Mississippi State University Experiment Station

MAFES Research Highlights

cover

Summer 1999
Volume 62, Number 3

Contents

- From the Director
- State of Agriculture in Mississippi
- Ag Summit Sets Agenda for State
- MAFES Researchers Awarded Patents
- MAFES Plans for Future with Biotech Institute Seminars
- MAFES CoHosts Monsanto Seminar
- MAFES Agronomist Studies Gi-Ant Problem
- MAFES Poultry Research Has Dual Purpose
- MAFES Animal Waste Monitoring Research
- MAFES Ensures Safer Processing of Catfish
- Food Quality and Safety Research
- Satellite Technology Helps Grow Cotton
- RSTC Brings Satellite Info To Ground Level
- Ag Fellow Records Senate Experiences
- Ag Economists Advise Policymakers
- MSU's Vice President Foil Retires

From the Director

Social historians have divided the history of civilization into several transitions, or periods of change. *Gradualism*, the concept that change is slow, regular and predictable, has been the case for about 99 percent of human history. For the last several decades of this century, change has occurred exponentially.

Perhaps the most dramatic shift was the cultivation of soil to grow domesticated crops. This ushered in the *Agricultural Age* (circa 8000 B.C. to circa 1750 A.D.). Technological innovations included the use of seeds, as well as the use of wood picks and sharpened stones for digging and planting. During the Iron Age, Jethro Tull's iron plow made large-scale agricultural production

possible, so more land could be farmed by fewer people, and greater quantities of food could be produced faster.

The *Industrial Revolution* began in the mid-18th century when James Watt harnessed steam power in the first steam engine. Factories replaced cottage industries as work shifted from hand tools to mechanically produced goods. People moved from family farms into growing, bustling cities in search of higher pay and better working hours. Technologies included Eli Whitney's cotton gin, Isaac Singer's sewing machine, Cyrus McCormick's harvester and Henry Ford's automobile, while more recent innovations included gasoline-powered farm implements and synthetic fertilizers and pesticides.

During this expansive period, agricultural advancements included the 1862 Morrill Act that authorized land-grant institutions like Mississippi State University, and the 1887 Hatch Act that established agricultural experiment stations.

Today's *Information Revolution* began in the 1950s and 1960s with the development of the computer chip. The explosion of available information is phenomenal, and much technology is being developed to improve our lives. Agriculture is utilizing that information through technologies such as remote sensing, biotechnology, genetic engineering and precision farming. The next millennium has been tagged as the age of biology.

On the eve of the new millennium, MAFES recognizes the firm foundation it has developed over the last 112 years and is looking toward the future to continue advancing the state's agriculture.

Mississippi legislative funding is helping MAFES meet growing demands on the state's agricultural resources, but national and private funding is more competitive than ever.

MAFES research focuses on many areas pertinent to Mississippi agricultural production, with five featured in this issue:

1. Biotechnology
2. Environmental monitoring
3. Animal waste management
4. Food quality and safety
5. Remote sensing/precision agriculture

MAFES research helps Mississippi farmers stay at the forefront of agricultural production, and MAFES scientists focus on improving and advancing Mississippi agricultural products. We remain good stewards of the finances entrusted to us.

Thank you for your support and interest in Mississippi agriculture. We hope you will come visit us at one of our 16 experiment stations located across the state.

Vance H. Watson, *Director*

State of Agriculture in Mississippi

By Linda Breazeale

Low yields and market problems brought on by Mississippi's weather challenges and world economic problems resulted in a $100 million decline in the value of agriculture and forestry production in the state.

"Observers should remember that because 1997 was a record year in agriculture, supplies were high going into 1998. The economic crisis in many major U.S. markets resulted in less movement of U.S. products to foreign countries," said John Lee, MAFES economist.

"While some 1998 commodities stand out as dropping significantly in their farm-gate value from the previous year, we had some remarkable records set in 1997 that would have been hard to beat regardless of any single factor," said Lee. "Most growers experienced better-than-average yields and average prices in 1997, but that was not the case in 1998, which was below even the five-year average prices and yields."

Lee estimated that total crop value dropped about 21 percent from 1997. Cotton, soybeans, corn, rice and wheat posted losses ranging from 5 to 36 percent. Acreage, production and prices are three main factors that impact farm-gate values from year to year. The Freedom to Farm Act, in its third year in 1998, allowed growers more flexibility but played havoc with commodity markets.

Soybeans. Soybean production values dropped 34 percent in 1998 due to yield declines and lower prices. Average yields in 1998 fell to 24 bushels per acre compared to 31 a year earlier. This resulted in a 48-million-bushel crop that is expected to bring more than $1 per bushel less than the 1997 crop.

Wheat. "Wheat lost nearly 40 percent for the second year in a row. In 1997, blame went to reduced acreage, and in 1998, poor prices were blamed," Lee said.

Corn. Corn posted a second year of significant declines. After a record crop in 1996, corn's value dropped about 35 percent in 1997 and dropped another 28 percent in 1998. It's farm-gate value dropped from $203.6 million in 1996 to $122 million in 1997. In 1998, corn value was $88 million.

Top Ag Products. Mississippi's top enterprises included poultry and eggs, which had a total farm production value of $1.53 billion; timber, $1.33 billion; and cotton, $504 million. Poultry and eggs were 12 percent higher than in 1997, timber was up about 2 percent and cotton dropped about 21 percent.

Catfish did well with a 15 percent increase in value of production, for a value-added production of more than $306 million.

Milk value was up 3 percent, despite much weaker prices in the second half of the year.

Cattle/Calves. Cattle and calves brought in $159 million, showing a decline of 9 percent for 1998.

"Cattle producers entered 1998 expecting better prices. Fed cattle producers, anticipating these, delayed marketing, which resulted in heavier cattle and added to the total beef tonnage," said Charlie Forrest, MSU Extension economist. "Even though grain costs were down, feedlots lost money. This limited what they could pay for feeder cattle."

Lower prices led producers to reduce the size of the nation's herd for the third consecutive year.

Hogs. Hogs posted the biggest livestock market losses with an estimated 21 percent decline in farm-gate value.

In 1998, market hog prices dropped to about 10 cents a pound, which was the lowest since the 1950s and 1960s. Hog supplies set a record in 1998 at 101 million head, 10 percent higher than a year earlier. Average hog prices for the year were $35 per hundredweight, well below break-even prices for producers.

See accompanying table

Ag Summit Sets Agenda for State

By Bonnie Coblentz

State agricultural, political, community and industry leaders met in April to outline an agenda to enhance the Mississippi economy through agriculture, forestry and rural community development.

Mississippi State University spearheaded the second Agriculture and Forestry Summit in Jackson. The recommendations of task forces formed a year ago to study several aspects of Mississippi's economy were announced at this conference.

As Mississippi State's agricultural research arm, MAFES plays a key role in helping the state's agricultural industry meet the Ag Summit objectives. MSU president Malcolm Portera explained the goals.

"Under the leadership of Dr. Rodney Foil, vice president for agriculture, forestry and veterinary medicine, Mississippi State brought a group of people together a year ago to develop an agenda for the state of Mississippi that takes it into the 21st century," Portera said. "They developed an agenda for the economy of the state of Mississippi and described the role Mississippi State University must play in assisting the state to expand its economy."

Goals are to ensure that MSU focuses on initiatives that provide the greatest economic and social returns, and to market the state and its ag and forestry products more effectively.

Foil emphasized technology transfer and the need for the state to stay current as this field changes.

"Technological change will not decline and will likely increase," Foil said. "We need to stay ahead of the trend rather than following along behind."

Distance education will continue to be a valuable teaching tool.

"We feel like the entire university will be committed to distance learning, but the agriculture, forestry and rural community sectors will be absolutely dependent on it to reach their goals," Foil said.

MAFES Director Vance Watson discussed changes needed in the workplace to improve the economy. He stressed the importance of establishing a remote sensing and spatial technology center for agriculture and forestry and a biotechnology institute at MSU to address plant and animal issues.

"Scientists at Mississippi State University have been involved in biotechnology research for nearly 20 years," Watson said.

Watson emphasized the initiatives that focus on better environmental stewardship. These included a heightened focus on waste research and disposal options, new pharmaceutical and vaccine testing, and more comprehensive food safety programs. He also discussed the importance of sustainability and profitability in agriculture and forestry.

Kaye Bryant, forest landowner and former forestry commissioner, discussed initiatives that deal with the home, and how strengthening families can contribute to economic growth. Of primary importance is preparing youth for the workplace, she said.

"Youth need an understanding of career opportunities and a work ethic that causes them to do more than just get by but to succeed," Bryant said. "We also need an educational standard across the state so we know when children leave the school system they're playing on the same field."

Ken Stewart, senior director of projects for Georgia Pacific Corp., said Mississippi's economic machine must become the preferred supplier of products and services internationally, not just locally.

"To be successful in this economy, we have to meet consumers' needs better," Stewart said.

To do this requires a greater public awareness of global markets, enhanced trade opportunities made possible by reduced trade barriers, and better marketing of Mississippi agriculture and forestry products.

Portera said MSU will take the lead in seeing that these agriculture, forestry and community development initiatives are followed as a road map to improving the Mississippi economy. Updates will be presented next year.

Summit Recommendations

The Homeplace

1. Assist youth in making a successful transition to a dynamic workforce.
2. Assist the family in maximizing its potential for social functioning and well-being.
3. Enhance the ability of communities to reach their economic and social potentials.

The Workplace

4. Adopt a sound process to justify each priority program in DAFVM, based on the current status and trends in Mississippi agriculture/forestry and the greatest economic and social returns.
5. Package a positive message for print and electronic media that promotes agriculture and forestry so consumers perceive these industries as beneficial to them.
6. Improve the effectiveness of technology transfer.
7. Enhance Mississippi's agriculture, forestry, and rural communities by educating the state's clientele through distance-education methods of teaching.
8. Use biotechnology to create new products from existing crops.

9. Apply technology to convert wood and other agricultural by-products for greater economic uses.
10. Establish a biotechnology institute capable of addressing plant and animal issues.
11. Produce biorational control agents (BRCs).
12. Identify disposal options for poultry litter.
13. Enhance the MSU livestock waste research and education efforts and create an MSU Livestock Waste Research and Testing Laboratory (MSU-LWRTL).
14. Establish the MSU Remote Sensing and Spatial Technologies Center for Agriculture and Forestry.
15. Develop a more comprehensive preharvest and postharvest food safety program at MSU.
16. Use models and laboratory technologies to develop novel animal models for pharmaceutical and vaccine testing of disease conditions, benefiting livestock and human health.
17. Help Mississippi landowners derive profit from public demands for recreational opportunities and for conservation of natural resources in the state.
18. Develop a program of research and education to assist agricultural producers in managing yield, price, and income risks.

The Marketplace

19. Create or enhance public awareness of global markets.

20. Identify, develop, and disseminate information to promote international trade of Mississippi's agricultural and forest products.

21. Enhance trade opportunities by reducing barriers at state and local levels.
22. Create capabilities to provide information and service for effectively promoting the use of Mississippi's agricultural and forestry products in domestic and foreign markets.

MAFES Researchers Awarded Patents

By Rebekah Ray

Numerous awards and distinctions were listed behind Sir Alexander Fleming's name, but he never received a patent for his 1928 discovery of penicillin, the antibiotic that has saved countless lives from infectious diseases.

Discoveries such as Fleming's are considered intellectual property and are patentable. Intellectual property is a product of human intellect that has commercial value. Without patent protection, intellectual property is of little value since finding a partner to develop the product commercially would be difficult.

Unlike their Scottish predecessor, several MAFES scientists have received patents on intellectual property that originated from their research.

Patenting Process. Intellectual property patents are rights of ownership issued by the federal government for 17 years. Patents allow owners, or in this case scientists, rights to prevent others

from making, using or selling their invention or discovery without permission.

Patentability is determined by *novelty* (nothing identical has previously been developed), *utility* (the item is helpful) and *nonobviousness* (the invention or discovery differs from all previous knowledge).

The patent process includes several stages: *local evaluation* (invention disclosure is under local review by the university), *patent attorney evaluation* (patent attorney reviews the disclosure for its patentability), *provisional patent application, application pending* (patent attorney prepares patent application), *patent pending* (application for the patent is filed with the U.S. Patent and Trademark Office), *patent allowed* (a patent is allowed by the USPTO but not yet issued) and *patent issued* (MAFES and researchers receive patent).

MAFES Patents. The USPTO has awarded 23 patents to Mississippi State. MAFES holds 11 of these, with many on the cutting edge of the science known as biotechnology.

Biotechnology is the application of organisms, their components or biological techniques to develop or manufacture a product. For generations, biotechnology produced bread, cheese, wine and beer. Modern biotechnology has developed antibiotics, insulin, interferon, Bt cotton, recombinant DNA, and herbicide-, insect- and virus-tolerant crops.

Biotechnology will play an increasingly important role in helping meet multiple agricultural needs of the 21st century.

"A primary goal of our research is to help Mississippi farmers increase production and reduce agricultural production costs. Discoveries in biotechnology will improve Mississippi's agricultural production," MAFES Director Vance Watson said.

Incorporation of Soy Protein in Dairy Yogurts. Health benefits of soy protein have received much attention in recent years. In the U.S., human consumption of soy protein is low, and most of it is used as animal feed.

Traditional foods with soy protein have chalky textures and marked off-flavors, and have been unacceptable to American consumers. MAFES food scientist MaryAnne Drake combined soy protein with the sensory qualities of traditional yogurt to override typical problems related to foods containing soy proteins.

DNA Molecule Encoding a 33kD Cysteine Proteinase and its Use in Transforming Plants to Provide Insect Resistance. MAFES biochemist Dawn Luthe and MSU post-doctoral biochemistry student Tibor Pechan, with U.S. Department of Agriculture research geneticist Paul Williams and MSU doctoral student Bing-Hua Jiang, isolated the gene 33kD.

This proteinase has shown resistance to pests such as the fall armyworm, corn earworm, European corn borer, Asian corn borer, spotted stem borer, Southwestern corn borer, sugarcane borer, tobacco budworm and the African maize stem borer. When used with other implanted genes in "gene stacking," 33kD may provide an additional resistance to several crop pests.

The USDA provided insect-resistant corn lines that enabled MAFES scientists to isolate mir1 from the corn.

Fiber-Specific Protein Expression in the Cotton Plant. MAFES biochemist Din-Pow Ma isolated several cotton genes that encode lipid transfer proteins specifically expressed in cotton fiber cells. These proteins and their genetic controlling elements will some day enable scientists to develop genetically engineered cotton that is resistant to pests and exhibits novel traits and physical properties, such as longer and stronger fibers.

In 1998 cotton had a value-added production of $541 million.

Heliothis Virescens and Helicoverpa Zea Egg and Early Larval Protein-Specific Monoclonal Antibodies. Cotton continues to be a leading row crop in Mississippi, but tobacco budworms (TBW) and corn earworms (CEW) can wreak havoc on its production. In the U.S. last year, the two pests caused nearly $1 billion worth of damage on various crops.

To apply pesticides effectively, producers need to know the identity of pests. Pests are easily identified as adults, but larvae cause much damage. Identifying caterpillars of these devastating species is more difficult. Additionally, the time period for identifying and applying insecticides is narrow.

Former MAFES entomologist Sonny Ramaswamy and post-doctoral research associate Fanrong Zeng developed a monoclonal antibody-based diagnostic kit that allows producers to quickly and reliably identify TBW and CEW eggs and early larvae. Ramaswamy is now at Kansas State University.

Similar to a pregnancy test, the diagnostic kit relies on a simple color reaction that differentiates eggs of the TBW and the CEW, and identifies them within several hours.

S***oybean Transformation and Regeneration Methods.*** MAFES horticulturist Nancy Reichert and former MSU postdoctoral research assistant Yinghui Dan developed a new approach of introducing DNA into plants, particularly soybeans. In previous methods used in genetic engineering, only a few plant cells received the traits. This new method of cloning is faster and more efficient, and enables scientists to introduce DNA into more varieties.

Mississippi produced over $290 million of soybeans in 1998.

Methods for Transformation of Cotton and Kenaf and Organogenic Regeneration. Cotton and kenaf are in the Malvaceae family, but unlike cotton, no methods have existed to engineer kenaf genetically through tissue culture. Reichert and MSU graduate student Margaret Young and former student Teong-Kwee Lim have a patent pending that could revamp the way transgenic cotton is produced.

Producing 100 percent pure cotton through genetic engineering is not possible since undesirable genes will always be present. The cotton variety 'Coker' is 98 to 99 percent pure and regenerates readily, so it is ideal for breeding labs.

The researchers developed a method to regenerate commercial varieties of cotton that can be successfully coupled to various DNA introduction methods. With this approach, varieties can be genetically engineered directly, negating the need for intensive breeding efforts.

Methods for Maize Transformation Coupled with Adventitious Regeneration Utilizing Nodal Section Explants and Mature Zygotic Embryos. Reichert has applied for a patent to improve

methods for the development of genetically engineered corn. Last year, corn had a value-added production of more than $8.8 million in Mississippi.

Methods for Genetype-Independent Nuclear and Plastid Transformation Coupled with Clonal Regeneration Utilizing Mature Zygotic Embryos in Rice (Oryza sativa) Seeds. Additionally, Reichert has a patent pending for developing resistance to rice water weevils through genetic engineering.

Channel Catfish Virus with a Deletion in Gene 50 is Attenuated* In Vivo *and Can Be Used as a Viral Vector for Channel Catfish Vaccination. Catfish is one of Mississippi's top agricultural commodities, with a 1998 total farm value of $306 million. Through research partially funded by MAFES, College of Veterinary Medicine scientist Larry Hanson received a patent to help the state's catfish producers obtain new strategies for producing healthy catfish.

In-Vitro *Cellular/Biomaterial Strain Simulator and Electrochemical Cell Culture Corrosion Test.* Materials implanted into the human body are used to expand or replace functions of damaged or diseased tissues. In orthopedic and dental applications, the integration of these materials into bones depends on cells that are immediately adjacent to the surfaces of the device. The interaction between the cells and the surfaces of these materials is not completely understood.

MAFES agricultural and biological engineer Joel Bumgardner received provisional patents for developing devices to help determine how host cells and tissues respond to implant materials. The *cell strain simulator* allows cells to be grown on surfaces of implants and alloys under known strain conditions. The *cell culture electrochemical plate* allows cells to be grown on implant surfaces and monitors cell response.

These devices will improve the long-term use and effectiveness of dental and orthopedic implant devices.

By fulfilling its purpose of discovering new knowledge, MAFES scientists are continually researching ways to further improve Mississippi agricultural production.

MAFES Biotech Research

Survival Rates of Tobacco Budworm (*Lepidoptera: Noctuidae*) Larvae Exposed to Transgenic Cottons Expressing Insecticidal Protein of *Bacillus thuringiensis*--C.D. Parker, Jr., V.J. Mascarenhas, R.G. Luttrell and K. Knighten

Expression and Regulation of Lipid Transfer Protein Genes in Developing Cotton Fibers--D. Ma

Rapid Quantitation of Viable *Escherichia coli* 0157:H7 in Foods Using Novel Molecular Techniques--M.A. Drake and J.L. McKillip

Insect Resistance to Mechanisms in Corn -- D.S. Luthe and W.P. Williams

Inducing Long-term Immunity to Enteric Septicemia of Catfish Using the Channel Catfish Virus Vector -- L.A. Hanson and A.J. Ainsworth

Increased Bull Fertility Associated with Heparin Binding Protein (Fertility Associated

Antigens)--G. Smith, T. Engelken, T. Kiser, R. Evans, A. Williams, and B. Banes

Identification and Isolation of Root-Knot Nematode Resistance Genes from Corn--N. Reichert

This is a partial list of MAFES research in biotechnology

What is Intellectual Property?

Intellectual property includes items such as scientific discoveries, mechanical inventions, chemical formulas, machines and software, poetry, music, designs, artwork, advertisements, anything that results from intellectual creativity.

Providing protection for intellectual developments gives proprietary nature for its use, research, development or design. Because of intellectual property laws, researchers can receive patents, copyrights or trademarks on products of the human intellect that have commercial value.

Intellectual property law includes all the statutes, government regulations and court decisions that determine who owns the property and how that property may be sold or loaned. Intellectual property law includes categories such as trade secret laws, copyright laws, trademark laws and patent laws.

MAFES Plans for Future with Biotech Institute Seminars

By Rebekah Ray

To keep Mississippi a leader in agricultural production and research, MAFES is helping to develop a university-wide Biotechnology Institute.

"This project, funded by the Robert M. Hearin Support Foundation, is the first concerted biotechnology planning effort in the state to use new developments in this rapidly growing area. This multi-disciplinary initiative will help Mississippi capitalize on the potential economic benefits biotechnology offers," said Nancy Cox, assistant director of MAFES and chair of the university's biotechnology steering committee.

Biotechnology uses living organisms, biological components or biological techniques to improve human health and food production.

Traditional biotechnology has made possible the production of bread, cheese, wine and beer, and in modern times, biotechnology has been used to produce antibiotics, insulin and interferon. Through the use of recombinant DNA, scientists have also used biotechnology to develop insect-, virus-, and herbicide-tolerant crops, such as "Bt" cotton.

"Locating the Biotechnology Institute at Mississippi State is significant because of the university's land-grant background and heritage, and our present strengths in agricultural biotechnology," Cox said.

Goals of the institute include building on existing MAFES strengths to increase plant and animal resistance to diseases and insect pests, to improve the quality of Mississippi commodities, to

develop better diagnostic methods for animal and plant diseases and to improve environmental quality and waste management strategies. New areas in computational biology and animal biotechnology are also being studied.

"To develop the Biotechnology Institute, Mississippi State will consult with other premier biotechnology centers such as the University of Maryland Biotechnology Institute, the Danforth Plant Science Center and the Minnesota Food Animal Biotechnology Institute," Cox said.

MAFES representatives on the biotechnology steering committee include biochemist Dawn Luthe, agricultural bioengineer Joel Bumgardner and project coordinator Tinna Hall. MSU administrators on the committee include Jerald Ainsworth, director of research at the College of Veterinary Medicine; Juan Batista, director of the Agribusiness Institute; and Gary Jackson, assistant dean of the College of Agriculture and Life Sciences.

The developmental process of the biotechnology institute included a series of seminars June 15-17, which provided additional information on the need and importance of biotechnology.

In two seminars sponsored by the MSU Department of Forestry, H.D. Bradshaw, a research associate professor from the University of Washington College of Forest Resources, addressed "Quantitative Genetics in the Era of Genomics" and "Populus as a Model System for Forest Tree Genetics and Genomics."

The MSU Department of Biochemistry and Molecular Biology hosted San Diego State University professor of chemistry Stephen Dahms, who spoke on "Career Opportunities in Biotechnology" and "Biotechnology Centers: A National and Regional Perspective." Dahms is also director of the California State University Program for Education and Research in Biotechnology.

The Hearin biotechnology offices are located in Bost Building on the Mississippi State University campus. For additional information on the institute, check its web site at www.mafes.msstate.edu/biotech/.

MAFES CoHosts Monsanto Seminar

By Rebekah Ray

Biotechnology, precision farming, environmental issues, the global economy and technological advances are dramatically impacting agriculture, researchers heard at the Monsanto Life Sciences Seminar at Mississippi State University.

MAFES co-hosted the April 8 event.

"Agriculture is changing rapidly, and companies such as Monsanto are moving fast to adopt those changes. This seminar gives insight into how Monsanto helps shape agricultural business for the future," said Rodney Foil, vice president for agriculture, forestry and veterinary medicine at MSU.

Monsanto spokesmen included Douglas W. Rushing of Tallahassee, Fla., and Patrick Quinn, Thomas J. Hoogheem and John R. Anderson, all from St. Louis, Mo.

Researchers were reminded of the importance of biotechnology and its benefits to humanity. The

need for genetically engineered crops has developed because of declining government subsidies, increased demands for food, agricultural producer consolidations and information availability.

"The speeding up of plant breeding through biotechnology can help meet increased demands for food brought on by population growth. By 2020, feed and food crops are projected to increase 75 percent. Biotechnology allows more crops to be produced in smaller spaces and reduces chemical treatments needed," Rushing said.

The Monsanto seminar was one of four presented around the country. MAFES, the MSU Extension Service, the College of Agriculture and Life Sciences and the College of Veterinary Medicine sponsored the event.

MAFES Agronomist Studies Gi-Ant Problem

They are chemists, architects, engineers -- and invaders.

By Rebekah Ray

More than 50 years ago, they probably "stowed away" on a ship and landed in Mobile, Ala. Since then, imported fire ants, or *Solenopsis spp.*, have spread across the Southeast. Now, they infest more than 200 million acres in 11 states and Puerto Rico.

"I don't know of anything that has been such an unstoppable force here in the South like fire ants. Not only are they harmful to humans and animals, they are changing our environment," said David Pettry, MAFES agronomist. Pettry's research investigated the impact fire ants are having on the environment.

Two species of imported fire ants are found in Mississippi: *Solenopsis invicta* Buren, the red or light species; and *Solenopsis richteri* Forel, the black or dark species. Native to Uruguay and Brazil, the two species have moved east, west and north to cover the southeastern United States. *S. richteri* is found in northern Mississippi and Alabama, while *S. invicta* is more widespread.

"Fire ants are all over Mississippi in all types of soil and seem to permeate the entire state. We're looking at how they are affecting the soil environment, including the nature and structure of soil, air, and water movement, soil temperature and how they mix soils," Pettry said.

Environmental Impact. These tiny intruders can seriously impact agricultural production. Their mounds alter vital soil characteristics, damage crops, and interfere with cultivation, grazing and harvesting.

"Not only are they dangerous, their venom can be poisonous. When bitten, humans may develop allergic reactions to the venom. And, if a newborn calf falls into a mound, the results can be serious," Pettry said.

So, the battle with fire ants rages on.

"Materials used to fight fire ants are staggering. People have tried gasoline, motor oil, insecticides, boiling water, Clorox®, Tide® and even grapefruit halves. These could seep underground into the water table, so to protect the environment we need to know about fire ants," Pettry said.

Colonization. Fire ants mate shortly after a rainfall. Fertile queens take a nuptial flight, mate in mid-air, land in moist soil and create burrows to lay eggs. Able to produce her own weight in eggs each day, a single queen can start a colony.

Sterile female ants, the colony workers, appear within several weeks. Their main purpose is to care for the queen and tend her eggs. In three years, a colony can grow to 120,000 ants that inhabit a mound 16 to 24 inches in diameter and can produce more fertile male and female winged ants. The colony may one day number 230,000.

Mounds. Ants make their nest, or formicary, in the soil of open areas, pastures and fields. Not typically found in wooded areas, mounds may soon appear after a section of trees have been felled. Fire ants seem to be attracted to electrical fields, typically around air conditioning units and electric fences.

The "crust" of the mound is not as stable as the undisturbed topsoil and the mound interior. After ants construct a tunnel network, they cover the top tier of tunnels with a thin mulch of debris. The crust is not water-repellant and is vulnerable to erosion from heavy rainfalls. Moisture or air that enters the crust passes through the mound, through the channels and into the underlying soil.

This research proposed the name "formicarious pedon" for soil structures that differ profoundly from undisturbed soil. Formicarious pedons are large, very porous mounds that sit on the original pedon, or soil. A typical dome-shaped mound can be as high as 3 feet, with a dense underground network of interconnected tunnels that may extend down to 6 feet into the underlying soil. Several channels reach to the water table.

MAFES Study. For the last four years, Pettry and MSU scientists William P. Green and Richard E. Switzer have examined the impact fire ants have made on a wide variety of Mississippi soils. In consultation with MSU Department of Entomology and Plant Pathology researchers Richard Brown, Henry Pitre and James Jarratt and U.S. Department of Agriculture researchers Homer Collins and Tim Lockley, the team looked for long-term implications regarding structure, composition and function of formicarious pedons on Mississippi soils.

Studies were conducted on 12 soil sites throughout the state. In their evaluations of both formicarious pedons and undisturbed soils, researchers measured and compared the structure, composition and other physical components like temperature and hydrology.

Formicarious pedons are composed of particles of excavated soil and plant material mixed and assembled by the ants. The mounds are typically higher in clay, phosphorous and potassium and lower in organic matter, sand and silt than the surrounding undisturbed topsoil.

The pH of the inhabited mound and submound is usually higher than that of the uninhabited pedon and has very different temperatures and moisture levels. The formicarious pedons also heat up faster than surrounding soil in the spring and summer, and dry out more quickly than adjacent soils.

The pedons allow more infiltration and leaching through the fragile crust and porous channel network.

Additionally, active ant mounds have increased populations of bacteria and fungi during habitation.

Perhaps the most obvious long-term effect of fire ants is the homogenization of the upper part of the soil, which changes the nutrient and water retention in the soil. In their mound-construction process, ants bring subsoil to the surface and mix it with topsoil. When these mounds collapse, the materials backfill the channels, so that the chemical composition of the soil has altered.

This could result in noticeable increases in the need for agricultural fertilizers, and elements such as nitrogen, phosphorus and potassium may be lost from the soil through concentration and leaching.

As colonies relocate, die or develop, ants may alter 100 percent of a given landscape in less than 100 years. The presence of many mounds over a field could alter the entire landscape.

Imported fire ants have taken hold of soils that have never before experienced such destructive forces.

"We don't yet have an environmentally friendly way to control imported fire ants. In their native habitats, the ants are controlled by naturally occurring mechanisms. The more we know about fire ant lifestyles and habitats, the closer we will be to controlling them and saving our environment as we know it," Pettry said.

MAFES Poultry Research Has Dual Purpose

By Rebekah Ray

Traditional Southern meals typically include oversized platters heaped with piping hot fried chicken.

The staple probably came from Mississippi, which ranks fourth in the nation in broiler production. In 1998, poultry was the state's top agricultural product, with an estimated total farm production value of $1.43 billion. With this demand comes the problem of managing the litter appropriately. Proper management of animal waste is one emphasis of MAFES.

"Poultry production and proper management of chicken litter are big issues today. Actually, I like to call it "poultry litter nutrient management' because it's such an asset when properly reused," said Tim Chamblee, MAFES poultry scientist.

Chamblee is investigating three aspects of chicken litter: the nutrient content of chicken litter produced in Mississippi; methods of measuring the quantity of chicken litter produced in the state; and environmentally safe uses of it.

Nutrient Content. Chicken litter includes the nutrients nitrogen, phosphate, and potash. Mississippi poultry producers need to know the nutrient levels of litter produced on their farms, Chamblee said.

"Nutrient composition varies from state to state and could even vary within a state because of different feeds and growth times. Other poultry-producing states know the nutrient content of their litter, and our Mississippi producers need to know the nutrient value of litter present in their chicken houses," Chamblee said.

In the near future, all producers will need to have in place a comprehensive nutrient management plan stating how animal wastes will be used.

"Nutrient levels may vary with the type of birds produced. Chicken feed for different stages of growth contains different nutrient levels," Chamblee said.

Two types of broilers are produced in Mississippi. The "fast-food" broiler is raised for 42 days to reach a weight of 4 to 41/2 pounds. The larger "debone" birds produced for restaurants and grocery suppliers are raised 54 to 56 days to reach a weight of 6 to 61/2 pounds. The different growth times of these two types of broilers could also influence nutrient content of litter.

"The Natural Resources Conservation Service of the U.S. Dept. of Agriculture has developed a set of guidelines for nutrient management plans. To date, Mississippi producers have been using analyses from other states, so we're establishing data to help Mississippi producers know nutrient levels in the chicken litter," Chamblee said.

Litter Measurements. MAFES is developing ways to help poultry producers measure what is produced in their houses.

According to one estimate, Mississippi broilers produce 600,000 tons of litter annually, but there are no figures for total poultry production that include litter from pullets and hens.

Poultry producers need to know the amount of litter produced in their houses, as well as its nutrient content. Then, they can properly apply litter without harming the environment, Chamblee said.

"Producers have not had accurate methods to measure litter amounts in their poultry houses," Chamblee said. "We're looking for an efficient method to enable producers to determine how much litter is produced within a certain period of time."

Used locally as fertilizer on hay and crops, chicken litter replaces chemical fertilizers and loosens up soil, and may even be blended with cattle feed. Although it is a good source of nutrients for pastures and croplands, the litter has limited markets because the nutrient levels are not highly concentrated.

"We're looking at nutrient concentrations where Mississippi poultry production is primarily located. In 1998, most Mississippi poultry was produced in Scott, Smith, Leake, Simpson and Jones counties, near most of the state's poultry processing companies," Chamblee said.

Years ago, producers cleaned out houses after shipping each flock of birds, but today, due to the limited availability of pine shavings, several flocks are grown on the same litter before cleaning out, Chamblee said.

The frequency of cleaning out chicken houses varies according to poultry production company guidelines.

Utilization. MAFES research is assisting Mississippi poultry producers to be better stewards of the environment.

"We're concerned with the environmental effects of land-applied chicken litter. If chicken litter is over-applied, nutrients could move into lakes and streams with possible adverse affects,"

Chamblee said.

Most chickens are fed a corn-and-soybean meal diet, but not all the phosphorous in the feed can be utilized by the chicken. Phytase enzymes can be added to poultry feed to make the plant phosphorous more available and in turn, reduce the amount of phosphorous present in the feed. This can result in a reduction of the phosphorous present in poultry litter and reduce phosphorous applications to the environment.

MAFES researchers are investigating other uses for poultry litter like using it as fertilizer for pine forests, expanding its use in cattle feeds and composting it for use in lawns and gardens.

Poultry has come into its own as a desirable Mississippi-produced food product. MAFES research is also ensuring that its production does little harm to the environment.

MAFES Animal Waste Monitoring Research

Reduction of Effluent Discharge and Groundwater Use in Catfish Ponds -- T.P. Cathcart, J.W. Pote, and D.W. Rutherford

Characterization of Mississippi Poultry Litter -- T.N. Chamblee

Biosolid Application to Hybrid Bermudagrass: Effect on Forage Characteristics and Water Quality -- D. Ingram and D. Lang

Reduction of Swine Farm Odors and Total Waste Volume through Modification of Swine Dunging Behavior -- W. Frank, T.N. Burcham, T. Cathcart, R. Little and M. Crenshaw

Swine Odor Reduction System -- T.N. Burcham, K. Cadwallender, D. Hudson, B. Baldwin, A. Borazjani, M. Zappi, and W. Frank

The Feasibility of Recycling the Sands-Solids Mixture from a Solids Settling Basin for Use as Bedding Material in a Dairy Free Stall Barn -- R. Moore, T.N. Burcham, B. Herndon, and D. Lang

Runoff Collection, Measurement and Analysis from Research Plots Treated with Swing Lagoon Effluent -- T.N. Burcham

Poultry Waste Management for Water Quality in Mississippi Agronomic Systems -- W.L. Kingery, K.O. Willeford, P.G. Gerard, J.L. Oldham, J.R. Johnson, D.H. Huddleston, M.S. Cox, E.D. Peebles, R.L. Ivy, B.B.Johnson and S.F Oppenheimer

Development of Nutrient Management Strategies for Commercial Swine Production -- J.J. Varco, and D. Lang

This is a partial list of MAFES research in animal waste monitoring

---

MAFES Ensures Safer Processing of Catfish

By Rebekah Ray

Part of MAFES food quality and safety research ensures the availability of top-quality healthful food and food products.

MAFES food scientist Doug Marshall keeps a close eye on Mississippi catfish to ensure that its production and processing fit federal regulations.

"Catfish producers have an obligation to deliver clean, wholesome fish to processing plants who in turn are responsible for delivering clean, wholesome catfish products to consumers," Marshall said.

Catfish is one of Mississippi's top commodities. In 1998, total catfish sales for the state were $306 million, meaning that more than 65 percent of catfish sales in the nation comes from Mississippi. The state's 420 catfish farms are located primarily in Humphreys, Sunflower, Leflore, Washington, Yazoo, Sharkey, Issaquena, Lowndes, Noxubee and Kemper counties. Of the 25 catfish processing plants in the South, Mississippi has 14, with nine in the Delta, one in southwest Mississippi and four in east-central Mississippi.

As human consumption of aquacultured catfish continues to increase, more emphasis is placed on safe handling in processing plants. Aquacultured foods may be contaminated with several human pathogens: *Salmonella, Edwardsiella tarda, Clostridium botulinum, Listeria monocytogenes, Aeromonas hydrophila* and *Vibrio*.

Marshall's research makes certain that Mississippi farm-raised catfish is processed and packaged in the safest possible manner.

"During several phases of processing, catfish processing equipment needs to be cleaned and sanitized frequently to ensure the removal of biofilms, or layers of microorganisms on surfaces. Older, more mature biofilms are more difficult to remove and require more powerful removal methods than simple water rinses," Marshall said.

Marshall conducted a three-phase investigation to identify deleterious microorganisms present during catfish processing.

Identification of Microflora. Two catfish processing plants were surveyed. Plant 1 was a small facility that used manual processing techniques, while Plant 2 was larger and more automated.

Researchers took biofilm samples from several stages of processing and identified the following bacteria: *Aeromonas, Pseudomonas, Acinetobacter, Providencia alcaligenes, Citrobacter freundii, Hafnia alvei, Plesiomonas shigelloides, Edwardsiella tarda, Morganella morganii, Enterobacter Enterococcus, Staphylococcus, Streptococcus* and *Bacillus*. The safety of processed catfish in these plants was noted by the absence of definitive human pathogens.

At both plants, the largest percentages found were *Pseudomonas* and *Aeromonas*. Most bacterial types identified from the larger, automated plant were *Pseudomonas*, while more than half the bacterial types identified in the smaller, manually operated plant were *Aeromonas*.

The study concluded that much of the bacteria identified from equipment surfaces would not likely constitute a food safety concern, except for opportunistic human pathogens *A. hydrophila* and *E. tarda*.

***A. hydrophilia* on Stainless Steel.** Biofilms may adhere to and proliferate on poorly cleaned and sanitized food processing surfaces, and then contaminate foods. Biofilm thickness can be less than a monolayer of cells or as thick as 300 to 400 nanometers.

A rare opportunistic human pathogen, *A. hydrophila*, can cause septicemia, fresh-water wound infection, skin infection, gastroenteritis, corneal ulcer, acute and chronic diarrhea and pneumonia. Sources contaminated by *A. hydrophila* include impure water, foods and hospital-acquired infections.

Since *A. hydrophila* was isolated on catfish processing equipment, this study evaluated the potential of the bacterium to establish biofilms on stainless steel, the predominant material used for food contact surfaces.

Stainless steel chips were placed in test tubes contaminated with *A. hydrophila*. The chips were then incubated at 4, 28, and 42 degrees Celsius for 4, 8, 12, 24 and 72 hours. Scanning electron microscopy showed that irreversible cell attachment occurred rapidly following short exposure times.

More extracellular biofilm material was found at 28 C than at 4 C. Prolonged exposure on food-processing surfaces resulted in the formation of complex multilayered structures.

This phase showed that *A. hydrophila* biofilms attached and developed multilayer structures on stainless steel chips. Complex biofilms were absent at 4 C suggesting that refrigeration hindered complex biofilm formation.

Rapid attachment of *A. hydrophila* and its ability to proliferate into biofilms shows the need for more thorough methods of cleaning and sanitation than standard rinsing with hot water. Because *A. hydrophila* can easily attach to and colonize on stainless steel surfaces, food quality and safety could be compromised should control measures fail.

Destroying *A. hydrophilia*. In food environments, processors rely on physical and chemical control measures such as hot water, hand washing and chemical bactericides to prevent the attachment and development of biofilms that might cause food spoilage or transmission of disease-causing agents.

Many biocidal chemicals are used to inactivate microorganisms, but no products or practices including adequate sanitation prevent attachment and primary film formation.

This study tested the use of moderate heat or chlorine to kill *A. hydrophila* biofilms on stainless steel.

Exposure to heat. Stainless steel chips were colonized with *A. hydrophila* for eight hours, three days, and eight days at 28 C. The chips were heated to 50 C or 60 C in a tempered water bath for one or three minutes and then placed on ice. Microbial survivors were counted. Inactivation of older biofilms required more heat than inactivation of younger biofilms.

Exposure to sanitizer. Prepared biofilms on steel chips were exposed to various strengths (0, 25, 50, 75 parts per million [ppm]) of chlorine for one minute at 25 C. As the chlorine levels increased, more *A. hydrophila* cells were inactivated. *A. hydrophila* was not detected after a one-minute exposure at 60 C or to 75 ppm chlorine.

Since there is a wide prevalence of *A. hydrophila* biofilms in water and aquaculture products, the bacterium can contribute to food spoilage and human illness.

MAFES research continues to ensure the safe handling and processing of catfish, so that consumers only need be concerned about whether to have their catfish blackened, grilled, fried, sautéed, patéed or baked.

MAFES Food Quality and Safety Research

Effect of Barley Straw for the Control of Off-Flavor in Pond-Raised Catfish -- G.D. Wills, C.S. Tucker and E.J. Jones

Identification of Volatile Off-Flavor in Reduced-Fat Cheddar Cheese Containing Lecithin -- O. Suriyaphan, M.A. Drake, and K.R. Cadwallender

rRNA Stability in Heat-Killed and UV-Irradiated Enterotoxigenic *Staphylococcus aureus* and *Esherichia coli* -- J.L. McKillip, L.A. Jaykus and M.A Drake

Humoral immune responses of channel catfish (*Ictalurus punctatus*) fry and fingerlings exposed to *Edwardsiella ictaluri* -- L.Petrie-Hanson and A.J. Ainsworth

Breeder Age, Dietary Fat and Broiler Yield: Effects of Broiler Age and Dietary Fat on Subsequent Broiler Slaughter Yield -- E.D.Peebles, S.M. Doyle, T. Pansky, P.D. Gerard, Mickey A. Latour, C.R. Boyle and T.W. Smith

Organic Acid Dipping of Catfish Fillets: Effect on Color, Microbial Load and *Listeria monocytogenes* -- M. Farid A. Bal'A and D.L. Marshall

Vitis rotundifolia as a Source for Vinegar -- J.F. Anderson, D.K. Tidwell and J.L. Silva

This is a partial list of MAFES research in food quality and safety

---

Satellite Technology Helps Grow Cotton

By Rebekah Ray

Remote sensing technology has been around for the last 30 years, long enough for MAFES researchers to now be adapting it to specific Mississippi crop production and resource management.

On a test plot in the North Delta, MAFES agronomist Jac Varco and research assistant John Thompson used remote-sensing and variable-rate fertilization to help Mississippi cotton crops grow under different conditions.

"To the untrained eye, soils may appear uniform, but different soils with differences in chemical and physical properties may exist within a field and that can affect crop production," said Varco.

Until recently, Mississippi Delta cotton farmers did have not have the tools to vary application

rates within fields.

"Remote sensing can help distinguish different soil textures, elevation and drainage patterns in a field so that nitrogen fertilizer can be applied more appropriately," Varco said.

Nitrogen is an essential element for plant growth. Soil microorganisms release it in an available form as they feed on organic matter and plant residues. Nitrogen fertilization increases photosynthetic activity and plant growth, and produces healthy looking plants with a dark green color.

Overapplication of the nutrient can delay crop maturity by causing excessive growth and increase insect infestation and boll rot. Controlling plant height in cotton is critical for effective use of insecticides and for mechanical harvesting.

Researchers from the Institute for Technology Development located at the Stennis Space Center in Picayune used Lidar, or laser radar, to determine soil elevations on the test plot. They also used multispectral imaging to distinguish soil moisture patterns. By coupling this information with soil elevation measurements, they could predict drainage.

After uniformly applying nitrogen to a cotton field, researchers used a global positioning system to map out 72 acres of the site on a one-acre grid to determine soil characteristics.

The researchers established a control section and two test sections that were treated with variable rates of nitrogen. One test section was fertilized according to soil test nitrogen availability results, and the other used that same information and included elevation, soil moisture and clay percentages. Control plots received 40 pounds of nitrogen per acre as sidedress in addition to 60 pounds of nitrogen applied after planting.

Over the growing season, researchers measured plant height and leaf nitrogen status, and used remote sensing to determine how variable rate fertilizer nitrogen applications affected cotton growth.

Researchers showed that applying nitrogen in varying rates redistributed nitrogen fertilizer levels throughout the field but did not decrease net levels of fertilizer.

"This research is preliminary but it demonstrated that combining remote sensing technology and variable rate fertilizer applications can improve cotton production. Producers with high levels of variability in their fields might benefit from using variable rate nitrogen applications," Varco said.

This research was done in conjunction with NASA's Commercial Remote Sensing Program and ITD/SSC.

RSTC Brings Satellite Info To Ground Level

MAFES and several MSU research operatives established the university-wide Remote Sensing Technologies Center this spring to help Mississippi farmers produce better crops more efficiently.

"There's tremendous potential for using remote sensing in agriculture. We're researching the development of new tools and new uses of those tools to help Mississippi farmers produce crops

more economically," said David Shaw, MAFES scientist and director of the RSTC.

MAFES and MSU are bridging the fundamental science of remote sensing with its practical application to agriculture and forestry.

Because of its land-grant mission, MSU has developed some of the strongest programs in the nation for agricultural research and extension education, as well as engineering. The ability to tie remote sensing technologies to the "ground truthing" research of MAFES makes the RSTC a natural for MSU.

Soils in Mississippi, particularly in the alluvial Delta, vary within each field and need to be managed in localized areas rather than on a whole-field basis. Mississippi produces all of the major crops grown in the U.S., and 40 percent of the state's land is forested.

MAFES scientists work in multi-disciplinary teams with other MSU researchers and with USDA/ARS scientists at Starkville and Stoneville. MSU's Engineering Research Center handles data management and image interpretation, and MSU's Forestry and Wildlife Research Center brings its long history of expertise in remote sensing.

Mississippi farmers and foresters have readily adopted new technologies in transgenic crops and precision agriculture. Mississippi foresters are among the national leaders in intensified forest management.

The location of the NASA's Stennis Space Center (SSC) in Hancock County is an added plus for applying space technology to Mississippi crops. In addition, the Mississippi Space Commerce Initiative, located at the SSC, is focusing on bringing the remote sensing industry to Mississippi. Both of these organizations provide critical components of applications development, while their proximity to MSU provides a unique setting for the development of the RSTC efforts.

"At the RSTC, we're working closely with NASA and agricultural producers and distributors to develop commercial applications of remote technology," Shaw said.

These technologies are still cost-prohibitive for many producers.

"Our goal is to make satellite and airborne technology beneficial to keep more of the state's producers in the business of farming," Shaw said.

To learn more about producer needs, RSTC personnel met with farmers to conduct needs and feasibility assessments and then developed applications to address those needs, Shaw said.

Last spring, Mississippi State University received $10 million in federal funding to establish the RSTC. These funds will be used to develop new methods of applying satellite technology to agriculture, forestry, wildlife and transportation ("MSU Receives $10 Million Remote Sensing Grant," *Highlights*, 62:2).

The RSTC is also developing comprehensive research on Mississippi forests. Dave Evans of FWRC uses spectral data of forests and Lidar (a technology similar to radar) to determine tree heights and tree types and to monitor various stressors such as insects.

When applied to agriculture, this same information can determine crop heights. Similarly, it can

provide a pattern recognition signature, or spectral map, that can be used to monitor crop stress, nutrient deficiencies, weed infestations, disease incidence, and insect populations. Such information can even be used to time applications of defoliants and plant growth regulators in fields.

"There is tremendous potential in applying this technology to other crops, but there are also several challenges to work through, including data management and development of a properly trained workforce to handle these technologies," Shaw said.

A key component of RSTC is in workforce development. We need to train people to use these technologies and to handle the vast amount of data now available, Shaw said.

More information on the RSTC can be downloaded from www.rstc.msstate.edu.

MAFES Remote Sensing Research

Unique Cotton Yield Monitor -- F. To

Integrating GIS into Precision Crop Management -- D.C. Akins, J.L. Withers, J.M McKinion, S.B. Turner, F.D. Whisler and J. Varco

Remote Sensing as a Tool for Detecting Weed Distributions -- F.E. LaMastus, D.R. Shaw and M.W. Shankle

This is a partial list of MAFES research in remote sensing

Ag Fellow Records Senate Experiences

By Rebekah Ray and Wash Respess

Both come from rural Mississippi communities and both realize the importance of agriculture to Mississippi's economy.

Wash Respess, the first MAFES Agricultural Fellow, spent the spring 1999 semester in Sen. Thad Cochran's Washington, D.C., office. He posted monthly updates on the MAFES homepage (www.mafes.msstate.edu) to keep Mississippians informed of congressional actions related to agriculture.

Respess grew up on a Quitman County farm that produces cattle, catfish and row crops. A graduate student in animal physiology at Mississippi State University, he has an undergraduate degree from MSU in biochemistry and molecular biology.

As Mississippi's senior senator, Cochran is in his fourth consecutive term in the U.S. Senate. He serves on the Agricultural, Nutrition and Forestry Committee and the Appropriations and Governmental Affairs Subcommittee, which oversees farm programs and appropriations for the U.S. Department of Agriculture.

The MAFES Agricultural Fellowship is presented annually to a graduate student who receives

partial MAFES funding. Selection is by a special committee appointed by the MAFES director.

Excerpts from "The Wash Report". . .

January 1999 -- One of the top agriculture issues facing the 106th Congress is crop insurance reform. This is sure to be a highly debated issue because of last year's farm disaster.

February 1999 -- Many are talking about crop insurance reform...hopefully, something good will come from the interest in crop insurance, but I don't see anything being done to raise commodity prices. It is disturbing to see the economy doing so well while agriculture is struggling along.

March 1999 -- This administration and Congress have decided that help for farmers should come in the form of a "safety net." Crop insurance reform seems to be the way the government will try to take some of the risk out of farming. There are many opinions on how to fix crop insurance, but no one seems to have all the answers yet. We have been very busy trying to find solutions, and the agriculture committee has held a couple of hearings to discuss the situation with crop insurance.

Mississippi has definitely had an impact at the hearings. MAFES agricultural economist Keith Coble testified at the first crop insurance hearing (*see "MAFES Ag Economists Advise Policymakers"*).

April 1999 -- The House and Senate passed the budget resolution that earmarked $6 billion for crop insurance. Thus, we have been busy trying to find an answer to crop insurance reform. It seems agreed upon that something must be done to change the current risk management policy, but so far no plan has been agreed upon.

Late May 1999 -- Many Democrats, especially Sen. Harkin from Iowa, wanted to provide a large amount of support for farmers now, but Republicans, led by Sen. Cochran, took a different view on agriculture relief.

Sen. Cochran and his staff know that relief will be necessary, but at this time no one knows how much relief will be needed. Sen. Harkin tried to secure funds for crops that have just been planted.

Sen. Cochran declined to ask for a large amount of support until we know how much money it will take to help out farmers in these depressing times of dramatically low prices. He felt that if a large amount of support had been made on the Fiscal Year 99 supplemental appropriations, then it would have been almost impossible to find compassion from non-farm state senators this fall when it will be known how much will be needed for agricultural relief. Support should be coming for farmers, but not until the fall.

MAFES Ag Economists Advise Policymakers

By Linda Breazeale

Crop insurance programs are too complex for a quick fix, and two MAFES agricultural economists want to make sure policymakers understand that even minor changes can have major effects on growers and government costs.

Keith Coble and Barry Barnett, MAFES agricultural economists, have met with local farm organizations and surveyed individual farmers on their concerns regarding crop insurance and risk

management decisions. With extensive experience in risk management issues, they bring a unique understanding of the impact various decisions will have on farmers, the insurance industry and the government.

"Policy changes need to be based on a thorough understanding of the dynamics of insurance programs," Coble said. "We try to educate decision makers on the difference in the price support payments before 1996, the current transition payments and options for a future farm policy."

Coble has testified before the U.S. Senate Agriculture Committee and various advisory committees, such as the Commission for 21st Century Agriculture Policy.

"A short-term response this year would be a new policy related to crop insurance," Coble said. "On the other hand, debate will continue over the long-term solutions as they revamp farm policy by 2002."

The two economists have hosted key Senate staff members for extensive crop insurance discussions, fielded numerous calls from Congressional staff members and made presentations on crop insurance and risk management strategies around the country.

"Given the current low market prices, there is much debate on what can be done to help farmers. As the market goes down, the government will be looking for another way to support growers," Barnett said. "Originally, crop insurance addressed yield problems, now people are asking if it also can provide price support."

MSU's Vice President Foil Retires

By David Lack and Rebekah Ray

Rodney Foil spent 30 years helping improve the lives of others.

In May, Foil retired as vice president of the Division of Agriculture, Forestry and Veterinary Medicine at Mississippi State University. MAFES is part of this division.

"Rodney Foil's contributions over the past three decades have been a key ingredient in the transformation of agriculture- and forestry-related enterprises in our state," said MSU President Malcolm Portera. "Mississippi's agricultural and forestry sectors are more productive and efficient than ever before, and the research and service provided under his leadership have been important factors in bringing that about, along with expanded services in 4-H youth development and family and consumer education."

Foil has used knowledge to empower others. Under his leadership, numerous Mississippians realized their potential while building productive lives.

Background. Foil grew up in Bogalusa, La., and received his undergraduate and masters degrees in forestry from Louisiana State University. He later earned a doctorate in forestry from Duke University.

Foil began his career as a commercial land management forester and later returned to LSU to work in research, teaching and extension positions. In 1969, he moved to Mississippi State, where he

spent the rest of his career.

MSU Leadership. At Mississippi State, Foil became head of the Department of Forestry and ultimately dean of the School of Forest Resources, as well as associate director of MAFES. Foil was named director of MAFES in 1978, and Experiment Station research prospered during his eight years of leadership.

In 1986, Foil became vice president of MSU's Division of Agriculture, Forestry and Veterinary Medicine, a position that allowed him to implement programs to benefit Mississippians from all walks of life. The division is MSU's most diversified component, with more than 1,700 employees and seven major units.

Times were challenging for agriculture when Foil moved into his new position. He began a strategic planning effort called "Focus On A Better Future" that utilized a team approach to solve problems by consolidating units. The program saved budget dollars that were reallocated to high-priority programs identified by division teams and advisory groups.

Research and Extension Centers were established to place researchers and specialists closer to the clients they served.

And, team communication efforts were strengthened with the development of the Division Policy Advisory Council and later, the Division Faculty Senate.

Another part of this strategic planning effort included Ag and Forestry Summits that continue to actively involve stakeholders and support groups in helping division personnel identify strategic directions (The most recent advisory group meeting was presented in *Highlights*, Vol. 62:2. The Ag Summit is mentioned on page 21 in this issue).

Building on his concern over wise management of natural resources, Foil led the effort to upgrade the School of Forest Resources into the College of Forest Resources. To further the goal of resource management, he established the Forest and Wildlife Research Center to provide overall leadership in natural resource conservation.

Under Foil's 13 years of leadership, funding for the division increased 68 percent, from approximately $60 million to more than $100 million. More than $30 million was allocated for new facilities. His management enabled the division to achieve new levels of success.

Foil saw agriculture as the backbone of Mississippi's economy and worked to keep it at the forefront.

Part of the purpose of the MSU Division of Agriculture, Forestry and Veterinary Medicine is to provide Mississippians with comprehensive educational programs.
