Mississippi State University Experiment Station

MAFES Research Highlights

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Contents

From the Director

Moving into a new century and a new millennium suggests a shift in perspective.

When the 20th century dawned, a group of scientists unknowingly ushered in the Atomic Age when they began exploring the nature and function of atoms, the smallest particle of an element that still retains the identity of that element. The ancient Greeks had first referred to these particles as *atomos*, meaning "indivisible."

Through studying atoms, scientists could now look into elements of matter instead of seeing only what was visible to the naked eye. This discovery ushered in a period that has been referred to as the *Age of Physics*.

During the 20th century, man witnessed the impact of atomic power that dominated a way of thinking. Atomic energy was violently manifested on August 6, 1945, at Hiroshima and three days later at Nagasaki. The awe and terror resulting from these two events almost overshadowed the benefits of

taming atomic energy to use as a power source or for other purposes such as food irradiation.

The new century we are facing has already been pegged as the *Age of Biology*. A branch of this fundamental science, biotechnology, uses technology to reprogram biological processes. This procedure has tremendous potential, particularly in agriculture, and has helped with the development of common foods like bread, cheese, wine and beer. More recently, biotechnology research has led to the development of antibiotics, insulin, Bt cotton, recombinant DNA and interferon.

Agricultural research has been the focus of MAFES since its establishment in 1878. MAFES is still committed to developing profitable production systems for those commodities and enterprises that have been the cornerstone of Mississippi agriculture over the last 100 years. Research in new areas such as biotechnology, remote sensing, environmental monitoring, animal waste management and food quality and safety are important tools and have much potential for improving agricultural production in Mississippi.

With check-off dollars from the Mississippi Soybean Promotion Board, MAFES is producing extremely useable and highly versatile products from this crop once used only for forage. Learn more about several of the projects in the following article.

A highly destructive imported species of termites, *Coptotermes formosanus*, is spreading across the coastal South, and several MAFES researchers have joined with USDA researchers to learn more about them. Read about their efforts in the Termite article.

The Mississippi Gulf Coast is a major supplier of several types of seafood, and MAFES research is ensuring safer handling and packaging of these valuable commodities. Read about Custy Fernandes' research on shrimp and oyster processing in Shellfish Safety.

Several MAFES horticulturists have received federal funding to improve the green industry in south Mississippi. See Green Research Grows at Poplarville.

For the past century, MAFES has worked to keep Mississippi at the forefront in agriculture and pledges to do the same for the coming century. And, as always, we welcome you at Mississippi State University in Starkville or at any of our Experiment Stations located across the state.

Vance H. Watson
Director

Soybeans -- It's Soy Good for Mississippi

by Rebekah Ray

Soybeans and soy derivatives are being used in a variety of places -- coffee creamers, salad and cooking oils, diesel fuels, pesticides, paints, pharmaceuticals, linoleum backings, vinyl plastics, shampoos, chocolate and candy coatings, mayonnaise, cosmetics and bakery products, as well as soy foods like miso, soymilk, soy sauce, tofu and tempeh. Note that *Highlights* is printed with soy ink. These many uses are great news for Mississippi's soybean producers.

MAFES is continuously conducting research on this valuable commodity, which contributed more than $290 million to the state's economy last year. Its value as a row crop is second only to cotton. End-of-the-year records for 1998 showed that Mississippi harvested 2 million acres of soybeans, with top production coming from Bolivar, Sunflower, Coahoma, Washington and Leflore counties.

"Soybeans top the number of acres farmed and hold the number-two spot in value, with production

increasing. State average yields during the 70s and 80s averaged 21-22 bushels per acre. During the 1990s, state average yields have increased to 26.6 bushels," said Tom Jones, Mississippi State University agricultural economist.

Change is taking place in Mississippi soybean production and is very positive, Jones said.

"Research by MAFES scientists and MSU Extension Service's SMART program, conducted by Alan Blaine, is helping farmers gain knowledge that will increase their bottom-line profits. MaryAnne Drake's soy protein yogurt will increase the demand for soybeans, while Nancy Reichert's development of a new method for introducing DNA into soybean plants will improve characteristics of the plant," said Truett Bufkin of the Mississippi Soybean Promotion Board (MSPB). Both of these researchers have received patents for their work on soybeans (see story on MAFES patents in *Highlights* 62:3).

MAFES researchers Normie Buehring (Northeast Mississippi Branch Experiment Station superintendent/agronomist), MaryAnne Drake (MSU food scientist), Gabe Sciumbato (Delta Branch Experiment Station plant pathologist), Nancy Reichert (MSU horticulturist) and David Shaw (MSU weed scientist) are conducting research that will enhance and improve soybean production in Mississippi. Summaries of several MAFES and MSPB projects are included here.

Evaluation of Maturity Group V Soybean for ESPS (Buehring). The early soybean production system (ESPS), which has been successful in the Midsouth and the Mississippi Delta has had very limited success and acceptability in North Mississippi. A lack of adapted maturity group (MG) IV soybean varieties has been a major factor for the limited success.

Little research has been reported on using MG V varieties in the ESPS. Initiated in 1999 through a grant from the MSPB producer check-off program, this research can identify MG V varieties that are as productive when planted in mid-April as they are when planted in mid-May. This research has the potential to allow growers to take advantage of the ESPS, which eliminates the negative aspects of a muddy harvest situation that causes harvest losses, rutted fields and delayed land preparation, all of which are often associated with MG VI varieties in north Mississippi.

Soybean Row Spacing, Population Density and Herbicides on Sicklepod Management (Buehring). Sicklepod, a weed pest in soybean production in the Southeast, reduces yield up to 35 percent. In 1997 and 1998, the MSPB funded research to investigate how reducing soybean row width and increasing soybean seeding rate affected sicklepod management and soybean yield. These combinations were evaluated using both conventional and Roundup Ready varieties with single or sequential herbicide applications.

Research with both varieties showed that reducing row width from 30 to 15 inches improved sicklepod control or increased soybean yield under good growing conditions. Further reduction in row width from 15 inches had little effect. In the conventional varieties, reducing row width to 15 inches coupled with increasing seeding rates from four to eight seeds per foot of row increased late-season sicklepod control and soybean yield by 11 bushels per acre. However, yield with the eight-seed-per-foot treatment using a pre-emergence herbicide application only was equal to yield with the four-seed-per-foot treatment using both pre- and postemergence herbicide applications.

With Roundup Ready soybeans, planting eight seeds per foot of row in 15-inch rows reduced the need for a second Roundup application and increased yield by eight bushes per acre. Reducing soybean row width to 15 inches in combination with increased seeding rate may be an economically viable option, especially with the Roundup Ready system.

Incorporation of Soy Protein in Dairy Yogurts (Drake). Soy is a healthful food source and is a common ingredient in Asian diets. In the U.S., however, human consumption is low, and traditional foods with soy protein have chalky textures and marked off-flavors.

To overcome these undesirable traits, Drake developed a method to incorporate the benefits of soy protein into yogurt. Last spring, she applied for a U.S. patent for this process.

At the Worldwide Food Expo in Chicago on Oct. 27-31, Central Soya, Inc. offered 2,000 samples of lemon-flavored soy protein yogurt developed through Drake's process. Based in Ft. Wayne, Ind., Central Soya acquires agricultural products and markets them to agricultural, food and industrial distributors.

Seedling Disease Research (Sciumbato). There has been a dramatic shift to ESPS in Mississippi that has involved planting MG IV and V soybeans as early in the growing season as possible. These beans can be planted up to six weeks earlier, when weather and soil conditions are much cooler than conventional planting time, but the seeds and emerging seedlings are more susceptible to diseases such as *Pythium* and *Phytophthora*. Sciumbato researches the effectiveness of chemical and biological seed treatments and seed treatment rates and timings.

Resistance or Tolerance to Major Soybean Diseases (Sciumbato). More than 220 soybean varieties are entered each year in the Mississippi Soybean Variety Trial (MSVT). The normal lifespan of a soybean variety is three to five years, so about 28 percent of the entries each year are new. Sciumbato conducts greenhouse, growth chamber and field trials to determine disease resistance or tolerance to *Phytophthora* root rot, soybean mosaic virus, bean pod mottle virus, charcoal rot, stem canker, frogeye leaf spot and *Phomophsis* blight. Several results follow.

Phytophthora *root rot*. *Phytophthora* has been a limiting factor to soybean production on heavier Mississippi Delta soils. More than 50 races of root rot have been identified so far, with five races found in Mississippi soybean production. No variety has complete resistance to all races. Sciumbato and MAFES entomologist James Robbins identify the major races present and have named several possible new races in Mississippi.

Soybean Mosaic and Bean Pod Mottle Virus. Variety yields are checked for resistance and susceptibility to soybean mosaic virus and bean pod mottle virus. Test plots are grown under "no" or "high-disease" pressures and are monitored for yield losses due to viruses. During periodic visits to variety trial locations, Sciumbato and Robbins look for soybean diseases and collect insects to check for soybean mosaic virus or bean pod mottle virus.

Charcoal Rot Sensitivity. The fungus that causes charcoal rot produces a toxin that Sciumbato and Reichert use to screen soybean varieties. The toxin was found to inhibit seedling growth. The researchers have found large differences in susceptibility of soybean varieties, breeding lines and tissues to this toxin. Soybeans that are resistant to this toxin will be screened in field trials to determine resistance or tolerance to charcoal rot.

Development of Value-Added Soybeans (Reichert). Genetic enhancement involves introducing DNA into plants for regeneration. For soybeans, many researchers use a regeneration system that requires the careful excision of immature seed embryos from developing pods, a technically precise process that necessitates continual maintenance of plants under appropriate conditions. When this system is used to introduce DNA, only a few, non-agronomically acceptable genotypes are capable of regeneration. For incorporation of the new DNA into commercial varieties, six to eight generations of backcross breeding are needed.

Reichert developed a unique, patented procedure to regenerate soybean plants more easily and efficiently. The process uses seedling stem (hypocotyl) tissues taken from ordinary mature seeds one week after germination. Since no plants have to be maintained continuously, tissue manipulations are easier. This process has successfully regenerated soybean plants from all 15 varieties (MG IV -- VI) tested to date.

When used to introduce DNA, Reichert's method worked with the new variety Bolivar (MG V) that U.S.

Department of Agriculture soybean breeder Jeff Tyler developed (see New Soybean Variety Developed). Because DNA can be introduced directly into the desired variety, no backcrossing is required, although several years of testing must be done.

Reichert, Sciumbato and Tyler are cooperatively researching methods to develop value-enhanced soybeans and are especially interested in developing soybeans resistant to bean pod mottle virus and soybean mosaic virus. There is some natural resistance to soybean mosaic virus in several genotypes, but the resistance is strain-specific, and soybeans have no natural resistance to bean pod mottle virus.

This process of genetic implanting should enable any genotype to be genetically altered so that genes of interest can be introduced directly into the elite soybean varieties of interest, and the time needed for developing and marketing new transgenic varieties will be shortened.

Expert System for Herbicide Recommendations (Shaw). The computer program MSU-HERB, a modified version of a program originally developed by North Carolina State University, has been developed and tested in Mississippi through the support of the MSPB.

Users input weed species, weed size, weed population per 100 square feet, environmental conditions, herbicide costs, expected soybean yield and selling price. The program calculates estimated yield and dollar losses from weeds present, computes the efficiency and net returns for all available herbicide treatments, and produces a list of recommended treatments ranked in order of net returns. It also indicates whether using a no-treatment approach will provide a positive net return, utilizing a threshold-based weed management approach rather than automatic herbicide applications. In 1998, the program was expanded to include transgenic soybean varieties with Roundup Ready and Liberty Link.

The software can demonstrate benefits of choosing the right herbicide for the specific weed spectrum in a field instead of treating all weeds present with one herbicide. Current research is evaluating combinations of Roundup with conventional herbicides for input into the program.

Economics of Roundup Ready and Conventional Soybeans (Shaw). Field studies conducted over the last four years determined beneficial and detrimental aspects of conventional and transgenic variety/herbicide programs. Low- and high-input systems were used with the highest yielding conventional and Roundup Ready varieties to compare both herbicide effectiveness and economics of the systems.

Yields from Roundup Ready varieties were comparable to conventional high-yielding varieties in most instances. Weed control was comparable within each level of input. And overall net returns favored the Roundup Ready systems in most cases. However, the research also indicated that reliance on a total postemergence system required the grower to make applications much more quickly, with a smaller application window than when soil-applied herbicides were used to prevent early weed infestations.

Overall, net returns favored reducing herbicide application rates from those suggested on the herbicide product label.

Preharvest Weed Control Programs in Early-Maturing Soybeans (Shaw). As Mississippi producers continue moving toward earlier-maturing varieties of soybeans, mid- and late-season weed infestations are causing substantially more problems with harvesting because warm weather promotes weed growth. Weed populations lower than those normally considered a threshold can cause significant economic problems with harvesting and quality.

In this investigation, a preharvest treatment was identified that had not been previously evaluated. The treatment, paraquat plus sodium chlorate, was extremely effective and economical for a broad spectrum of weeds. Soybean quality and yields were not adversely affected with preharvest applications timed as early as 75 percent leaf drop.

Redvine Control Programs in Soybeans (Shaw). Earlier work supported by the MSPB indicated that Banvel or Roundup applied after soybean leaf drop but before harvest could effectively control redvine, a difficult perennial weed. More recent studies have found that applications of Roundup during the season in Roundup Ready soybeans can also be used to reduce redvine populations in subsequent years.

Increasing the Roundup rate and applying an additional application later in the growing season enhances control. In-season applications at rates used for annual weed control may be as effective as more costly preharvest weed control treatments, and these are expenditures that would normally be incurred in a Roundup Ready weed control program anyway.

Future research will address the benefits of in-season Roundup applications over multiple years from an annual and perennial weed control standpoint as a systems approach.

Site-Specific Weed Management (Shaw). In conjunction with the NASA Stennis Space Center in Picayune, research is being conducted to evaluate the potential of using aerial hyperspectral images to determine where weed infestations are in fields and then identify species based on differential reflectance patterns. Fields in Mississippi's Delta and Hills, as well as plot research sites at experiment stations, are being surveyed.

Although still early in its development, this research could tremendously impact the economics and environmental aspects of weed management. Precision applications of herbicides through maps generated by remote sensing can help reduce herbicide usage which will provide economic benefits.

For more information on MAFES soybean research, log onto http://www.soybeans.msstate.edu .

New Soybean Variety Developed

by Laura Martin

A new soybean variety should be ready for Mississippi farmers by 2001, said researchers with the U.S. Department of Agriculture and MAFES. The new cultivar, Bolivar, is a high-yielding variety that adapts to the clay soils of both the Lower Mississippi River Valley and in east Mississippi.

Variety Trial Yields of Bolivar

Site	Irrigated/Non	Bushels/Acre
Delta		
Clarksdale	irrigated	65.6
Stoneville	irrigated	76.5
Hollandale	irrigated	61.9
Hills		
MSU	non	45.1
Prairie	non	36.3
Bolton	non	27.8

"A shortage of good public soybean varieties in the state prompted the release of Bolivar," said Jeff Tyler, research geneticist for the USDA at Stoneville. "Yield of the new variety has averaged about three to five bushels per acre more than Hutcheson. In Mississippi, Bolivar averaged 11 inches taller in height and matured one day later than Hutcheson."

Agricultural Research Service scientists at Stoneville developed the new conventional soybean variety. During experimental tests, Bolivar's total average plant height was 33.5 inches, with an average yield of 46 bushels per acre in irrigated and non-irrigated tests.

Bolivar is named for Bolivar County, which is known for the many soybeans grown there each year. It has purple flowers, tawny pubescence, tan pods at maturity and dull yellow seeds with black hila.

The new variety can be valuable to public and private soybean breeders as a germplasm source for yield and pest resistance. Bolivar has shown field tolerance to *Phytophthora* root rot and is resistant to stem canker and soybean cyst nematode.

In the spring of 1999, USDA provided breeder seed of Bolivar to MAFES for multiplication. Working with contracted seed producers, MAFES will oversee stages of seed certification.

"Our foundation seed increase performed very well, yielding 64.5 bushels per acre," said Randy Vaughn, manager of MAFES foundation seed. "As a result, roughly 3,400 bushels of foundation seed will be available to registered seed producers in the spring of 2000."

The foundation seed serves as the link between the seed-producing public and the plant breeder. Quality tests are done in each stage to measure seed conditioning, germination and purity.

After harvesting, the foundation seed is sold to interested seed companies in the state. They will, in turn, plant the seed and sell their crop as registered seed in 2001, said Vaughn.

"Preliminary test results for seed germination and purity of this production have also been encouraging," Vaughn said. "Assuming all goes well, registered seed will be available for 2001 production and considerably more volume of certified class seed in 2002."

Termites

by Rebekah Ray

Roll up the red carpets, shut the doors and close the windows! Termites are never welcome, especially not the new species of the wood-eating pest that is munching its way across the coastal South.

Formosan subterranean termites, *Coptotermes formosanus*, are a formidable foe across the Mississippi Gulf Coast. Formosans also have been found in Alabama, Florida, Georgia, Louisiana, Texas, Virginia, Arkansas, California, Hawaii, New Mexico, North Carolina and South Carolina.

A team of MAFES researchers has joined the U.S. Department of Agriculture's Agricultural Research Service (USDA-ARS) and several other coastal states to take aim at this intruder. Mississippi researchers are exploring the rural-urban interface to see how Formosans may be moving into forests and other wooded areas.

"Formosan termites have been found as far as 70 miles inland in Mississippi. They have been detected from eastern Texas to South Carolina and Hawaii and are profuse in the French Quarter in New Orleans, where a 15-block area is being treated by Louisiana State University and USDA," said David Veal, head of the Coastal Research and Extension Center (CREC) in Biloxi.

In addition to Veal, the investigative team includes MAFES environmental scientist Cathy Hollomon and MSU Extension Service agribusiness specialist Jerry Harper, who are also based at the CREC. Other team members include MAFES agronomist Carl Hovermale and MAFES horticulturist Patricia Knight, who are based at the South Mississippi Branch Experiment Station in Poplarville. Janine Powell, a USDA-ARS entomologist from Stoneville, leads the investigation. MSU postdoctoral research associate Changlu Wang works with Powell. These researchers spent the past year surveying south Mississippi to learn more about Formosan termites.

Economic Impact. Formosans are considered one of the most destructive and aggressive termites in the world, having caused about $1 billion annually in damage and control measures in more than a dozen Sunbelt states.

"We know a great deal about native termites found in our warm, moist climate, but Formosans are more aggressive and more difficult to destroy. Any time there is a non-indigenous pest with the potential to cause damage as this one does, you have to learn more about it to fight it. We've just finished the first year of surveying south Mississippi to learn about the spread of the termite," Veal said.

Formosan Characteristics. Formosan subterranean termites are native to China and were imported into Taiwan (formerly known as Formosa). They were first discovered in the U.S. in 1965 and are believed to have stowed away in wooden packing crates sent home from the Orient following World War II. The termites entered this country through ports in New Orleans and Lake Charles, La., Galveston and Houston, Texas, and Charleston, S.C. After the war, these crates and pallets probably were used for building materials or ended up in landfills to be buried under soil, a haven for subterranean termites.

"Even though Formosans feed voraciously, they are slow to increase in numbers. We've just begun to see the damage they're causing. That's another problem with this pest, you're not likely to notice them until it's too late," Veal said.

Like native termites, Formosans are social insects and exist in colonies that feed on wood cellulose.

Native termites live underground, as do Formosans, but Formosans also create nests made of "carton," a mixture of chewed wood, saliva and excrement. These allow them to tap into water sources like leaking pipes or air conditioning ducts.

Formosans live in a caste system composed of workers that do the tending, feeding and tasks necessary for the colony to survive; soldiers that defend the colony against intruders or invaders; alates or the winged reproductives that swarm from late April through June; and kings and queens, which are former alates whose sole function at this stage is to mate and produce eggs. A colony may contain up to 10 million individual workers and soldiers.

It is thought that each queen can produce 2,000 eggs each day. Additionally, Formosans have the potential to live many years.

"At night during mating seasons, swarms of alates abandon their cartons to set up new colonies. In New Orleans, some evening ballgames have had to be cancelled because of the great number of alates hovering under the lights. Less than 1 percent of the alates will succeed in starting another colony," Veal said.

After a colony is established, Formosans are extremely destructive and consume wood faster than other subterranean termites. Since Formosans are weak fliers, they do not spread rapidly on their own but are transported through infested soils or other materials.

"Since these critters are not very adept at flying, they move best by infesting lumber such as railroad ties, landscape timbers or wood products, or even through infested mulch," Hollomon said.

In addition to infesting wooden structures, Formosans have been found attacking 47 species of plants, including trees such as citrus, avocado, wild cherry, cherry laurel, ligustrum, hackberry, cedar, willow, tallow, wax myrtle, sweet gum, mimosa, cypress, red bud, Chinese elm and oak. Formosans have also been found in sugar cane and pine stumps.

"They've attacked creosote poles in Hawaii. Not much is immune to them, and they find the most minute cracks to get through to the underlying wood," Veal said. "The little sneaks have been known to pass through cement, lead, asphalt, plaster, mortar, rubber, brick, plastic, Styrofoam and even PVC pipes to find food sources."

MAFES Research. Because the best way to overpower these destructive little creatures is through a

community effort, MAFES has joined other coastal states to understand the impact of Formosans and to develop ways to hinder their destruction.

"We're evaluating Formosans in four areas, including surveying and consulting with local exterminators, identifying tree hosts through remote sensing, developing techniques to stop their infestation of houses and buildings, and evaluating various baits and treatment protocols in housing developments," Veal said.

Surveys of local pest control operators. Initially, the investigators needed to determine locations and population sizes of Formosans in the Gulf Coast area of the state. Researchers disseminated 122 surveys to landscape contractors and pest control operators from Hattiesburg to the Coast. Many responded that if Formosans were found, they would not guarantee the effectiveness of treatments because the pest is so difficult to kill.

"We're finding that all forms of Formosans except soldiers look very much like native termites. 'Live' nests are difficult to find for further study and evaluation because when home or business owners learn they have termites, their first response is to call an exterminator," Veal said.

To determine levels of Formosan infestations, Knight, Hovermale and Hollomon placed sticky traps on light poles in three transects: Highway 98 from Hattiesburg to the state line; Interstate 10 from Stennis Space Center near Picayune to Alabama; and along Highway 26.

"The traps showed evidence of colonies on the Coast, in Picayune and in downtown Poplarville, where we've discovered an entire block is infested," Hovermale said.

Use of remote sensing to identify tree infestations. Formosan termites have been found in virtually everything, even living trees. In forests, remote sensing may help identify areas where they settle.

"We're using remote sensing and fly-overs to ascertain current infestations in City Park in New Orleans and other areas in New Orleans," Harper said.

Developing techniques to manage Formosan spread. Unlike native termites, Formosans can live above ground or underground and tunnel to get inside a house to build a carton nest.

To deter movement of the pests, horticulturists and agricultural engineers are testing various techniques such as creating landscape barriers and placing stainless steel mesh between foundations and housing construction.

"Hurricane Georges left many trees broken last year. In New Orleans, many trees had been weakened from infestations of Formosans. Unlike native termites that eat the soft wood of tree rings, Formosans hollow the tree out," Knight said.

Evaluating baits and treatment. There are many termite baits on the market, but traditional treatments do not work on Formosans, which cause more concentrated damage and are more difficult to control.

"We want baits for general use because right now, individuals are being advised to call professional exterminators, many of whom will not guarantee successful treatments of these termites because they are so hard to eliminate," Hollomon said.

"If not treated at the community level, Formosans can infest previously treated areas. They are extremely strong survivors," Harper said.

Formosans may have natural predators in the Orient, but they remain unchecked in the South. The wood-eating pest seems to resist chlordane, an effective organochlorine termiticide that was banned in 1988.

"We've studied both native and Formosan termites for many years but still don't know or understand much about either. By working with area states and USDA-ARS, we're trying to learn all we can about *Coptotermes formosanus* so Mississippians can better handle the little foe," Veal said.

Shellfish Safety

By Rebekah Ray

Safer Processing On Horizon For Mississippi Seafoods

The harvesting and processing of seafood delicacies such as shrimp and oysters is becoming a major industry along the Mississippi Gulf Coast, and MAFES seafood researcher Custy Fernandes is investigating ways to speed up the procedures, which will lead to safer seafood.

Fernandes has received more than $250,000 in grants from the Gulf Coast Industry Initiative (GCII) to develop methods to mechanize seafood harvesting and processing, which will increase productivity on the Coast. The GCII is a competitive grant awarded by the National Sea Grant and the National Oceanic and Atmospheric Administration (NOAA). Sea Grant protects the Great Lakes and oceans, while NOAA, a unit of the U.S. Department of Commerce, safeguards the environmental and economic well-being of coastlines.

"Over the last five years, there has been extensive economic growth on the Coast. While this has greatly benefited the region, it has also plugged into the available workforce needed by the seafood industry to process and package seafood harvests. Seafood processors are looking for ways to continue harvesting and processing seafood faster and maintain its safety," Fernandes said.

Seafood processors along the Gulf Coast have been very supportive of research done by Fernandes.

"I asked them what they needed to stay competitive and they opened the doors of their facilities. Their support of Mississippi State's research has helped me get additional funding," Fernandes said.

Seafood is very important in human diets and has been marketed as such because of its high levels of essential nutrients such as valuable polyunsaturated fatty acid and minerals. The quicker seafood is processed after harvest, the greater its safety.

Shellfish are categorized by shell structure as either crustaceans or bivalves. Crustaceans include shrimp, crab and crawfish, while bivalves include oysters, clams, mussels and scallops. The majority of seafood harvesting in Mississippi focuses on shrimp, oysters and crab.

SHRIMP The Mississippi shrimp season opens each May with the Blessing of the Fleet. The actual opening date varies each year and is determined after the Bureau of Marine Resources decides that shrimp are large enough to be harvested.

Historically, family-owned and -operated companies have processed shrimp manually along the Mississippi coast. During the last 30 years, shrimp processing has shifted from manual to mechanized processing, because of computers and process controllers. Mechanized processing enhances processing volumes and reduces processing time, thus sustaining food safety. Mississippi's seafood harvesting and processing businesses compete with companies located on the Pacific and Atlantic coasts.

"The per capita consumption of shrimp is rising all over the United States because shrimp is a delicacy people enjoy. Furthermore, shrimp can easily be added to both American and international cuisine," said Brian Gollott, vice president of C.F. Gollot and Son Seafood in Biloxi, one of the largest shrimp processors on the Mississippi Gulf Coast.

Gollott and his younger brothers, Arnie, Dale, Nicky and Ben, are the fourth generation to manage the family-owned shrimp-processing facility located on Biloxi's Back Bay. C.F. Gollott handles one of the highest volumes of shrimp production on the Coast and is one of a few Mississippi shrimp processing plants that operates year-round.

Shrimp is the most widely consumed seafood. Mississippi's modernized shrimp processing plants work year-round. This gives flexibility to shrimp harvesters in delivering their catch to processors. To ensure fast processing and increase food safety, shrimp can be unloaded, processed and packaged within 15 minutes because of mechanical processing methods like those now in use at C.F. Gollott and Son that were developed through MAFES research.

Weather dictates shrimp harvesting, with prime fresh harvesting occurring from May through December. During the remaining months, C.F. Gollott and Sons processes fresh domestic and frozen imports from all over the globe. Imported shrimp come primarily from Venezuela, China, Ecuador and Honduras.

"Gulf Coast shrimp are the best of all species, and imports keep the product available year-round for our customers," said Gollott.

Part of the research conducted by Fernandes is transferred to the processing plants through methods such as teaching Hazard Analysis Critical Control Point (HACCP) classes, educating shrimp dealers and processors about shrimp viruses, and investigating uses for by-products.

"When MAFES administrators toured our seafood processing plant last April, their visit created a very strong impression in our minds about MAFES administration's research support for Mississippi's agricultural business," Gollott said.

No part of the shrimp is wasted. Meats are packaged for consumption, while by-products like shells and heads are used in livestock feed and for fertilizers.

"HACCP classes taught by Custy and David have helped us process and package safer shrimp. We know how to process, package and sell shrimp, but MAFES research helps keep us abreast of new technological advances and food safety issues," Gollott said.

OYSTERS The Gulf of Mexico has a large reservoir of wild and farmed oysters. Production of oysters could greatly benefit Mississippi's economy, but labor needed for harvest and shucking is in short supply. Oysters are generally harvested from mid-October to late May, with most of the harvesting along the Gulf Coast done manually by family operations. Harvesting processes currently used are labor-intensive and expensive.

Other oyster-producing areas of the country use mechanical equipment to harvest the bivalves from oyster reefs. To remain competitive, Mississippi's commercial harvesters and processors could benefit from faster harvesting and processing methods of oysters. Mechanization would reduce the oyster cost per sack, give the state's oyster industry an economic edge over producers along the Atlantic and Pacific coasts, and sustain product safety.

Oysters are eaten raw or cooked. Because of their stationary nature and filter feeding practices, oysters tend to accumulate metabolites, or digestible materials. Oysters are the shellfish most commonly eaten raw, a custom people have practiced for centuries. However, these bivalves may also contain potentially pathogenic microorganisms that can present a health risk to consumers who eat raw oysters. This risk is more severe to individuals with weakened immune systems.

Oyster farmers and processors feel that consumers' reluctance to eat raw oysters has reduced consumption of the bivalve. Oyster processors are now experiencing economic hardships and are questioning how their industry will survive.

Between 1975 to 1986, states surrounding the Gulf of Mexico harvested 18.8 million pounds of oysters, and annual sales of raw oysters were $24 million. Between 1987 and 1996, yields were 17.2 million pounds, with annual sales at $38 million. Fear of a food pathogen known as *Vibrio vulnificus* has been blamed for the lack of sales growth. *V. vulnificus* is a common, naturally occurring bacterium that may be fatal when consumed by immuno-compromised individuals.

Because of its tendency to harbor naturally occurring pathogens, the oyster is perhaps the most regulated seafood. Raw oyster shellstock is harvested from approved growing areas, a process mandated by state and federal requirements.

To ensure public health and consumption safety, every sack of oysters is tagged at each step, starting on the boats. Tags indicate that the oyster sack originated from an approved area and reef open for harvesting. Information on the tags includes date harvested, state of harvesting, location and area, harvester, identification number and dealer name. Processing is color-coded by state, so Mississippi-processed oysters receive yellow tags, while Louisiana-processed oysters receive white.

"In modern oyster processing, record-keeping is enormous and is so well-regulated and tracked that chances of consumers getting sick is minimal," said Jordan Bradford, owner of Bradford Seafood Company in Pass Christian.

Oysters are the only seafood tracked so extensively. There is also a label on each package of oysters cautioning immuno-compromised consumers against using the product. Yet, even with warning labels, the industry is held accountable for the safety of the seafood products, Fernandes said.

"The regulations have helped the industry because harvesters are taking correct precautions, which is helping Mississippi supply safe oysters," Fernandes said.

Three grants will enable Fernandes to evaluate consumer attitudes toward irradiated oysters, develop mechanized methods for harvesting seafood and develop mechanized methods to process oysters.

Evaluating Consumer Attitudes toward Irradiated Oysters. In 1995, the USDA published new regulations to improve the nation's seafood supply. Because of concern toward pathogens in oysters, the Center for Science in Public Interest petitioned the Food and Drug Administration to require all seafood processors to show zero tolerance for *V. vulnificus*. These requirements, if adopted, would severely limit the marketing of live oysters.

Of several suggested methods for meeting these standards, one includes treating oysters with radiation. Consumers have accepted irradiated foods such as spices, meats, fruits and vegetables. Irradiation improves safety and extends shelf life, and has proven successful in reducing levels of *V. vulnificus*. Since irradiation alters sensory attributes, consumer attitudes and preferences to irradiated oysters need to be assessed.

Mechanized harvesting. Per-acre oyster yields along the Gulf Coast are lower than yields along the Atlantic or northwest Pacific coasts, where oyster harvesters use mechanization. Converting mechanized processes used for harvesting other shellfish will reduce operating costs of oyster harvesting in Mississippi.

"We plan to develop machines to harvest oysters from bedding grounds and increase harvests in a shorter period of time. It's a win/win situation," Fernandes said.

In mechanical dredging, oysters are harvested with a dredge or tongs from reefs and then transported to the harvesting vessel using hydraulic pumps.

The Mississippi oyster industry supports Fernandes' research. Because of cooperative letters written by

the state's 12 oyster processors, he received the highest amount of funding awarded nationally to a single person this year by the GCII.

"This research will advance the industrial practices by shifting it to mechanization that will sustain and promote food safety," Fernandez said.

Mechanized processing. In processing, raw oysters are shucked and then packed in crushed ice for chilling and transportation. Oysters are shucked by forcing a knife between the two shells and cutting the adductor muscle from the shells. Because the workforce is decreasing, oysters are being shucked with hammers and knives, a process that can damage the oyster and reduce meat yields.

Shucked oysters are then washed either on perforated trays called skimmers or with air agitation, in which meats are placed in tanks of water and then agitated by air introduced at the bottom of the tank. Both methods remove mucus, pseudo-feces, mud and shell fragments.

To remain competitive, oyster processors are looking at other methods to reduce their dependency on labor. Developing a mechanized process for shucking oysters could greatly help the industry remain competitive.

Additionally, the Food and Drug Administration requires that processors develop a HACCP plan. Because of HACCP, processors keep extensive records at identified critical control points, including receiving and storage of live and shucked oysters. Practices developed by the National Shellfish Sanitation Program (NSSP) suggest that each sack of oysters should be shucked within a one-hour period. After shucking, the internal meat temperature should be reduced to less than 45°F within two hours.

Mechanized processing reduces processing times. A process that facilitates the opening of oyster shells will help Mississippi oyster processors comply with mandatory NSSP requirements.

Mississippi is fortunate to have diversification with its agricultural crops, which includes field crops, ornamentals, poultry, livestock, forestry and seafood. MAFES improves product quality and yield, and through research at the Coastal Research and Extension Center units in Biloxi, Pascagoula and Gulfport, the Experiment Station keeps Mississippi competitive in the seafood industry.

	Shrimp (1998)*	Oysters (1996)*
Mississippi Landings	10,049,000 pounds	1,623,000 pounds
Gulf of Mexico	155,002,000 pounds	18,732,000 pounds
Dockside Values of MS Landings	$20.49 million	$2.50 million
Plant-gate values	$143.91 million	$6.30 million
Estimated Annual Economic Impact of Harvesting and Processing	$125 million	$10 million
* Most recent figures available. *Figures provided by MAFES marine economist Ben Posadas.*		

Green Research Grows at Poplarville

by Rebekah Ray

Horticulture, the "green industry," is one of the fastest growing areas of agriculture and includes fresh-cut flowers and foliage, potted flowering and foliage plants, bedding plants, perennials, annuals and bulbs, shrubs, trees, cut Christmas trees, seeds and other propagative materials.

MAFES horticulturist Patricia Knight at the South Mississippi Branch Experiment Station in Poplarville received a federal grant to work jointly with the U.S. Department of Agriculture Small Fruits Research Center to expand ornamental research in south Mississippi. Through this funding, MAFES and USDA researchers will help solve problems that have hindered expansion of the ornamental industry.

The funding will also enable MAFES to add an urban horticulturist to address post-production ornamental concerns, a floriculturist to support the greenhouse industry and a plant physiologist to provide an interface between basic research and applied problems. Also on the drawing board are plans for more container pad spaces for research and greenhouses to expand herbaceous annual and perennial research.

"By adding new personnel and additional facilities and labs, we can develop the horticulture program and expand our applied research to help nurseries within the state," Knight said.

The population across southern Mississippi is growing and nurseries here are expanding. This grant will help broaden MAFES research to support the growing horticulture industry, which is centered in Lucedale. With the rapid growth across the Coast, research on landscaping materials is vital to preserve the environment, Knight said.

MAFES horticulture research is located primarily at the South Mississippi Branch, which is a unit of the Coastal Research and Extension Center based in Biloxi.

Horticulture represents more than 10 percent of total U.S. crop cash receipts and is the third largest value crop in the country, ranking behind corn and soybeans.

Poplarville Hosts Fall Field Day

By Rebekah Ray

Most southern horticulturists know hot, humid weather is a part of gardening, so the near 100-degree temperatures did not interfere with the Ornamental Horticulture Field Day on September 9.

More than 70 producers and professional nursery suppliers registered for the 27th annual event at the South Mississippi Branch Experiment Station. The Poplarville station is one of several Coastal Research and Extension Center units, which include facilities in Biloxi, Gulfport, Pascagoula, McNeill and White Sands.

"Because we're located in the U.S. Department of Agriculture's Zone 8 Plant Hardiness Zone, we draw participants from south Mississippi, southeastern Louisiana and south Alabama," said MAFES horticulturist Patricia Knight.

Following a morning walking tour of the ornamental plant research plots, participants attended afternoon discussions related to integrated pest management, fertilization timing and labor issues. Station personnel also demonstrated sprayer calibration.

"We received positive feedback and good responses to our ornamental research. We hope those attending gained valuable information to take with them," Knight said.

Crystal Springs Bursts Into Fall Bloom

by Rebekah Ray

Cars from Alaska, Louisiana, Tennessee, Georgia, Missouri, Indiana, Texas and various counties across Mississippi filled the parking lots at the 21st annual Fall Flower and Garden Fest held Oct. 15 and 16 at the Truck Crops Branch Experiment Station in Crystal Springs.

More than 3,000 participants used the two-day event to walk through the 2.5 acres of gardens, tour the 175-acre station, and attend seminars on food safety, shade gardening, food preservation, growing camellias, rose gardening, making vegetable art, beekeeping, quick vegetable breads, butterfly gardening and birdwatching.

This year's garden festival featured numerous flower varieties, a two-acre vegetable garden, a climbing vegetable trellis, a patio landscape garden, shade and herb gardens and a backyard habitat.

"The orange and yellow colors of the marigold mound were exceptional. I've never noticed before the fragrance of marigolds, but there were so many blooms that I could smell them as I walked by," said Jamie Vickers of Hattiesburg.

Several All-America Selections winners are located in the gardens. The Truck Crops Branch is one of 27 official testing sites for new vegetable varieties. Only two are in the South, with the other in South Carolina.

More than three dozen different varieties of rose bushes bloomed for guests. Located adjacent to the flower garden, a lattice tunnel showcased the climbing vegetable, *Dolichos lablab*, a hyacinth bean profuse with showy deep-purple flowers and bean pods.

"This is a really big deal. With all the varieties of flowers, I can see why people come from all over," said Brian Utley of Starkville.

Agency representatives from the U.S. Department of Agriculture answered questions concerning rural development, natural resources conservation, farm services, food safety and inspection, food and nutrition, forestry, soils and water conservation, and agricultural statistics.

During the week following the event, more than 2,700 second graders visited the gardens.

Formerly called Fall Garden Day, the Fall Flower and Garden Fest has been held since 1979. In addition to MAFES and the Truck Crops Branch, other sponsors of the event include USDA, the Central Mississippi Research & Extension Center and the Mississippi State University Extension Service.

Pecan Field Day Held at Truck Crops

By Rebekah Ray

Pecans are a valued agricultural commodity across the South. On Aug. 12, producers from Mississippi and Alabama gathered at the Truck Crops Branch Experiment Station in Crystal Springs for a Low-Input Pecan Production Field Day. Growers from Georgia, Tennessee, Arizona, Texas, Louisiana and Oklahoma also attended the event.

Almost 100 producers, researchers and extension agents toured several pecan orchards in the area to learn about pecan cultivars and low input.

Low input refers to production practices that use minimum pesticide applications to control insects and disease. The drip-irrigated orchard at Truck Crops has received herbicide applications during the past three years but has never been sprayed for disease or insect control.

One orchard included selections of pecan trees that were thought to have some level of tolerance or resistance to Scab Disease, a serious disease of commercial pecan orchards and home plantings. In the humid South, Scab often causes total crop failure if control measures are not applied. The disease is characterized by black lesions on nuts, which can cause the nuts to fall without producing edible kernels. Since regular, expensive fungicide applications can reduce the risk of crop failure, a highly resistant variety is integral to low-input production.

Mississippi and Alabama pecan producers meet annually for a field day somewhere in one of the states. The event was a cooperative program of MAFES, the Mississippi State Extension Service, the Alabama Extension Service and the Mississippi and Alabama Pecan Growers Associations.

Cattle Management Computer Program Revised

By Laura Martin

As new technologies make life easier, a recently updated computer program is enabling cattle producers to get a better grasp on their herds.

"The Mississippi State University Cattle Program is designed to provide record keeping and production management data to cattle producers, whether they are part-time herdsmen with 30 head of cattle or large commercial operations with thousands of head," said Wallace Killcreas, MAFES agricultural economist.

MSU Cattle replaces an older cattle inventory program that is not Y2K compliant. In January, the new inventory and management software will be offered to cattle producers in Mississippi and other states as a public-domain computer program. MAFES units across the state are already using MSU Cattle.

Helpful in tracking changes and keeping inventory of cattle stock, MSU Cattle can be used to make efficient management decisions to produce healthier and more profitable cattle. In addition, when used consistently the program can help users keep accurate, up-to-date records for taxes and other financial management purposes.

"It is a breakthrough as far as user interface," Killcreas said. "The user enters various types of information and then the program allows him to define groups. The old program is not Y2K compatible and dealt with animals individually. And, MSU Cattle is designed to create reports and spreadsheets. Animal movements are now swifter with a faster processing speed."

Rick Evans, superintendent and animal scientist at the MAFES Prairie Research Unit, agrees that MSU Cattle is user-friendly. He is working with Killcreas to make the program simple yet versatile.

"MSU Cattle allows more user options," Evans said. "The old program did a good job as far as an inventory program. This one has inventory plus some more. It has filters where you can sort cattle, and it also provides worksheets for use in the field since many people don't have laptops.

"We've made a real effort to make the program user-friendly," Evans said. "The old program became defunct as of Dec. 31. We are trying to keep the new program easy to read and easy to access so cattle producers will want to use it and won't find it intimidating."

MSU Cattle uses a Windows setup procedure already familiar to many computer users. The program can

be run on any computer using Windows95 or higher with minimal disk space required. Written in user-friendly computer language called Microsoft Visual FoxPro, MSU Cattle can be installed from a CD-ROM.

MAFES Food Researcher Recognized

By Rebekah Ray

MAFES food researcher Doug Marshall recently received recognition for his research in food quality and safety.

At the Institute for Food Technologists (IFT) annual meeting in Chicago last summer, Marshall taught the short course that he co-developed, "New Software Tools for Product Development."

The course highlighted software that could be used by professional food scientists to make their research more productive.

The IFT, a non-profit professional scientific society for food scientists and food technology employees, offers continuing education courses for food researchers who develop products for food companies.

Additionally, Marshall was recognized as the Distinguished Fellow Lecturer at the 19th Rapid Methods and Automation in Microbiology International Symposium at Kansas State University. An invited lecturer there, he spoke on "Rapid Impedance Methods for Seafood," which he has researched for the last 10 years. His lecture reviewed applications of electronic impedance technologies to determine the quality and safety of seafood.

Terhune Joins MAFES as Fisheries Biologist

By Rebekah Ray

Fisheries biologist Jeff Terhune joined the MAFES research team at the Delta Research and Extension Center (DREC) in Stoneville last spring.

A former MSU Extension aquaculture specialist, Terhune will be working with the applied fish disease research program. His research will include investigating fish diseases such as proliferative gill disease (PGD), a condition causing severe gill damage that could lead to fish suffocation.

PDG is caused by myxosporean parasites released from Dero worms that live as natural inhabitants in pond sediment. Mild occurrences of the disease have been found in all ponds tested recently in the state. PGD accounts for 25 percent of the total cases of fish diseases submitted to the diagnostic laboratory at DREC.

Terhune's research will study how PGD and other diseases impact fish farm production. MAFES and the Extension Service can then help producers determine good management recommendations to minimize the occurrence of PGD.

Terhune received undergraduate and master's degrees in aquaculture, fisheries and wildlife biology and a Ph.D. in microbiology, all from Clemson.

Poston is New MAFES Weed Researcher

By Rebekah Ray

Daniel H. Poston has recently joined MAFES as a weed scientist at the Delta Research and Extension Center in Stoneville.

Poston's research will focus on soybean weed control with emphasis placed on evaluating economic returns associated with planted transgenic crops. He will also examine ways to develop more profitable soybean production strategies in the Delta.

Poston's research includes chemical treatments of smooth pigweed, *Amarenthus hybridus*, and soybean and cotton weed control. He has also conducted weed control research in cotton, corn, tomato, potato and other vegetable crops.

Additionally, Poston was a high school agricultural education instructor in South Carolina, where he developed curricula and supervised adult education opportunities for local agricultural producers.

Poston received a doctorate in weed science from Virginia Tech, and both a master's in agronomy and a bachelor's degree in agricultural education from Clemson.

MAFES Presents Additional Biotech Seminars

By Rebekah Ray

Biotechnology is changing the face of agricultural research, and through the Hearin Biotechnology Project, MAFES offered several seminars this year to underscore its importance.

Funded by the Robert M. Hearin Support Foundation, the Hearin Biotechnology Project Seminar Series is part of the developmental process at Mississippi State University to organize a university-wide multi-disciplinary Biotechnology Institute, which will help Mississippi capitalize on the potential economic benefits offered by biotechnology.

On Sept. 13, Alan Wood, virologist at the Boyce Thompson Institute and professor of entomology at Cornell University, spoke on "Glyco-Biotechnology: Producing Mammalian-type Glycoproteins in Insect Cells." Wood has investigated the production of glycosylated proteins. By understanding glycosylation, researchers can make useful therapeutic proteins using recombinant technology.

In a seminar entitled "Agrivirion Inc., a Biotechnology Company from Then and Now: Startup to the Present," Wood shared his experiences in establishing a biotechnology research company.

On Sept. 27, Raymond Zilinskas spoke on "Implications of Modern Biotechnology for Biocriminality." Zilinskas is a senior scientist at the Center for Nonproliferation Studies of Monterey Institute of International Studies and a professor at Johns Hopkins University.

He gave an overview of chemical and biological weapons and the basic scenarios of biological weapons, which are based on viruses, bacteria, biological toxins and genetically altered organisms. Chemical weapons are inert substances that act on physiological systems, while biological weapons like anthrax are pathological agents that introduce diseases into human bodies and cause fatal reactions.

In a Sept. 28 lecture on "Biological Inspections in Iraq: Lessons for International Arms," Zilinskas spoke on biological-warfare-related inspections in Iraq in 1994.

The Biotechnology Institute will build on existing MAFES strengths to improve the quality of Mississippi commodities, to develop better diagnostic methods for animal and plant diseases, to improve

environmental quality and waste management strategies, and to increase plant and animal resistance to diseases and insects.

Additional information on the Institute can be found in *Highlights* 62:3 and at www.mafes.msstate.edu/biotech/.

'White Gold' Grows in Hills

By Rebekah Ray

Mississippi's reputation as an agricultural state stems primarily from its legacy in cotton production, much of which has historically occurred in 18 Delta counties, but MAFES research is helping this white gold grow in hilly sections of the state.

MAFES cotton research is conducted by breeders Ted Wallace and Roy Creech at Mississippi State University and John Creech at the Delta Research and Extension Center in Stoneville (see related article below).

"Historically, cotton in Mississippi has been grown on about 1 million acres, with close to a third of that coming from non-Delta areas, which are commonly referred to as the 'hill section.' These sections have smaller farms but represent a greater number of producers than the Delta," Wallace said.

The hill section represents a wider range of growing environments, such as soil variations, weather patterns and irrigation practices.

Soils. A result of pre-levee floods that spanned many centuries, the Delta consists of extremely rich and fertile soils deposited by the Mississippi River. Following floods in the 1920s, the river was bound by larger, more secure levees. In other areas of the state, cotton may be grown on smaller deltas of minor rivers or creeks, and the soils tend to be sandier.

Weather. Good cotton production depends on appropriate weather conditions. Cotton yields are best following long hot, dry summers accompanied by timely rainfalls. Cotton prefers annual rainfalls of 60 inches, which should be received at critical times to prevent drought stress, especially during the fruiting stage, or cotton yields can be reduced significantly. Cool, cloudy or rainy days also slow production growth.

Irrigation. Historically, Delta producers have enjoyed high cotton yields because of irrigation methods that supply water when and where needed. Due to the topography of non-Delta ground, much of it cannot be irrigated so it is referred to as dryland cotton, even though it may receive a significant amount of rainfall. Delta fields, however, are usually graded, and center-pivot irrigation methods are used.

Breeding. Most of the breeding for Mississippi varieties takes place in the Delta, but some of these varieties do not perform as well in other parts of the state. Given the concentration of breeding in the Delta, much of Wallace's research has been in developing cotton adapted to the 'hill sections' of the state.

Because the Delta is so important in cotton production, Wallace's cotton is evaluated there also. Breeding lines are evaluated at both research stations and at on-farm sites. With the development of herbicide-resistant, or transgenic, varieties, testing conventional breeding lines at on-farm sites is becoming more difficult because many producers have switched to a weed control program that is not compatible with the conventional, or non-transgenic, breeding lines being evaluated.

Varietal development is a long-term investment of both money and time, taking from eight to 10 years.

"In hill cotton development, we are just now reaching the stage in which several strains of cotton are showing potential in performance," Wallace said.

Three MAFES cotton strains, two of which came from this breeding program, were included in the 1999 Cotton Variety Testing Program for comparison of performance to commercial varieties. Performance in the variety test may take place on up to 12 locations in both the Delta and the hill section and is critical to the success of a variety.

"Controlling weeds is a problem faced by all cotton producers. To test plots that are off-station, I look for producers who use conventional weed control and tillage methods, use pre-emergent herbicides and who will let me test varieties in their fields," Wallace said.

MAFES Profits from Father/Son Researchers

By Rebekah Ray

U.S. Highway 82, the Internet and telephone wires connect a father-and-son MAFES research team who work on opposite sides of Mississippi.

Both Roy Creech and his son, John, are looking for ways to improve Mississippi's leading row crop, cotton. One has a lab at Mississippi State University's Starkville campus and the other conducts research at the Delta Research and Extension Center in Stoneville (DREC).

"Becoming an agronomist was John's decision, and even though he could have been successful in other disciplines, I'm pleased he enjoys working with cotton," said the elder Creech, who researches cotton host plant resistance at MSU. Roy has taught agronomy for 39 years, a career that included 12 years at Penn State University and 27 years at MSU.

"I went into genetics and plant breeding because of an interest in developing new genetic techniques and using those techniques in plant improvement," Roy said.

Like his father, John studied genetics and plant breeding, but he added molecular biology to his list of interests. Roy has also begun molecular biology research.

At DREC, John is responsible for the Mississippi cotton variety trials, which provide the state's producers with needed data to make necessary variety choices. As the Delta's cotton breeder, he researches traits neglected by commercial breeders, notably insect resistance factors like high glanding, nectariless, yellow pollen, adaptation to shorter seasons, and narrow-row production.

Additionally, John works with his father in developing root-knot-nematode-resistant cotton lines that perform well in the Midsouth. John is also evaluating lines developed by former MSU cotton breeders Bob Bridge and Steve Calhoun.

Becoming an agronomist came naturally to John, who as a child wanted to become a farmer. His grandfather had operated a small family farm.

"As a high school kid, I worked summers at MSU's North Farm. Through my father, I was exposed to different aspects of agronomy. Some of the earliest memories I have were going to the fields with him to do plant crosses in corn." John said.

After receiving his master's degree in 1985, John spent several years in the military.

"I still love the work and the personal satisfaction found in agriculture, and in working with Mississippi

producers." John said.