



Jerry Gilbert, left, and research associate Robert Cossar at switchgrass research plots

Marco Nizovich

## New Technology

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While agriculture is one of mankind’s basic industries, it also is one that readily embraces new technology.

In the 19th century, the steel plow and steam-powered engines revolutionized farming. During the 20th century, the use of chemicals pushed productivity to previously unimagined levels.

Biotechnology promises to be one of the revolutionary new technologies for the 21st century, and MAFES researchers are applying the new science to projects ranging from new materials for medical implants to protecting crops from insect damage.

MAFES funding helped establish the Life Sciences and Biotechnology Institute at Mississippi State in 2000. The institute fosters multidisciplinary collaborations among scientists working in basic biology, agriculture, human and animal medicine, food science and bioinformatics.

Another field providing MAFES scientists with new tools for research is spatial technology, which generates information based on geographic location. In 2002, four technical centers at Mississippi State that use spatial technologies pooled their resources and personnel to form the GeoResources Institute.

The institute provides remote sensing expertise for MAFES projects. Remote sensing uses aircraft- or space-based platforms to capture information about conditions on the ground.

MAFES scientists are using remote sensing data to help farmers apply precision-farming techniques to their crops, which enables them to conserve resources by using only the inputs their crops need, while also protecting the environment from unnecessary chemical applications.

### *Research applies new techniques to ancient energy source*

Biomass fuel in the form of woody plants was the first energy source harnessed by man. Today, wood and other biomass fuels account for just slightly more than 10 percent of energy used worldwide, but it has the potential to provide a significantly larger portion.

MAFES scientists and other researchers at Mississippi State are investigating production of energy by using biomass from crops such as switchgrass and from byproduct sources such as wood waste, poultry litter and cotton ginning trash.

The researchers are working with gasification of biomass to produce a synthesis gas that can be converted to ethanol or other chemical products.

“The ultimate goal of the project is to produce an inexpensive source of energy that can help provide energy independence for our country,” said MAFES biological engineer and Agricultural and Biological Engineering Department Head Jerry Gilbert. “Keys to the project’s success will be

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Robert Cossar briefs Mississippi Farm Bureau representatives on MAFES biomass research.

establishing a reliable source of biomass, such as switchgrass, and the effective use of microorganisms to boost the amount of ethanol produced by the biomass.”

The biomass project at MSU began in 2001 and is headed by Gilbert and professor of chemical engineering Mark Zappi. They and other MSU scientists are collaborating with colleagues at Oklahoma State University on the U.S. Department of Agriculture funded project.

“Switchgrass is of particular interest because it is a high-yielding grass native to Mississippi and other southern states,” Gilbert said. “Each year, one acre of switchgrass will yield enough biomass to generate about half of the electricity needed to meet the demands of a typical American home.”

### ***Animal health research on science’s new frontier***

Proteomics research at Mississippi State University may provide the key to new, more effective methods of production in the poultry industries.

Proteomics is a field of science so new that many people in agriculture are not familiar with the term, according to Shane Burgess,

assistant professor in the Department of Basic Sciences at the College of Veterinary Medicine.

“The term ‘proteome’ was coined less than a decade ago and refers to all the proteins expressed by a genome—the genetic material of an organism,” he said. “Proteomics is the study of all the proteins produced by a genome.”

Burgess began his work at MSU in early 2002, and his program is the only one of its type dedicated to agricultural species, including chickens, in the world. MAFES support for the project is being provided through the Life Sciences and Biotechnology Institute. In addition to university support, he receives U.S. Department of Agriculture funding.

Proteomics is being applied to the chicken first because it is the first livestock species to have its genome fully sequenced. Also, chickens provide the greatest source of nonplant human protein in the world and are a \$1 billion industry in Mississippi alone. Vaccines that protect chickens from viruses, bacteria and parasites are extremely effective, but these vaccines also face challenges that are being addressed by Burgess’ work.

“One of the challenges is the development of resistance to vaccines,” he said. “Proteomics research can help avoid this by examining the basic structure of proteins in order to understand the mechanisms of disease development.”



Tom Thompson

Shane Burgess, standing, and research associate Tibor Pecham apply proteomics to the mechanisms of disease development in chickens.