MAFES RESEARCH

HIGHlights

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Mississippi Agricultural and Forestry Experiment Station

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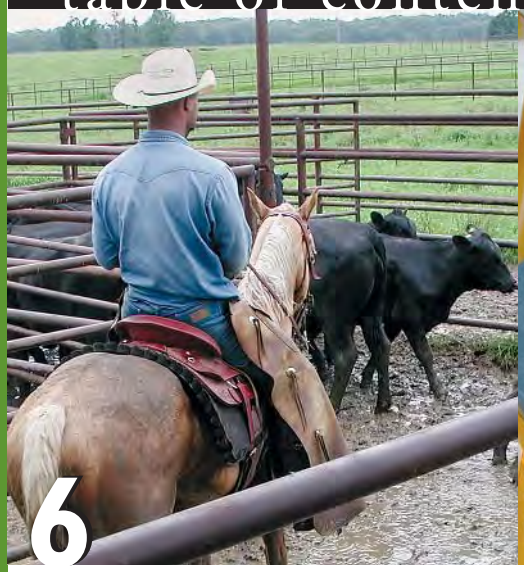

from the DIRECTOR

Ask the average person what goes on at any particular university and you'll likely get answers that include teaching and athletics, not necessarily in that order.

Ask a farmer or anyone else closely involved with agriculture the same question and you'll probably get the same answers, plus research.

MAFES researchers and their counterparts at universities across the nation serve society in a variety of ways. Sometimes they work to head off problems before they occur. That's the case with work being done by MAFES scientists to find ways to control soybean rust before the disease becomes a problem in Mississippi.

Other MAFES scientists are working with colleagues in Mississippi State's College of Engineering to find viable alternative energy sources that can be used to ease the nation's dependence on petroleum products. A promising breakthrough in biodiesel research has been made in the Department of Agricultural and Biological Engineering. Biodiesel is the subject of the article beginning on page 10.

The ultimate goal of research is to use discoveries made in the laboratory to improve some aspect of society. The process is called technology transfer. The results of MAFES research with tunnel ventilation are paying off for dairy farmers, including one Scott County producer who recently installed a tunnel ventilation system in his dairy barn. The story is on page 16.

While football and a new academic year are stirring up a lot of excitement on the MSU campus, there's also exciting things going on in labs on campus and at branch experiment stations throughout the state.

Vance H. Watson
Director

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MAFES RESEARCH HIGHlights

MISSISSIPPI AGRICULTURAL AND FORESTRY EXPERIMENT STATION

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"THESE DISEASES CANNOT BE IGNORED, AND RATES AND TIMINGS OF FUNGICIDE APPLICATIONS FOR RUST AND OTHER FOLIAR DISEASES MUST BE RESEARCHED."

GABE SCIUMBATO

Frogeye leaf spot is one of the soybean diseases already in Mississippi.

SOYBEAN RUST... Battle lines form before disease hits

By Bonnie Coblentz

The battle against an inevitable soybean disease has begun in Mississippi, with researchers and specialists ready to attack rust once it appears in the state.

Soybean rust is a fungal disease spread by spores. It can be carried on the wind for hundreds of miles, transported on people or machinery, or spread by infected plant material. Left untreated, it completely defoliates and often kills a plant, reducing yields by as much as 80 percent.

The Mississippi State University Extension Service, the Mississippi Agricultural and Forestry Experiment Station and the Mississippi Soybean Promotion Board have joined forces with the U.S. Department of Agriculture and the Bureau of Plant Industry against this disease, which is present in many other soybean-producing countries.

Billy Moore, Extension plant pathologist emeritus with MSU, is working with the team in the statewide battle against the disease.

"It's not a matter of if, but when we're going to get soybean rust," Moore said.

There are two strains of soybean rust, but only an aggressive Asian strain is a threat to the United States. The Asian strain was discovered in Japan in 1902, and it quickly spread throughout the rest of Asia. It moved to Australia and then to Africa in 1996. A cyclone spread rust to the rest of the continent's soybean growing areas shortly after it arrived in southern Africa.

In 2001, it was found in South America, and now Brazil, Argentina, Paraguay and Bolivia are fighting the disease. Brazil is a significant producer of soybeans, and Moore said producers there are doing an excellent job fighting the disease. Despite their efforts, when the disease arrived in 2002, Brazil had estimated yield losses of 4 million bushels. In 2003, that loss jumped to 80 million bushels, and by this year, losses had reached 170 million bushels.

Moore had three reasons why the losses continue to increase in Brazil.

"About 95 percent of farmers are spraying for rust. The 5 percent who don't spray experience almost total losses, some producers aren't spraying a second time, and even when fungicides are applied correctly, they still only give about 80 percent control," Moore said.

Fungicides are a preventative and must be applied on time and before the disease arrives.

"You can get a good crop if you spray to prevent the disease," he said.

Rust may first occur anywhere in the United States, but it is expected to enter into the Southeast from Central America, following a path similar to the one that corn blight took when it entered in 1970. Kudzu is an excellent host for rust, as are crops such as green beans and peas.

"Climatic conditions are very favorable for rust in the southeastern U.S.," Moore said. "Ideal temperatures are 68 to 86 degrees."

The best news about the disease may be that U.S. winters should beat it back every year. Moore said researchers expect rust to be able to overwinter in Florida and south Texas, then move north every year into soybean fields.

"We may dodge rust in early plantings because it has to move in from other areas where it overwintered, but then it can build up quickly and cause damage on later plantings," Moore said.

Mississippi has six sentinel plots from George to Adams counties and one in Stoneville that are monitored weekly for the arrival of rust. All were planted at least one month before producers planted soybeans. Four plots are on private fields, while others are on the South Mississippi Branch Experiment Station in

Poplarville, the Delta Research and Extension Center in Stoneville and one at Alcorn State University near Lorman.

Any suspect sample taken from a sentinel plot or any other field in the state is sent to MSU's plant pathology and nematology lab in the Department of Entomology and Plant Pathology. Clarissa Balbalian, a MSU Extension Service diagnostician, manages that lab.

"We were trained to identify soybean rust and have the proper equipment and permits in place," Balbalian said.

This lab, which is in the southern division of the National Plant Diagnostic Network, currently serves just Mississippi, but it could serve neighboring states as well. When soybean rust is discovered, final identification will be made by USDA personnel in Beltsville, Md. Balbalian said educational efforts have helped those in contact with the soybean crop learn to identify the disease correctly.

"Our growers and agents know the problems we commonly see and what to look for," Balbalian said. "When we get our first positive, we likely will see a flood of samples."

Gabe Sciumbato, MAFES plant pathologist in Stoneville, said seven fungicides have been identified to fight rust, and others are in the process of being added to the list. The day rust is discovered in the United States, Mississippi will join other states poised to receive an immediate Section 18 Emergency label allowing producers to use these fungicides.

"Right now, we're looking at these and other experimental fungicides to determine their effectiveness against major soybean diseases present in Mississippi to see how they fit into a disease management program" Sciumbato said. "Our research has shown that the new, high-yielding, early-planted soybeans can have significant yield and seed quality improvements following the use of late-season foliar fungicides."

Other research at Stoneville involves determining the resistance of entries in the Mississippi Soybean Variety Trials to major soybean diseases in Mississippi. Researchers expose plants to diseases by sticking infected toothpicks into the stems, spraying spores on the plants or mixing fungus with the seed at planting. It has been shown that soybean rust weakens the plant and makes it more susceptible to other soybean diseases.

"These diseases cannot be ignored, and rates and timings of fungicide applications for rust and other foliar diseases must be researched," Sciumbato said.

Sciumbato said long-term rust control will come through a resistance breeding program. U.S. researchers only work with rust in countries where it is present or in special containment facilities.

"There are several races of the rust, and single gene resistance has not lasted for very long. Therefore, breeders must incorporate several genes, each adding some resistance," Sciumbato said. "This will take several years to develop."

Photos by Bob Ratliff

Research associate Ken Stetina checks one of the soybean research plots at the Delta Research and Extension Center.

Cattle Research at Brown Loam

Animal Scientists Study Cattle Temperament

Take 4 inches of muck in a corral, mix in lots of humidity, a light drizzle and 50 unhappy cows, add two scientists, two cowboys with their horses, a cow dog and a couple of pieces of high-tech equipment and what do you have? In the case of the Brown Loam Branch Experiment Station, those are the ingredients for a livestock research lab.

Those were the conditions on a sultry July day when MAFES animal scientist Rhonda Vann and herdsman David Miller were evaluating a group of steers and heifers for pen temperament, chute temperament and exit velocity. James Green and David Funches, along with Lucy the cow dog, assisted them.

The work at Brown Loam is part of a collaboration with Texas A&M University researcher Ron Randel to evaluate the relationship between temperament and animal performance and body composition.

The speed at which an animal leaves the holding chute is a key factor in the research. For her research, Vann uses an infrared timer to clock the cattle as they come out of the chute.

Photos by Bob Ratliff

"Preliminary research results indicate that exit speed is a preferred measurement due to the subjective nature of the chute and pen temperament scoring systems," Vann said. "Heifers are more temperamental than steers, and cow and calf exit speed are significantly correlated, which suggests that selection for exit velocity within the cow herd could improve the temperament of calves produced."

The study has generated data on stocker steers indicating that after a 168-day grazing period, temperamental steers have reduced growth performance and body composition.

The research also has shown that the fastest animals out of the holding chute tend to be less tender after being in the feedlot for 120 days.

"If found to be a valid measure, exit velocity is easily measured, and could possibly be used in the selection of animals with more desirable temperaments," Vann said. "This could help producers increase the production efficiency of the animals in their herds."

While in the chute, the heifers also were tested for pregnancy using real-time ultrasound as part of early pregnancy research with the station's commercial herd.

Harvesting Corn with Steers

Another cattle research project at Brown Loam is a collaboration between MAFES animal scientist Mike Boyd of the MSU Department of Animal and Dairy Sciences at MSU and agronomist Glover Triplett in the Department of Plant and Soil Sciences.

Jim Lytle

Their project uses grazing systems with conservation tillage corn to add value to feeder cattle.

"Grazing cattle on standing corn is a new production concept made possible in wide geographic areas with conservation tillage," Boyd said.

He listed several benefits of harvesting the corn with steers:

- New marketing options are opened;
- Value is added;
- Existing corn stores are less diminished;
- Higher quality beef can be produced than is currently being produced;
- Concentrations of animal waste can be reduced at feed yards;
- Wildlife habitat may be dramatically improved.

"This is an ideal system for the family farmer because little equipment is required and profit potential is increased," he added

In early April 2003, corn was planted on 35 acres at the Brown Loam Station using conservation tillage practices. Potential corn yield was estimated two weeks before grazing was initiated and was determined to be about 120 bushels per acre.

Once the corn reached roasting ear stage, steers that were previously assigned to the integrated summer grazing systems were transferred from the Leveck Animal Research Center at Mississippi State to Brown Loam.

During the first 28-day period, the steers were followed through slaughter to gather carcass weight, carcass quality grade, rib eye area, yield grade and back fat thickness.

The steers were divided into two groups based on weight. The heavy group averaged 1,000 pounds, and the light group averaged 880 pounds.

Preliminary feedlot data shows the heavy steers gained 4.8 pounds a day while on feed and the light group gained 4.25 pounds per day.

"Both gains were well above what would be expected of heavyweight steers," Boyd said. "Steers treated similarly at the Ames Plantation in Tennessee as part of the project were fed at a different feedlot and gained 5.2 pounds per day while on feed."

Early economic data suggest the system may work well for producers in Mississippi. The corn grazing system is being repeated at Brown Loam this year.

RADIO CHIPS HELP KEEP TABS ON PLANTS

"An implantable radio frequency identification device can be used by commercial nurseries to track plants in their inventory or as plants move in and out of a retail outlet."

Richard Harkess

Bob Ratliff

Inventory control, an important part of any modern business, is difficult for the nursery industry.

Large shrubs and trees are hard to track using the electronic barcode readers common in most businesses because of the need to get a scanner close to the barcode and problems with soil damaging the barcord labels. Another alternative, manual inventory, increases labor costs.

A high-tech solution to those problems is being researched at Mississippi State University.

"An implantable radio frequency identification device can be used by commercial nurseries to track plants in their inventory or as plants move in and out of a retail outlet," said Richard Harkess, an associate professor of floriculture and ornamental horticulture. "This can save labor and reduce mistakes at both locations."

Photos by Bob Ratliff

An implantable radio frequency identification device, or RFID, contains a tiny chip that reflects a signal back to a reader. The signal can be received from several feet away, even if the chip is imbedded in a tree or buried in soil.

Harkess is conducting a 1-year study to determine the feasibility of using various types of RFIDs with nursery plants. His is the only such study with nursery plants in the nation.

The project is funded by a U.S. Department of Labor grant to the Mississippi Agricultural and Forestry Experiment Station.

"The need to adapt the technology to the nursery industry is being driven by large retailers, such as Wal-Mart and Target, that are moving toward requiring all their merchandise to be RFID compatible," Harkess said. "The Department of Defense is even adapting the technology for tracking its purchases."

One advantage of RFID over electronic product readers, he added, is that RFID does not need a line-of-sight reading to record information.

"The chips emit a low frequency signal that can be picked up by the reader just by walking by the product," Harkess said. "In a nursery, they can provide information about the fertilizer, water and other inputs a plant has received, as well as information about the number and types of plants in the inventory."

In the study, Harkess is using four types of chips, two of which are contained in rice- grain-shaped glass cylinders that can be implanted into the woody trunks of trees and shrubs. The other two are a small plastic wedge and a disk that can be hung from a branch, buried in the potting soil or glued to the edge of a plant container.

The various applications are being tested on 160 crab apple trees at the Mississippi State greenhouses.

"Finding a way to adapt this technology is important for the nursery industry because the major retailers will soon require it of all their suppliers," Harkess said. "It can also help individual nurseries do a better job of managing their inventories."

The technology behind RFID has been around since World War II, but it has been too expensive for widespread use until recently. That is changing as advances in technology bring down the price of the RFID chips.

"The price of the RFID chips currently used by Wal-Mart is 20 cents, compared to $1 a year ago," said Bosh Bruening, vice president of PlantFind, Inc., a business-to-business e-commerce portal for the greenhouse, nursery and other horticultural industries. "Prices are continuing to fall and once they reach a nickel a tag, widespread use of RFID technology will be economically feasible."

While the driving force behind use of the technology is the nation's major retailers, Bruening agrees with Harkess that the use of RFID can have significant benefits for horticultural businesses.

"The benefit of this technology is the amount of information it can track and the ease with which the information can be recalled," he said. "For example, a single tag can tell a grower the date a cutting was stuck, who performed the task, and when the plant was fertilized, transplanted and trimmed. It also can track when a plant was sold, who it was sold to, how much it was sold for, when it is scheduled to ship, and even track the truck to its destination."

For Mississippi nurseries, the most attractive feature of RFID technology may be its inventory control possibilities.

"We don't currently supply any large retail customers, but we're always interested in any technology dealing with inventory control," said Dan Batson, owner of GreenForest Nursery in Perkinston. "Costwise, RFID might not be feasible for use on small container plants selling in the $3 to $4 range, but it could be useful for nurseries dealing in a large volume of more expensive trees and shrubs."

A disk, above left, that can be buried or attached to a plant is one of the types of RFID devices being studied at the MSU greenhouses. Richard Harkess and student assistant Candie Turnipseed, left, implant a glass cylinder containing an RFID chip into a tree.

BIODIESEL:

Energy from and for the Farm

Biological engineer Sandun Fernando, foreground, and graduate assistant Prashanth Karra are working to develop a new type of catalyst for converting soy oil to biodiesel.

Bob Ratliff

Record high oil prices are focusing a lot of attention on alternative energy sources, including biodiesel, a fuel derived from vegetable oils.

Since soybean oil is the most commonly used vegetable oil in biodiesel, it would seem soybean producers would be among its biggest fans. Farm use of biodiesel, however, is not widespread, and that concerns Thomas Howarth, who grows soybeans on his Circle H Farm near Cleveland.

"I would like to see more farmers aware of biodiesel," he said. "I'm lucky to live in an area where it's available."

Howarth is one of about a dozen Delta farmers who are regular customers for the biodiesel sold by Farmers Inc. in Greenville, one of the few sources for the product in Mississippi. Farmers Inc. sells a blend that is 2 percent biodiesel made from soybean oil and 98 percent regular diesel. Their supplier is West Central Soy in Ralston, Iowa.

"The price difference between the 2 percent biodiesel blend we sell and regular diesel currently is 3 cents a gallon," said Farmers Inc. manager Floyd Trammell. "Transportation costs from a Midwest supplier are high and we hope to find a supplier closer to the Delta."

Concern about voiding manufacturers' warranties has been one reason farmers and others have avoided biodiesel, but Morgan Beckham, chairman of the Mississippi Soybean Promotion Board said major equipment manufacturers Case IH and John Deere now warrant their engines to operate on biodiesel blends up to 5 percent.

> "Soybean producers who use biodiesel are helping their industry."
>
> MORGAN BECKHAM

"Soybean producers who use biodiesel are helping their industry," he added. "Its use also will help diesel producers meet upcoming federal regulations."

Federal Environmental Protection Agency regulations, Beckham said, require that sulfur additives in diesel be eliminated by October 2005 for on road vehicles and by October 2009 for off-road vehicles.

Ironically, lack of government support is one of the stumbling blocks to widespread acceptance of biodiesel by farmers and others large-scale diesel users.

"Legislation that would provide a tax incentive on biodiesel of 1 cent per gallon for each percent of biodiesel blended has been introduced in Congress, but has yet to pass," Beckham said. "That incentive would be enough to offset the difference in the cost of blended biodiesel compared to regular diesel."

Bill Webster, owner of Biodiesel Fuels of Mississippi in Meridian, agrees that a tax break is needed.

"Congress needs to pass an energy bill that will increase demand for alternative forms of energy by making prices competitive," he said. "I have the capacity to make 1,000 gallons a day using mostly recycled soybean oil from catfish restaurants, but right now demand is sporadic."

Since last October, one of Webster's customers has been the Lauderdale County School System, which has been running nine of its buses on a blend containing 10 percent biodiesel.

"We've had no problems whatsoever with the buses that are running on the biodiesel," said Roger Wright, the school district's transportation director. "From a maintenance standpoint we've seen no differences in the vehicles running on regular diesel and the ones using the blend."

Webster noted that there is one very noticeable

difference.

"The tailpipes on the buses running on the blend are clean; they don't have the black soot you usually see on diesel exhausts," he said.

The reduced emissions from the blend are the reason one of his regular customers uses it for tractor pull competitions in enclosed stadiums. Another customer operates a swamp tour business and uses the biodiesel in his airboats so his customers don't have to smell diesel fumes.

The time and energy needed to convert soy oil into fuel are among the factors that push up costs and limit interest in large-scale production of biodiesel. The Mississippi Soybean Promotion Board and MAFES actively support research aimed at simplifying the biodiesel production process.

MAFES biological engineer Sandun Fernando in the Department of Agricultural and Biological Engineering is conducting one such project. He is developing a new catalyst for converting soy oil to biodiesel.

"The catalysts currently in use are homogenous—they dissolve during the process and have to be refined out," he said. "We are working with a catalyst that does not dissolve, making its removal much easier."

Fernando is still evaluating his process, but his research indicates the use of the new catalyst can reduce the amount of time needed to convert soy oil to biodiesel from about one hour to just a few minutes—maybe just five minutes.

"Reducing the amount of refining needed to remove the catalyst also lowers the amount of heat and pressure required for the process," he said. "As a result, the cost of product should be significantly reduced."

Photos by Greg Ward

WHAT IS BIODIESEL?

Biodiesel is the name of a clean-burning alternative fuel, produced from domestic, renewable resources. Biodiesel contains no petroleum, but it can be blended at any level with petroleum diesel to create a biodiesel blend. It can be used in compression-ignition (diesel) engines with little or no modifications. Biodiesel is simple to use, biodegradable, nontoxic, and essentially free of sulfur and aromatics.

HOW IS BIODIESEL MADE?

Biodiesel is made through a chemical process called transesterification whereby the glycerin is separated from the fat or vegetable oil. The process leaves behind two products—methyl esters (the chemical name for biodiesel) and glycerin (a valuable byproduct usually sold to be used in soaps and other products).

IS BIODIESEL THE SAME THING AS RAW VEGETABLE OIL?

NO! Fuel-grade biodiesel must be produced to strict industry specifications (ASTM D6751) in order to insure proper performance. Biodiesel is the only alternative fuel to have fully completed the health effects testing requirements of the 1990 Clean Air Act Amendments. Biodiesel that meets ASTM D6751 and is legally registered with the Environmental Protection Agency is a legal motor fuel for sale and distribution. Raw vegetable oil cannot meet biodiesel fuel specifications, it is not registered with the EPA, and it is not a legal motor fuel.

For entities seeking to adopt a definition of biodiesel for purposes such as federal or state statute, state or national divisions of weights and measures, or for any other purpose, the official definition consistent with other federal and state laws and Original Equipment Manufacturer (OEM) guidelines is as follows:

> Biodiesel is defined as mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats which conform to ASTM D6751 specifications for use in diesel engines. Biodiesel refers to the pure fuel before blending with diesel fuel. Biodiesel blends are denoted as, "BXX" with "XX" representing the percentage of biodiesel contained in the blend (ie: B20 is 20% biodiesel, 80% petroleum diesel).

Source: The National Biodiesel Board

Photos by Bob Ratliff

Make (Less) Room for Melons

Americans love watermelons, but the melons many of us want today are not the big 20 pounders usually associated with summer picnics.

Personal-sized watermelons are gaining popularity, especially in larger cities. A 5- to 6- pound soccer-ball-sized melon—perfect for a small family and fits easily into the average home refrigerator—is what many shoppers want, even though the price is about the same as for the larger varieties.

Because of the changing melon preference, MAFES researchers at the Truck Crops Branch Experiment Station in Crystal Springs are conducting research with new varieties that can be grown by Mississippi's commercial producers.

The focus is on cantaloupe-sized seedless melons, said vegetable specialist Rick Snyder.

"We grew six different small seedless melons this year," he said. "They all grew and produced well in our trials."

Mississippi's commercial producers grow about 4,000 acres of watermelons each year, down from about 10,000 just a few years ago. Snyder said the introduction of personal-sized melons may not bring the commercial acreage back up, but it could mean more profit for producers.

"Right now, demand for watermelons drops off sharply after the Fourth of July holiday every year," he said. "The ease of transporting and storing the smaller melons in home refrigerators, as well as the fact that they are more easily eaten before they spoil, could keep them in demand all summer."

The small melons may eventually prove popular with home gardeners, but Snyder added that for now, limited availability of seed will likely keep them strictly a commercial crop.

Russ Houston

TEACHERS TRAIN AT MSU'S "AGRIPOD"

While students enjoy their summer vacation, many of their teachers themselves become students.

That was the case with eight high school agriculture teachers who trained this summer at the new Agricultural and Environmental Science and Technology, or AEST, Laboratory on the Mississippi State University campus.

The lab, funded by the state Department of Education's Office of Vocational and Technical Education through special funding from the Mississippi Legislature, is the only one of its type on a university campus. It is a high-tech octagonal environment that consists of a central project work area surrounded by state-of-the-art computer workstations. Because of its design, the lab has been dubbed "Agripod."

The teachers in the three-week summer program gained the endorsement to their license required to teach the AEST curriculum.

The curriculum is designed to move students from a very basic knowledge of agriculture to what it takes to run an agribusiness, said Bill McGrew with the Mississippi Department of Education.

"The first course of the curriculum introduces students to basic information about agriculture," he said. "If they are interested, they can move into the more advanced courses in following years, including ones on managing an agricultural enterprise."

The courses are geared to Mississippi agriculture.

"The curriculum was developed by Mississippi teachers, with input from the agricultural business community," McGrew said. "A similar computer-based instructional system had been developed by Applied Technologies of Calhoun, Ga. Our teachers presented the curriculum they developed, and Applied Technologies made changes to their modules to meet the Mississippi curriculum."

Magee Enterprises of Brandon represents Applied Technologies in Mississippi and has installed 48 of the labs. There are currently 154 agriculture programs in Mississippi, 48 of which have AEST labs and more are planned.

The teachers who trained on the Mississippi State unit during the past summer included Karen Cook, a teacher at the Monroe County Vocational Complex. The curriculum, she said, uses technology her students are already comfortable with to introduce them to what, for many, are new aspects of agriculture.

"Many of my students think of agriculture as just driving tractors and things like that," she said. "This shows them the technical and business opportunities available in agriculture."

A second group of high school teachers will train at the lab during the fall, and MSU students in agricultural education also are using the facility.

"With this facility, we'll be able to certify our students to teach agricultural science at the secondary level," said Walter Taylor, head of the Department of Agricultural Information Science and Education. "In the past, they had to go through three weeks of training after graduation to become certified."

Forest and Wildlife Research Center interim director Bob Karr, right, and Daniel Peterson examine small pine trees in the College of Forest Resources' Biotechnology/Genetics Lab.

Marco Nicovich

MSU RESEARCH *Unravels Pine Tree Mysteries*

Loblolly pine is the primary source of pulpwood for the entire U.S. paper industry and the most economically important crop of any kind in the Southeast.

Despite its economic importance, little is known about the genome of loblolly pine. The term genome refers to the DNA that defines an organism, including its genes and the DNA sequences containing 'blueprints' for all the heritable characteristics of the organism. In short, the genome is what makes a human a human, a cat a cat and a pine tree a pine tree.

Mississippi State University recently received a $1.6 million, three-year grant from the National Science Foundation to use state-of-the-art molecular biology techniques, robotics and powerful computational methods to research the pine genome.

Daniel Peterson, an assistant professor of molecular biology in the Department of Plant and Soil Sciences, leads the research group. The grant includes $1 million earmarked for research in Peterson's lab, the Mississippi Genome Exploration Laboratory (MGEL), and is one of the largest NSF grants ever awarded to MSU's College of Agriculture and Life Sciences.

The work on the project is being conducted through the Mississippi Agricultural and Forestry Experiment Station.

Peterson said characterizing the pine genome will not be an easy task because the vast majority of its makeup is highly repetitive 'junk DNA.' In fact, only about 2 percent of the pine genome contains genes.

"Additionally, the genome of pine is seven times larger than

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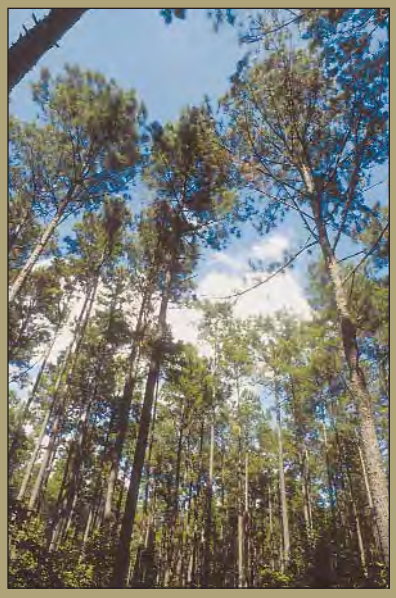

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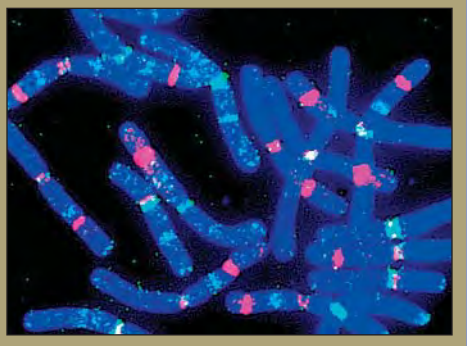

that of the human genome," Peterson said. "While both pine trees and humans have about 20,000 to 50,000 genes, pines have a lot more repetitive DNA. It will take a lot more >sifting' to get the pine genes out of the pine genome."

Peterson is especially qualified to tackle the monstrous pine genome. In 2002, while doing postdoctoral research at the University of Georgia, he was lead inventor of Cot-Based Cloning and Sequencing, a technique that allows scientists to efficiently separate genes from repetitive sequences. CBCS is being used in the research for the new NSF-funded project at MSU.

In addition to Peterson, other members of the research team include Dana Nelson and M. Nurul Islam-Faridi of the U.S. Forest Service's Southern Institute of Forest Genetics in Harrison County, and Doreen Main and Jeffrey Tompkins with the Clemson University Genomics Institute.

College of Forest Resources interim dean Bob Karr said the project is significant for Mississippi and other states with large forest industries. The university administration strongly supports this effort as MSU researchers take leadership roles in the pine genome research.

"The pine genome project is an important first step in the basic science necessary to apply some of the new technology in genetics to forest research," he said. "This will be a foundation other scientists can build on for the improvement of our forests."

Additional information about the pine genome project is available at the MGEL Web site: **http://www.msstate.edu/research/mgel.**

Tunnel Ventilation Benefits Dairy Cows

By Bonnie Coblentz

The heat of Mississippi summers presents a challenge to dairy farmers trying to keep their cows cool enough to produce abundant milk.

Traditional dairy barns are built with high ceilings so heat will rise and open sides that allow the free movement of air. Fans and water spray are used to cool the cattle.

Research recently turned to an innovation from the poultry industry that producers use to keep chicken houses cool. Three researchers with the Mississippi Agricultural and Forestry Experiment Station are studying the operation and efficiency of tunnel ventilation for dairy barns.

Tunnel-ventilation barns are built with low roofs, enclosed sides and fans on one end that pull air through the house. Some use cooling cells to further lower temperatures.

MAFES dairy science researchers Angelica Chapa, Terry Smith and Scott Willard studied tunnel ventilation at Mississippi State University's 20-cow tunnel-ventilated barn at the Dairy Research Unit in Holly Springs. Trials were run testing the performance of lactating Holsteins in the tunnel-ventilated barn compared with 20 similar cows in a traditional, freestall barn.

"Heat stress has a dramatic effect on dairy cows, decreasing feed intake, milk production and reproductive efficiency while increasing the incidence of mastitis," Smith said.

A 10-week trial showed the tunnel ventilation reduced heat stress in the cows it housed compared with those cooled by shade and fans alone.

Cows housed in the tunnel barn had peak body temperatures of 1.2 degrees lower than the cows housed in the traditional barn. The cows in the tunnel barn had a slower respiration rate by nearly 16 breaths a minute than those cows in the traditional barn.

"This increment in cooling improved feed consumption within the tunnel barn an average of 4 pounds of feed per cow per day," Smith said. "Additionally, the cows in the tunnel-ventilated barn produced an average of nearly 6 pounds of milk per day per cow more than the cows cooled by shade and fans alone."

"COWS HOUSED IN THE TUNNEL BARN RECEIVED LESS EXPOSURE TO CONDITIONS OF HEAT STRESS DURING THE STUDY THAN DID COWS HOUSED IN THE ADJACENT TRADITIONAL BARN."

TERRY SMITH

Dairyman Quinton Mills, left, and area extension dairy specialist Wesley Farmer with one of the animals from Mills' 400-head Forest County dairy herd.

Photos by Marco Nicovich

Smith is convinced that tunnel ventilation can solve much of the heat stress problem cattle face in the hot Southeast.

"Cows housed in the tunnel barn received less exposure to conditions of heat stress during the study than did cows housed in the adjacent traditional barn," Smith said. "Tunnel ventilation cooling of dairy cows can have a significant impact on milk production in the summer months on dairies in the southeastern United States."

Quinton Mills owns a 400-head dairy farm in Forest. He recently built a tunnel-ventilated, freestall barn for his herd, the first commercial barn of its kind in the state.

"We designed the tunnel ventilation system ourselves, bought all the pieces and put it together," Mills said.

Mills saw a tunnel-ventilated dairy barn in operation at North Florida Holsteins in Bell, Fla., and decided to design his farm in a similar fashion. His barn has a low roof, 32 fans on one end and curtains on the sides. The fans pull air all the way through the house, cooling the cows as the air passes over them. His system uses no cooling cells.

Chapa studied air quality issues in dairy houses. Gases, dust, odors and microbes can lower air quality within improperly ventilated, enclosed animal quarters.

"Freestall barns are open on all sides, and fresh air circulation prevents the buildup of ammonia and dust," Chapa said.

"Tunnel-ventilated barns pull air through the facility using fans. The continuous air exchange results in a cooler environment."

Chapa monitored the levels of environmental ammonia, hydrogen sulfide and other chemical substances to determine the air quality inside the two test barns.

"Over the entire 10-week study, environmental measurements show that the air quality compared favorably to what Occupational Safety and Health Administration standards have determined is appropriate for animal and human health," Chapa said.

Final results suggest that tunnel ventilation offers great potential to decrease the exposure to and effects of heat stress in dairy cows in the Southeast.

Cotton FIELD DAY

Photos by Bob Ratliff

The researchers had stories about ducks swimming between the cotton rows early in the growing season, but dusty fields greeted the almost 200 producers and others attending the Aug. 18 Cotton Field Day at the Delta Research and Extension Center.

MAFES and USDA/ARS scientists presented updates on their cotton research at nine stops in the center's research plots, including:

- Fertility in cotton/corn rotations and long-term rotation systems by agronomist Wayne Ebelhar.
- Management of irrigation and tillage practices by agricultural engineer Lyle Pringle.
- Variety trials and Delta Research and Extension Center breeding lines by agronomist/plant breeder John Hicks.
- Effects of nitrogen on yield and Bt protein production by Bill Pettigrew, plant physiologist with USDA/ARS.
- Development of cotton resistance to reniform nematode by USDA/ARS plant pathologists Lawrence Young and Sally Stetina.
- Evaluation of row spacing, plant population and reduced tillage practices by agronomist Steve Nichols.
- Harvest aid strategies by plant physiologist Charles Snipes.
- Efficacy of new insecticides and resistance to older products for various insect pests by entomologist Jim Robbins.
- Site-specific management technologies: crop, information and equipment by entomologist Aubrey Harris, research associate Patrick English and Scott Samson, geospatial extension specialist with the Mississippi State University Extension Service.

In addition to the tour stops, field day participants could visit a nematode exhibit by plant pathologist Gabe Sciumbato.

Scientists staffing exhibits at both the Cotton Field Day and the next day's Rice and Soybean Field Day included USDA/ARS agricultural engineer James Hanks with an application technology exhibit, MSU Extension Service weather technician Mark Silva with an agricultural weather exhibit and an exhibit by USDA World

Rice and Soybean FIELD DAY

Agricultural Outlook Board scientists Nancy Lopez and Bart Freeland.

Producers on hand for the Rice and Soybean Field Day at the Delta Research and Extension Center were reminded of how important they are to research programs by agronomist Tim Walker.

"We don't have every soil problem in the Delta represented at the center," he said. "That means research plots on the farms of cooperating producers help up provide good information to all producers."

Presentations on the rice and soybean tour included:

- Rice breeding lines, yield potential, resistance to disease and lodging, maturity options, and response to fertilizer by agronomists Dwight Kanter and Wayne Ebelhar.
- Rice seeding rates and management of N and P by agronomist Tim Walker.
- Nitrogen Diversity in soybeans; breeding for resistance and yield by geneticist Jeff Ray, USDA/ARS research geneticist Bob Paris and postdoctoral assistant Felix Fritschi.
- Charcoal rot in soybeans; inheritance of tolerance to charcoal rot by plant pathologist Alemu Mengistu and USDA research geneticist Rusty Smith.
- Control of horseweed and other critical weeds in soybeans by weed scientist and extension soybean specialist Dan Poston and USDA/ARS biologist Trey Koger.
- Fungicide seed treatment and early-season flooding on early soybeans by agronomist Lingxiao Zhang and postdoctoral assistant Steve Kyei-Boahen.
- Soybean variety report by Bernard White, manager, MAFES variety evaluations.
- Rice and soybean disease control and use of foliar fungicides in soybeans by plant pathologist Gabe Sciumbato and graduate student Ben Spinks.
- New compounds for rice weed control; performance enhancement of existing compounds and drift symptoms on conventional rice by plant physiologist Mark Kurtz and extension rice specialist Nathan Buehring.

Photos by Bob Ratliff

Rice and Soybean Day exhibits included Water Saving Irrigation in Rice by Joseph Massey and Cade Smith with MSU's Department of Plant and Soil Sciences and a display of soybean products by Truett Bufkin with the Mississippi Soybean

Pontotoc Tour Gives Producers Up-close Look at Research

Promotion Board.

The July 15 Research and Demonstration Tour at the Pontotoc Ridge-Flatwoods Branch was a chance for area producers to see research with their major crops.

Corn, soybean, cotton and sweetpotato research was featured on the field tour. One of the highlights of the annual Pontotoc tour is discussion of variety differences by seed company representatives.

At the corn research plots, MSU Extension Service grain specialist Erick Larson discussed corn production practices and gave an update on the 2004 crop situation.

Extension soybean specialist Alan Blaine emphasized the importance of early maturity group varieties at the soybean stop.

Extension area agronomist Bill Burdine updated producers on the sweetpotato crop situation. Research scientists Mark Shankle and Jack Reed discussed using a systems approach for weed and insect control in sweetpotatoes. These systems include herbicide rate, application type/timing and cultivation.

At the branch's cotton plots, Extension cotton specialist Tom Barber addressed issues related to no-tillage cotton. One of the unique projects at the Pontotoc branch is work with poultry litter as a fertilizer source for cotton. USDA/ARS research scientist Haile Tewolde updated the producers on that project.

Photos by Bob Ratliff

North Mississippi Crops in the Spotlight at Row Crops Field Day

About 200 producers, industry representatives and others interested in agriculture were on hand for the Aug. 4 Agronomic Row Crops Field Day at the North Mississippi Research and Extension Center in Verona.

The cotton stop on the tour of research plots included presentations by research associate Robert Dobbs, extension agricultural engineer Herb Willcutt and extension entomologist Angus Catchot. Topics discussed included 15-inch row production systems, how blending cotton varieties can affect yield and quality, cotton seeding rates and updates on new technology.

Corn insect management, Roundup Ready hybrids, soybean/corn production in sod and the crop situation were the major topics for the corn section of the tour. Presenters were agronomist Normie Buehring, grain specialist Erick Larson, agronomist Glover Triplett and Extension entomologist Don Parker.

Extension soybean specialist Alan Blaine gave an update on the crop at the soybean stop on the tour. Other topics included the soybean variety trials, soybean response to foliar fungicides and response to reduced seeding rates. Presenters included research associate Mark Harrison and Bernie White, manager of MAFES variety evaluations.

The program also included a presentation on potential invasive weeds in Mississippi row crops by Charles Bryson with USDA/ARS and an update on the state's new noxious weeds list by weed scientist John Byrd.

Mississippi Farm Bureau Federation President David Waide gave the keynote address following a lunch provided by supporters of the programs of the North Mississippi Research and

Photos by Marco Nicovich

UPDATES

Food scientist leads international professional group

MAFES food scientist Douglas L. Marshall is the new chair of the Institute of Food Technologists' food microbiology division. He is responsible for developing programs that reflect the organization's interests and goals and articulating policies to national and international audiences.

With a worldwide membership of 28,000, IFT is the largest organization for professionals working in food science, food technology and related professions in industry, academia and government. The more than 1,400 members in its food microbiology division are focused on areas in which bacteria, fungi, viruses, protozoa and parasites play a role.

At Mississippi State, Marshall has concentrated his research in the areas of marine and aquaculture seafood. He has been working to develop methods for rapidly detecting food-borne pathogens in muscle foods.

Marshall has served on the executive board of the Journal of Food Protection for four consecutive years and is a contributing editor of the journal Food Microbiology. During his career, he has provided more than 170 contributions to scientific research literature.

He also has been a frequent consultant to such national agencies as the National Institutes of Health, U.S. departments of Agriculture and Commerce, National Oceanic Atmospheric Administration, United Nations Food and Agricultural Organization, and the World Health Organization, among others. Additionally, he serves as a food safety consultant to private industry.

While at MSU, Marshall has been honored with the 2002 Ralph E. Powe Research Excellence Award and 1999 MAFES/Mississippi Chemical Corp. Award of Excellence for Outstanding Work. He also has been recognized with the 2002 International Association for Food Protection Educator Award.

Reddy receives "Outstanding Scientist" award

The Association of Agricultural Scientists of Indian Origin has presented its 2004 Outstanding Scientist Award to MAFES plant physiologist Raja Reddy.

Reddy joined the Department of Plant and Soil Sciences in 1988. He currently is conducting basic research using naturally lit, controlled-environment plant growth chambers to understand the interactions between plants and their environments, as well as how plants acquire resources and use those resources for growth in natural environments.

Reddy's research accomplishments include development of a new model for predicting the effects of PIX, a plant-growth regulator widely used in cotton production.

He also received the Southern Branch of the American Society of Agronomy's Career Award in Research at the professional organization's 2004 annual meeting.

Luthe serves on USDA panel

MAFES biochemist Dawn Luthe served on the 2004 Plants and Environmental Adaptation Panel of USDA's Cooperative State Research, Education, and Extension Service, Competitive Programs.

During a 3-day session in Washington, D.C., each panelist evaluated research proposals and helped identify the most meritorious proposals in the area of plants and environmental adaptation for funding. Each panelist provided in-depth written evaluations on about 14 proposals and participated in the discussion on those and other proposals.

"The service of Dr. Luthe was extremely valuable in upholding the highest standards of scientific excellence required for a competitive peer review," said Brad Fenwick, chief science advisor for Competitive Programs.

MAFES administrator named ASA Fellow

MAFES Associate Director Clarence Watson has been named a Fellow of the American Society of Agronomy.

ASA Fellows are selected based on outstanding contributions in an agronomic area of specialization, whether in research, teaching, extension, service, or administration in either the public, commercial, or private sector.

Watson eared a bachelor's degree in agronomy from New Mexico State, a master's working on alfalfa breeding, also at New Mexico State, and a doctorate in crop science with emphasis on forage grass breeding from Oregon State University.

He joined the faculty of Mississippi State in 1976 as an assistant professor of agronomy. Watson served as head of the Experimental Statistics Unit and as interim head of the Department of Plant and Soil Sciences before being named associate director of MAFES in 2002.

Watson's professional accomplishments include development and release of 'Marshall' and 'Jackson' ryegrass, assistance with the development of the COTMAP system for mapping and analyzing end-of-season fruiting patterns on the cotton plant, and release of more than 300 sorghum and millet germplasm lines for the humid tropics.

MSU-sponsored workshop features greenhouse mechanization

More than 30,000 individuals in the nursery industry attended the Aug. 11-13 Southern Nursery Association annual conference in Atlanta. Activities at the conference included a daylong greenhouse mechanization workshop sponsored by Mississippi State University and funded through a grant from the U.S. Department of Labor.

The workshop speakers included experts in various aspects of greenhouse mechanization and nursery operators who are using mechanization to help with labor-intensive jobs to increase safety, productivity and employee morale.

The nursery industry can learn from the auto industry, said Gene Giacomelli, director of the Controlled Environment Agriculture Center at the University of Arizona in Tucson. Examples he cited include creating hand tools for specific jobs and using mechanization to bring products to where jobs are performed.

"There's no one answer to 'what is mechanization in greenhouses.' It depends on what you grow and other factors," he said. "You have to analyze your process. Mechanization may not mean less work, but it should be smarter work and improve productivity and crop quality."

Other workshop speakers included K.C. Ting, chair of the Department of Food, Agricultural and Biological Engineering at Ohio State University; John Bartok, Jr., a consultant on greenhouse and nursery system design; Robert Grove, with Hines Nurseries in Texas; Neil Devaney, with Jaderloon Greenhouses; and Chris Rowe, with equipment supplier Bouldin and Lawson.

Bob Ratliff

Sharon Lankford-Rice, center, and Paulette Norvel-Lewis with the U.S. Department of Labor were among those attending the MAFES Greenhouse Mechanization Workshop at the 2004 Southern Nursery Association Conference. They also visited the Mississippi Nursery and Landscape Association exhibit with MAFES Associate Director Clarence Watson, left.

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