana and beyond our state’s borders.

Federal Goal 5

YOUTH WORKFORCE PREPARATION

Key Theme: Workforce Preparation - Youth

Juanita Johnson, Professor, 4-H Youth Development, LSU AgCenter

Program Description

In order for young people to successfully prepare for, find, and retain employment, they must be able to demonstrate their ability to use a variety of work readiness skills, including the skills needed to transition into young adulthood and establish independence, the skills needed for successful decision making about career interests and job search, and the skills needed to successfully retain the job and learn how to work. To ensure the development of youths’ work readiness skills, a 16-member youth Workforce Preparation Initiative Implementation Team (WPIIT) increases the capacity of state and local agencies to work together to benefit youth by hosting workforce preparation training meetings and by distributing career development resources. Youth members of the team help to identify needs and to develop program strategies. The major work of the team centers on development of career assessment tools, promotion of Career Month and distribution of teaching resources that are used to guide youth in identifying positive work habits, attitudes, and behaviors such as punctuality, regular attendance, presenting a neat appearance, getting along and working well with others, exhibiting good conduct, following instructions and completing tasks, accepting constructive criticism from supervisors

and co-workers, showing initiative and reliability, and assuming the responsibilities involved in maintaining a job.

Stakeholder Input in Program

To develop a strategic communications plan engaging key stakeholders in a process to increase knowledge and awareness of the need to provide workforce preparation programs for youth, contact was made with Governor's Office, Workforce Commission to identify stakeholders and to encourage participation in the youth workforce preparation program. On the local level, stakeholders were selected based on their work with youth in the area of workforce preparation. Asset-mapping to determine interest, opportunities and recommendation for participation. Stakeholders participated in local Focus Group meetings. On the state level, stakeholders participated in a Distance Education session. A report was generated and used to develop Plans of Work for the state and local levels.

Problem (s) Identified

The group identified the following problem: growing gaps between the knowledge and skills youth possess and the current and future needs of the workplace.

Initiation and Progress of the Program

A Distance Education session was conducted statewide to provide Extension agents information and resources to conduct programs on *What Employers Look for in New Employees*. The on-going training provided through club meetings, workshops and newsletters educate youth on the skills needed for current and future workplaces. A packet of resources was distributed statewide that included: (1) a video on *Industry-based Certification*, (2) brochure on *Alternative Plans for after High School*, and a report (3) *Right Here, Right Now! Louisiana's Urgent Agenda for a Knowledge Economy Workforce*.

Collaboration

Stakeholders include the Governor's Office, state agencies (Departments of Labor, Education and Economic Development), Workforce Investment Boards and Youth Council coordinators, business owners and local Boards of Education.

To further address the need for increasing opportunities and options for Louisiana's youth, a team of the LSU AgCenter's and the Southern University Agricultural Center's parish level and state level employees formed a Tri-State Workforce Preparation Team in cooperation with Arkansas's and Mississippi's Extension staff members and youth representatives. The three-state team convenes joint planning meetings, documents and disseminates workforce preparation resources and conducted a youth workforce preparation conference.

Program Impact

Efforts improved the availability and sharing of workforce preparation resources and increased the capacity of Extension local offices to offer workforce preparation programs. Extension

agents across the state delivered workforce preparation programs to more than 20,000 youth.

Youth programming included:

Career Day programs (4,028)

Conferences and workshops (4, 220)

Youth financial education through the *Welcome to the Real World* Program (979)

Job Fairs and tours (697)

Career Options workshops (5,600)

Club meeting educational programs (4,113)

Job Hunting clinics on *Interviews and Resumes* (2,081)

Jump Start for Job Seekers project workshops (273)

Source of Funds

State and Federal (Smith, 3 b,c)

Scope of Impact

Involved other states

a) The total FTE's expended on the Workforce Preparedness program was 15.75. It is estimated that 40% of the staff resources allocated to this program was multi-state work between Louisiana 4-H, national, and state extension services. The dollar equivalent of multi-state work is \$504,856 (15.75FTEs X \$80,136FTE X .4).

b) Louisiana and through the Tri-State Workforce Preparation Initiative: Arkansas and Mississippi.

c) Five percent of Louisiana's program resulted from program planning meetings, preparation and sharing of educational materials, training of youth participants, conduction of a Tri-State Workforce Preparation Conference and publication of workforce preparation lesson plans.

STAKEHOLDER INPUT

The LSU AgCenter consistently seeks stakeholder input on all research and education programs in order to maintain a focus on clientele needs and that its research and extension programs have value and impact. During the programming year the LSU AgCenter continued to place emphasis on its Advisory Leadership System, which has as its primary goal that all research and extension education programs of the LSU AgCenter are: (1) effective in meeting the needs of stakeholders, (2) being delivered in a manner that makes them accessible to all people, and (3) constantly assessed for relevance to ensure that they remain current. Regional Advisory Leadership Councils were added to the overall advisory system in 2002 with structural changes that were made in the AgCenter. These regional councils, comprised entirely of stakeholders, provide valuable advice to the Regional Directors regarding how the LSU AgCenter can improve service to stakeholders in the region by marketing the LSU AgCenter and its programs and identifying issues within the regions. In the 2003-2004 program year, all eight AgCenter regions conducted Advisory Council meetings with a total of over 160 stakeholders participating. Issues that the AgCenter will continue to address during the coming year which emerged from the stakeholder meetings included better marketing of AgCenter programs; the need for public education regarding production agriculture; increased partnerships and collaborations between the AgCenter and businesses, agencies and organizations; the future of extension in regards to staffing and maintaining a local presence throughout the parish; the future of Louisiana agriculture, and issues regarding rural/urban interface.

Extension and research faculty work closely with all the major commodity associations, i.e., cattle producers, rice producers, cotton producers, sugarcane producers, grain producers, the Louisiana Farm Bureau, family and community development associations, 4-H youth associations, and other groups to get input and guidance on programs. These organizations not only give guidance but also support many of the AgCenter programs with monetary and physical assistance. Input and direction from these organizations are the lifeblood of the LSU Agricultural Center.

Another dimension of obtaining stakeholder input for research programs are the Agricultural Center Exchange (ACE) groups which meet in conjunction with the LSU Agricultural Center's Annual Conference. These groups cover all of the economically important commodities produced in Louisiana as well as environmental, value-added, family, youth, economic, and nutrition issues. Each session is attended by all AgCenter research scientists and extension faculty (both parish and state-level) with programs in the respective areas. Stakeholder input into research projects is provided by extension faculty who bring a statewide perspective of the highest priority needs and researchable problems. In turn, extension faculty can then better understand the research perspective and progress on various projects. Of considerable value is the camaraderie which has developed between research scientists and extension field faculty, the majority of whom did not know one another very well prior to implementation of the ACE groups.

Research Section

Louisiana Agricultural Experiment Station scientists and administrators continued to meet regularly with a number of stakeholders as indicated in the Plan of Work. A representative but not comprehensive list of some of these commodity meetings is shown pages 293 and 294. The generalized forum for these stakeholder sessions is a series of presentations of research findings and proposed research projects by scientists directly to the stakeholder panels. This is followed by questions and discussions led by stakeholders which provide focus, direction, and specific suggestions that are incorporated into the respective research programs.

On a broader dimension, Louisiana Agricultural Experiment Station scientists and administrators participate each year in the Louisiana Farm Bureau Federation Annual Convention. As reflected in the Plan of Work, this is the predominant agricultural organization in Louisiana representing the total spectrum of agriculture, natural resources, youth, and policy issues of concern in the state. Beyond the general sessions, scientists and administrators participate and interact directly in commodity advisory committees, which are constituted by stakeholders and provide another vital feedback opportunity relative to research needs and recommended directions.

Extension Section

The Cooperative Extension Service conducted a series of community focus forums in every parish during the 1999-2000 program year involving a wide base of the citizenry and leadership of the state, including public officials, and representatives of business, industry, youth, and minority groups. The diversity of the state was captured by ensuring that gender, age, and ethnic groups were represented in the forums. Parish forums identified key issues and concerns needed to be addressed for a better future for parish residents. Based on stakeholder input from the forums, the LCES developed a statewide strategic plan for the five-year period 2000-2004, focused on 12 initiatives: After-school Education and 4-H Adventure Clubs; Economic Development; Master Farmer; Water Resources Management; Waste Management; Coastal Restoration; Environmental Horticulture; Family Financial Management; Farm Financial Management; Leadership and Volunteer Development; Nutrition, Diet, and Health; Parenting and Child Care. Parishes reported to their stakeholders the outcome of the forums, including strategic plans to address the identified issues. Initiative teams consisting of extension faculty (state and parish) and research faculty then developed curricula and action plans to enable parish agents to conduct educational programs in the identified areas.

In the 2003-2004 program year, as a follow-up to the initial focus forum program, a second round of focus forums was conducted with stakeholders in every parish. These forums were strategic planning sessions. Issues identified in the original focus forums were re-visited, with implementation reports made by extension faculty regarding these issues. Additionally, stakeholders were asked for input on other issues in the parish, and these concerns were included in the parish Plan of Work. All forums were facilitated by extension faculty outside the parish. Stakeholder input was also a segment of parish program reviews, which were initiated in 2003. The reviews are conducted by a team of extension faculty outside the parish, for the purpose of

reviewing on-going educational programs, recognizing program excellence, and recommending programming changes if need be. As one part of the reviews, stakeholder focus groups are conducted in the three programming areas of agriculture, family and consumer sciences, and 4-H youth development. Results from the stakeholder focus groups are included by the review team in submitting the parish program review summation.

In addition to the these efforts involving stakeholders, parish extension faculty continued to involve leaders and other influential people in agriculture, family and consumer science, youth, and community and economic development, in various commodity and subject-matter advisory committee to provide input on needs and problems which could be addressed in local education programs. For a state perspective, extension state-level faculty engaged representatives of their commodity or subject-matter area to gain input on stakeholder issues, needs, and problems.

MERIT REVIEW

Meetings with Stakeholders - (1998 - 2004)

Cotton Support Committee:	March 18, 1998 March 17, 1999 March 14, 2000 March 13, 2001 September 10, 2002 September 10, 2003 September 14, 2004
Rice Research Board:	October 28, 1998 December 16, 1999 December 14-15, 2000 November 12-13, 2001 November 21, 2002 November 18, 2003 November 16, 2004
Soybean and Grain Research & Promotion Board:	December 1-2, 1998 December 8-9, 1999 November 30 – December 1, 2000 November 28-29, 2001 November 19-20, 2002 November 20, 2003 November 18-19, 2004
American Sugarcane League:	February 3, 1998 February 4, 1999 February 23, 2000 January 28-29, 2001 February 19, 2001 January 28, 2002 February 19, 2003 February 25, 2004
Louisiana Beef Industry Council:	May 5, 1998 October 14, 1999 October 10, 2000 October 11, 2001 January 11-12, 2002 December 13, 2003 December 16, 2004

Meetings with Stakeholders – (1998 – 2004) - Continued

Louisiana Catfish Promotion and Research: September 2, 1998
June 23, 1999
September 29, 1999
December 5, 2000
August 29, 2001
October 29, 2001
May 9, 2002
August 21, 2002
May 14, 2003
June 16, 2004

Louisiana Crawfish Promotion and Research Board: May 19, 1998
August 10, 1999
July 17, 2001
February 12, 2002
May 9, 2002
May 28, 2003
June 16, 2004

Louisiana Sweet Potato Commission: June 11, 1998
June 17, 1999
June 14, 2000
June 13, 2001
May 22, 2002
June 19, 2003
July 23, 2004

Louisiana Farm Bureau Federation: July 3, 1999
July 15, 2000
July 12-15, 2001
July 10-12, 2002
July 12, 2003
July 8-11, 2004

PROGRAM AND PROJECT REVIEWS

One comprehensive CSREES program reviews was held during the reporting period. A review of the statewide research and extension programs in Biological and Agricultural Engineering was held on April 14-18, 2004. The review was conducted by a panel consisting of CSREES leaders and research/extension peers from other universities. The focus of the review was directed toward the future roles of research and extension professionals working in an integrated manner to address Louisiana's needs in this important area.

Project peer reviews of the proposed research activities of individual scientists continued according to CSREES guidelines as reflected in the Plan of Work. Approximately 52 project reviews were conducted which led to the establishment of approved projects with initiation dates during the reporting period 10/01/03 to 9/30/04. Following the established policy, review comments are solicited from peer scientists and extension specialists and the comments and a synthesis of recommendations are provided to the originating scientist by a member of the LAES administrative team. The changes made in the proposed project by the originating scientist are then reviewed at the LAES administrative level prior to final project approval.

EVALUATION OF MULTI-STATE ACTIVITIES

Research Section

The Louisiana Agricultural Experiment Station has traditionally encouraged and supported multi-state (formerly regional) research activities. LAES scientists have played significant leadership roles in many multi-state activities and they continue to do so today. In fiscal year 2004 LAES scientists were active participants in 46 approved multi-state projects. Of these 46 projects, 19 (41%) were North Central, North East, Western, or NRSP-based activities which reflects the truly national scope of what we refer to as multi-state research. The 46 projects address each of the five national goals. To further reflect the LAES support and involvement, scientists' travel expenses to annual technical committee meetings are currently being supported from administrative funds. Finally, to further indicate involvement and support, LAES Directors currently serve as administrative advisors to 9 active multi-state research projects.

Extension Section

The evaluation of multi-state activities has been beneficial in identifying ongoing activities and opening up new opportunities for collaboration between states and extension/research personnel thus strengthening the overall cooperative effort. Effectiveness and efficiency in utilizing materials from other states, collaborating on research projects, and communication among professional faculty and staff in different states have improved. Multi-state efforts initiated last year among Arkansas, Mississippi, and Louisiana on pesticide applicator training, digital diagnostic centers, and limited resource management program for young families continued in FY 2004 with new materials, publications, and joint training programs. A tri-state collaborative agreement among Louisiana, Arkansas, and Mississippi began in FY 2004. The agreement included three program areas in four Delta counties in each state: 1) 4-H Workforce Preparedness, 2) Master Farmer Program and 3) the Tri-State Community Development Initiative. Additional multi-state programmatic linkages occurred via the regional forester, master wildlifer and the regional water quality program located at Texas A & M University. In addition, extension specialists participated in the Southern Extension Research Association (SARE) exchange groups, the Southern Agriculture and Natural Resources committees, and numerous national and regional meetings. These exchanges provide extension professionals with new ideas and materials, and enable collaborations that result in new and more effective programs for Louisiana. Furthermore, the economic development initiative of the LCES has been greatly enhanced by collaborative work with the Southern Rural Development Center, Mississippi. Similarly, the fiscal year marked an initiative for collaborative programming with the Mississippi based Foundation for the Mid-South.

INTEGRATED RESEARCH-EXTENSION ACTIVITIES

During 2002, the LSU AgCenter was reorganized to more closely align research and extension functions in addressing problems and issues of various client groups. At the campus level, extension specialists who had been centrally located in the Cooperative Extension Building were moved into respective subject-matter departments and housed with their research counterparts under the administrative supervision of a department head. Several joint research-extension appointments have been made to promote integration. In the field, administrative lines were redrawn to create eight regional research and extension centers, subsuming parish extension agents and experiment station research personnel under their supervision. Regional directors were appointed to provide administrative guidance and better integrate research and extension efforts at the point of local program delivery.

In this way new competencies are brought to both the extension and research clientele. More joint appointments were made as departmentalization continued in FY 2004. This administrative approach includes placement of specialists at experiment stations around the state. Joint appointments are increasing at the stations.

Research and extension personnel continued to work closely to develop joint publications, coordinate research, and conduct educational programs. Concerted efforts have been made to improve communication between research and extension personnel so as to provide improved and rapid service to clients. Special initiatives such as the Formosan subterranean termites, fire ants, water quality, and the Master Farmer Program are being jointly conducted by the Extension Service and experiment station personnel.

Each year, research and extension personnel meet in AgCenter Exchange Groups. Researchers update extension personnel on the latest research projects and results, and extension personnel share their educational programs and the issues and problems their clients are facing for researchers to review and consider in their research agendas. In addition, teams of research and extension personnel meet in discussion groups two to four times a year to update one another on the latest research and education programs.

In the plant science area, researchers and extension faculty meet each year to review research and make recommendations for new varieties, fertilizers, pesticides, and other cultural practices which subsequently form the management practices recommended to clientele.

The LSU AgCenter established a Faculty Council in 2002. It includes 20 elected representatives proportional to faculty rank and divided between “on-campus” and “off-campus”. Off-campus members include extension agents and researchers located throughout the state. The Council provides rapid response and feedback to administration and increased communication and participation in policy to faculty. The administration accepted Council recommendations for increased participation of faculty in vice-chancellor and department head reviews.

INTEGRATED ACTIVITIES

Farm Production Budgets/Market Economics:

Projected costs and returns for numerous Louisiana commodities were developed and/or updated and provided to farm management faculty. These "production budgets" are used cooperatively with extension specialists and presented at grower meetings. Among the crops covered are catfish, crawfish, beef, dairy, broilers, forages, cotton, soybeans, corn, milo, wheat, rice, sugarcane, and vegetables.

Crop Genetics/Variety Trials/Variety Recommendations:

Variety trials were conducted on corn (hybrid), wheat, soybeans, rice, cotton, warm and cool season forages, sweet potatoes, and sugarcane. Results are published and provided to seed dealers, producers, and extension specialists. Researchers participate directly with faculty specialists as the varieties recommended for planting are being selected. Both research and extension personnel became involved in outreach activities in variety recommendations through participation in parish (county) agent training sessions and commodity producers meetings.

Insecticide Efficacy/Insecticide Recommendations:

Insecticide efficacy studies are conducted on all major Louisiana plant and animal pests. The data from the efficacy studies are provided to extension faculty, crop consultants, and producers at seasonal meetings and through direct contact. Research scientists participate directly with extension faculty to prepare insect control recommendation guides which are used throughout the extension system in educational activities.

Herbicide Efficacy/Herbicide Recommendations:

Herbicide efficacy studies are conducted on all major Louisiana crops. The data from these efficacy studies are provided to extension faculty, crop consultants, and producers at seasonal meetings and through direct contact. Research scientists participate directly with extension faculty to prepare weed control recommendations which are used throughout the extension system in educational activities.

Plant Health/Treatment Recommendations:

When cooperative extension faculty encounter plant health diagnosis problems they are assisted by research scientists. The scientists involved carry applied research activities on the efficacy of disease preventive agents and are active in providing assistance in the formulation of disease control recommendations used by extension faculty in educational programs.

Food and Agricultural Biosecurity:

In 2001 the state's agricultural community and government officials became concerned about terrorist attacks as well as the ever-present likelihood of the accidental introduction of damaging diseases and/or other pests into Louisiana's food production system.

In response, the LSU AgCenter and several co-sponsors hosted the Louisiana Food and Agricultural Biosecurity; Producer Awareness Conference. The conference helped Louisiana farmers and ranchers become more aware of the problems that could arise from the introduction of plant or animal diseases or pests into their operations.

Speakers prompted attendees to identify the diagnostic capacity needed to protect the food supply and identifying how a food-linked terrorism attack would affect Louisiana's food industry.

The conference was a forum for participants to interact and exchange ideas with leading biosecurity and agrosecurity experts and key policymakers from Louisiana and the nation. Attendees and speakers were able to address actions needed to reduce food contaminations risks.

Food Processing/Packaging/Safety:

Research and extension faculty interact to develop food safety procedures and deliver food processing and food safety information. Extension faculty conduct HACCP training sessions, with participation and assistance from research scientists. A Muscle Food Laboratory is jointly used for research studies and extension demonstrations. Food Science Department research and extension faculty for the third year have conducted a Food Processing Conference, with 170 attending this year. The conference serves to address timely topics in (1) economics and marketing and (2) technology and business issues. The conference includes for industry participants both plenary and break-out sessions.

Animal Health/Treatment Recommendations:

Veterinary science researchers conduct programs on aquatic animal health, anthelmintic delivery and efficacy, bovine respiratory disease, and brucellosis. Programs are closely coordinated with the extension veterinary specialist, the School of Veterinary Medicine Diagnostic Lab, and the Louisiana Department of Agriculture and Forestry.

Soil Testing/Fertility Recommendations:

The Soil Test Laboratory is operated by the LAES and all results are provided to the LCES soil scientist for fertility recommendations. County agents are involved in the delivery of the fertilizer recommendations.

Animal Waste Management:

Major research and extension outreach activities in this area are closely integrated. Land application of poultry litter and runoff from extensive dairy operations remain the highest priority areas. Research scientists teamed with extension faculty to prepare the waste management sections for BMP manuals used in extension outreach programs.

Master Farmer Program:

The Master Farmer Program is a joint educational effort of extension and research that allows agricultural producers to be proactive and address environmental challenges using research-based best management practices. The program's goal is the development of environmental stewardship as both a mindset and a practice of Louisiana farmers. A numerous group of agencies and organizations collaborate and cooperate extensively --in both planning and implementation--with the LSU AgCenter on this well-received program, some of which include: USDA – Natural Resources Conservation Service; Louisiana Farm Bureau Federation; Louisiana Department of Environmental Quality; Louisiana Department of Agriculture and Forestry; Louisiana Department of Natural Resources; Louisiana Soil & Water Conservation Districts; National Oceanic and Atmospheric Administration; and state-wide producers associations including rice, sugarcane, cattle, and cotton.

Master Cattle Producer Program

The Master Cattle Producer Program was designed and implemented by LSU AgCenter research and extension faculty, with close collaboration and cooperation, both in planning and program delivery, with agencies and associations including the USDA-Natural Resources Conservation Service; the Louisiana Farm Bureau Federation; and the Louisiana Cattlemen's Association. The educational program includes both animal management and marketing, with a strong emphasis on environmental stewardship. For example, the participants are required to take the first phase of the Master Farmer Program, which is composed of eight hours of classroom presentations on environmental stewardship. Over 100 enrollees are on schedule to graduate in FY 2005.

Master Horseman Program

The Master Horseman Program was designed and implemented by LSU AgCenter faculty to provide a comprehensive, in-depth educational program for horse enthusiasts state-wide. The program includes both classroom and hands-on sessions. Teaching faculty include both research and extension from the Department of Veterinary Science and the Department of Animal Science. Although coordinated by state extension faculty, parish-level extension faculty also teach in the classroom and conduct hands-on sessions. Parish horse associations, working in conjunction with parish faculty, help to coordinate and promote the program.

Asian Soybean Rust

Asian soybean rust is an aggressive fungal disease that under optimal environmental conditions can reduce soybean yield by as much as 80%. Brazil, a huge soybean producer, has been dealing with the rust problem for quite some time. In May 2004, LSU AgCenter research and extension faculty began work on a Louisiana Response and Action Plan for Asian Soybean Rust. This planning process, conducted over a five-month period, was primarily a joint effort by Department of Plant Pathology research and extension faculty. However, other agencies were kept informed of the situation, including the Louisiana Department of Agriculture and Forestry, and USDA-Animal and Plant Health Inspection Service-Plant Protection and Quarantine. The purpose of the plan is to outline actions for the pre- and post-confirmation of the establishment of Asian Soybean Rust. This document serves as a guide for state and private stakeholders in Louisiana regarding the detection, response, and management of this destructive disease.

Pest Management

Parish (county) agent training meetings, commodity producer meetings, the Louisiana agricultural Consultants Association annual workshop and the annual meeting of the Louisiana Plant Protection Association are characterized by programming that includes the integrated activities engaged in by research and extension professionals in entomology weed science, and plant pathology. These educational venues highlight integrated activities conducted throughout the year and by their nature-are integrated activities.

West Nile Virus:

In 2002 the threat of mosquito-borne diseases was addressed aggressively by the LSU AgCenter. The mosquito web site was established in May, 2002, and became a popular resource site with comprehensive information on West Nile virus and other mosquito-borne diseases. A mosquito conference was held in June, 2002, raising awareness and providing scientists, educators, and the media a means to assure the best available materials were provided to the general public. A youth outreach program, called Skeeter Busters, was conducted by 4-H, and Family and Consumer Sciences faculty targeted education programs for the elderly. The West Nile virus currently has abated somewhat, but AgCenter faculty continue to address the problem, mostly on the awareness level. Parishes throughout the state stress the importance of mosquito abatement programs as the first line of defense.

U.S. Department of Agriculture
 Cooperative State Research, Education, and Extension Service
 Supplement to the Annual Report of Accomplishments and Results
 Multistate Extension Activities and Integrated Activities

Institution: LSU Agricultural Center
 State: Louisiana

Check one: Multistate Extension Activities
 Integrated Activities (Hatch Act Funds)
 Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures* FY2004
Agricultural Financial Management	6,933
Arborist Continuing Education	1,486
Building Strong Families	3,962
Commercial Nursery and Landscape Systems	29,813
Continuing Education in Natural Resources	8,914
Cotton	38,175
Cotton Insect Pest Management	2,105
Dairy	47,609
Digital Diagnostic Program-Plant Pathology	37,802
Economic Development-Leadership and Training	27,899
Economic Development-Promoting Business	38,233
Economic Development-Tourism	42,693
Economic Development-Workforce Preparation	42,693
Equine Education	7,462
Family Nutrition	31,814
Family Resource Management	96,902
Food Safety	58,769
Forestry Tax Issues for Forest Landowners	2,311
Forestry Awareness	1,486
Formosan Subterranean Termites	22,451
Fruits and Nuts	44,175
Home Gardens and Grounds	275,684
Human Health	105,651

(continued on page 301)

*Expenditure from federal budget (Smith-Lever 3 b,c,d) in FY 2003 was 20.6% of total Cooperative Extension budget (state and federal). Multi-state (total) and multi-function (total) dollars multiplied by .206 to determine share of Smith-Lever funds attributed to multi-state and multi-function work.

U.S. Department of Agriculture
 Cooperative State Research, Education, and Extension Service
 Supplement to the Annual Report of Accomplishments and Results
 Multistate Extension Activities and Integrated Activities

Institution: LSU Agricultural Center
 State: Louisiana

Check one: Multistate Extension Activities
 Integrated Activities (Hatch Act Funds)
 Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures* FY2004
Increasing Farm Profits by Management and Marketing	9,905
Managing Risks in Agriculture	12,381
Master Cattle Producer	37,968
Master Tree Farmer	21,584
Oyster Food Safety	2,724
Poultry	25,885
Regional Forestry Forums	24,556
Regional Pecan Education	4,127
Soybeans and Grains Production	3,302
Sweet Potato Insect and Disease Control	8,254
Underserved Forest Landowner Outreach	34,667
Water Quality	95,912
Weed Science	20,635
Wildlife Extension Outreach	18,283
Wildwoods Wandering-Environmental Education	42,921
Wood Products Outreach	9,079
Workforce Preparation – Youth	104,000
Total	7,761,816

Paul Coreil, Director

Date

*Expenditure from federal budget (Smith-Lever 3 b,c,d) in FY 2003 was 20.6 % of total Cooperative Extension budget (state and federal). Multi-state (total) and multi-function (total) dollars multiplied by .206 to determine share of Smith-Lever funds attributed to multi-state and multi-function work.

U.S. Department of Agriculture
 Cooperative State Research, Education, and Extension Service
 Supplement to the Annual Report of Accomplishments and Results
 Multistate Extension Activities and Integrated Activities

Institution: LSU Agricultural Center
 State: Louisiana

Check one: Multistate Extension Activities
 Integrated Activities (Hatch Act Funds)
 Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures* FY2004
After-School Education	74,286
Agricultural Financial Management	17,333
Arborist Continuing Education	14,857
Building Better Child Care	7,891
Building Strong Families	7,924
Commercial Nursery and Landscape	24,844
Continuing Education in Natural Resources	29,714
Cotton	156,001
Cotton Insect Pest Management	2,806
Dairy	54,410
Economic Development-Leadership and Training	22,319
Economic Development-Promoting Business	12,744
Economic Development-Tourism	15,930
Economic Development-Workforce Preparation	15,930
Forest Products Development Center Outreach	4,952
Equine Education	37,308
Family Economics	58,141
Food Safety	44,076
Forestry Awareness	2,229
Fruits and Nuts	117,801
Home Gardens and Grounds	183,239
Healthy Well-Nourished Population	79,238
Family Nutrition Program (FNP)	31,814
Formosan Subterranean Termites	22,451

(continued on page 303)

*Expenditure from federal budget (Smith-Lever 3 b,c,d) in FY 2002 was 20.6% of total Cooperative Extension budget (state and federal). Multi-state (total) and multi-function (total) dollars multiplied by .206 to determine share of Smith-Lever funds attributed to multi-state and multi-function work.

U.S. Department of Agriculture
 Cooperative State Research, Education, and Extension Service
 Supplement to the Annual Report of Accomplishments and Results
 Multistate Extension Activities and Integrated Activities

Institution: LSU Agricultural Center

State: Louisiana

Check one: Multistate Extension Activities
 Integrated Activities (Hatch Act Funds)
 Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures* FY2004
Increasing Farm Profits by Management and Marketing	23,771
Invasive Species Management	2,476
Managing Risks in Agriculture	4,925
Master Cattle Producer	45,562
Master Tree Farmer	21,460
Pasture, Forages, and Small Grains	36,401
Poultry	64,711
Regeneration Alternatives-Natural Resources Management	660
Regional Forestry Forums	56,127
Rice Research Verification Program	25,573
Soybeans and Grain Production	166,731
Spatially Variable Pesticide Application	3,467
Sugarcane Burn Management	6,191
Sweet Potato Insect and Disease Control	11,556
Underserved Forest Landowners Outreach	34,667
Water Quality	20,635
Weed Science	323,062
Wildlife Extension Outreach	54,848
Wood Products Outreach	10,895
Total	9,141,401

 Paul Coreil, Director

 Date

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Check one: Multistate Extension Activities
 Integrated Activities (Hatch Act Funds)
 Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures FY2004
Farm Production Budgets/Market Economics	\$184,636
Crop Genetics/Variety Trials/Variety Recommendations	\$141,649
Insecticide Efficacy/Insecticide Recommendations	\$207,280
Herbicide Efficacy/Herbicide Recommendations	\$79,072
Plant Health/Treatment Recommendations	\$227,095
Food Processing/Packaging/Safety	\$86,977
Animal Health/Treatment Recommendations	\$28,751
Soil Testing/Fertility Recommendations	\$38,685
Animal Waste Management	\$39,014
Total	\$1,033,158

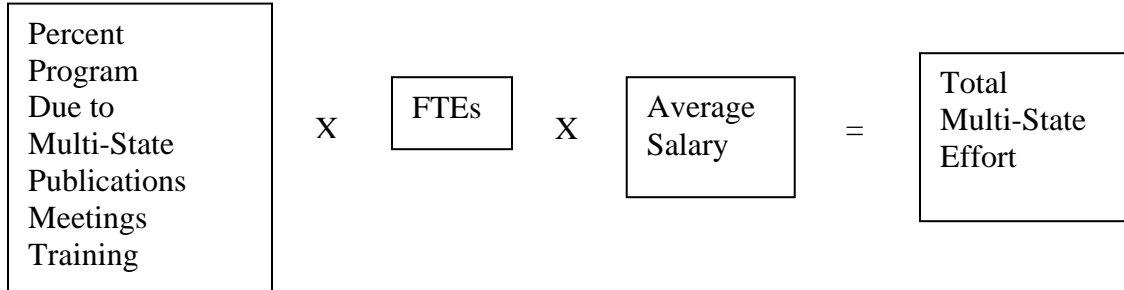
David J. Boethel, Director

Date

MULTI-STATE AND MULTI-FUNCTION BRIEFS

The LSU AgCenter is fully engaged with other institutions. Many of the materials, ideas and programs have come from other states. The free sharing of materials, ideas and programs at regional and national scientific meetings is the strength of the Land Grant System. Many state faculty assist with agent and producer training in the surrounding states and those efforts are expanding continually. Additionally, all of the recommendations and programs are research-based and research personnel are used extensively in developing recommendations, publications, training agents and producer meetings.

To determine multi-state work, each state faculty estimated the percentage of material, ideas or program that were obtained from other states through publications or meetings. The percent multi-state effort was multiplied by the number of FTEs devoted to the program times the average salary per FTE.



This calculation indicates the total multi-state effort. The federal expenditure on multi-state programs is the actual amount of federal funds devoted to the faculty delivering the program. A similar logic model and calculation was used for integrated activities.

The reports for multi-state and integrated activities are included in the body of the report. The total multi-state and integrated activity and the federal funds accounted for are listed below.

	<u>Total</u>	<u>Federal Portion Accounted For</u>
Multi-State Activity	7,761,816	1,598,934
Integrated Activity	9,141,401	1,883,128