

Representative Research Impacts

UT AgResearch advances science in agriculture and food systems, natural resource management, and family and community sciences through discovery of new knowledge, innovation of these discoveries into new products and processes, and application of these innovations to enhance the lives of citizens of Tennessee and the world. Our scientists pursue cutting-edge research resulting in scientific breakthroughs and development of new and unique plant varieties. Below are a few examples of research being conducted by UT AgResearch scientists.

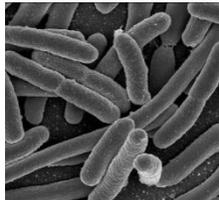


A Realistic Path to a Bioenergy Economy

Transitioning to biofuels and regenerative agriculture requires a careful choreography of industries, jobs, and policies. We're predicting the evolving bioenergy economy – transitions over time, the role of cellulosic feed stocks, job impact, effects on existing crops, and market impacts. This will help chart a realistic path to an energy economy with a large biofuels sector and cellulosic feed stocks.

Mycotoxin Poisoning in Poultry

Mycotoxin infection is a worldwide problem in feed. We tested an enzyme as a protective agent against mycotoxin poisoning in poultry. Chicken cells were totally protected against the toxin when co-incubated with the enzyme.



Bacteria that Break Down Pesticides

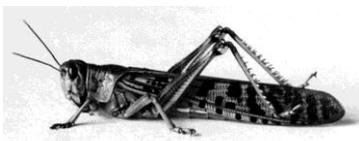
We used a special matrix structure to grow highly diverse bacteria for atrazine (herbicide) degradation. We monitored changes in the microbial community. This research will result in an improved ability to assess the persistence and ecological impact of economically-important herbicides.

Better Hay Storage Methods

Approximately 50% of Tennessee producers use inadequate storage systems and see losses of up to 40% per bale. The Tennessee Agricultural Enhancement Program in recent years has contributed to additional, and better, facilities by cost-sharing the building expense. This has allowed producers to maximize farm profits, adapt to changing market situations, improve operational safety, and increase farm efficiency.



Leveraging Insect Gut Healing



Exposure to pathogens or pesticides activates a healing mechanism in insects. This may allow design strategies to make insects more susceptible, leading to reduced pesticide use and more environmentally-friendly approaches. This research may also be useful for stem cell research and biomedicine.

Rollover Protection for Mowers

The RollOver Protective Structure (ROPS) design standard previously ignored the influence of the mower deck. We conducted field tests and revised the model to accurately predict the continuous roll tendency. The ROPS height required is much higher than the original, and too high for practical application, so new standards are being developed to protect the operator during a roll instead.



Biomass Size Reduction



Just-harvested biomass is awkward to handle, bulky and expensive to transport, and difficult to separate into its component parts. We examined size reduction techniques and equipment to minimize energy usage, finding that multiple passes through the equipment and high rotational speeds were counterproductive. Our size reduction and separation research has the potential to save the industry \$1B per year, based on energy savings alone.

Cattle Impact on Farm Ponds

We found that allowing cattle access to farm ponds significantly altered the pond micro-environment and impacted amphibian species. This research provides justification for congressional support of USDA conservation programs that provide incentives to producers who fence livestock from wetlands.



Large-Animal Veterinary Access

In a survey, livestock producers cited veterinary care problems including delays in obtaining services, treatment limited to animals transported to a facility, and excessive cost relative to the animal's value. Statewide negative impacts are estimated at \$9.5 million. Scholarship programs for large- and food-animal veterinary students, relocation incentives, and greater availability of veterinary technicians were seen as effective. This analysis has been provided to the Tennessee legislature.

Improving Reproductive Efficiency in Cattle

Collection of bovine embryos using a medium containing a special compound improved pregnancy rates of these embryos after transfer into recipients. No abnormalities in calf health, birth weight or weaning weight were observed. This will significantly improve the efficiency of producing genetically superior offspring.



Cotton Variety Identification for West Tennessee



We continue to identify new cotton varieties broadly adapted to West Tennessee, and provide a venue for seed companies to showcase new commercial cultivars in head-to-head comparisons under farm management and growing conditions. Tennessee cotton producers have indicated that variety test results are the single most valuable UT cotton research product to them. Top-10 yielding varieties in the 2006 cotton OVTs averaged 19% higher yield, worth \$48 million.

Creative After-school Programs & Childhood Obesity

Obesity has become an epidemic problem worldwide and we are now witnessing the emergence of adult-onset diseases in children. We want to determine whether after-school programs can be used as a means to prevent childhood obesity, including a program that uses creative problem-solving teams. Identifying novel and successful means to intervene early will greatly contribute to lowering and/or limiting the increase of obesity and related disorders.

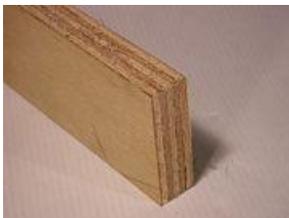


Delivery systems for health and nutrient compounds

For antimicrobials, it is important to achieve sustained release to enhance the efficacy. For heat and oxygen sensitive nutraceuticals, it is important to develop delivery systems to prevent their degradation during processing and storage. We have produced micro- and nano-particles of food biopolymers to enhance the stability and bioavailability of these compounds. These delivery systems should enhance food safety and reduce food spoilage.

Developing Soybeans that Resist Nematodes

Few commercially-available soybean cultivars do a good job of limiting reproduction of cyst nematode. We focused on minimizing soybean yield losses by identifying germplasm with improved resistance to cyst nematodes and multiple diseases. We are emphasizing the need to identify disease- and nematode-resistant genes and incorporate them into high-yielding soybean lines.



E-Beam Curable Adhesives for Wood Composites

The manufacture of wood composites is an extremely energy intensive process. We have created adhesives that can be cured virtually instantly with little drying and heat treatment, by exposing the composite to electron-beam radiation. At full market penetration, 65 trillion Btu/year of thermal energy may be saved. Further, new adhesive formulations have been invented that can take advantage of existing processing equipment, but reduce VOC emissions, especially formaldehyde, to zero.

Fescue Toxicosis Management Strategies

Tall fescue toxicosis continues to be the #1 grass-related disease in the U.S. in terms of economic loss to animal producers, affecting millions of beef cows and horses. Tennessee beef cattle losses due to tall fescue toxicosis are over \$100 million annually. Our research has resulted in management strategies to reduce fescue toxicosis.



Forest Protection in the Great Smoky Mountains



Loss of tree species will change the composition of forests on a scale comparable to the loss of the chestnut tree during the 1930's by dramatically destroying habitats used by invertebrates and mammals. Research is underway to develop specific procedures to protect and enhance forest health, not only in the Park but in all forested areas throughout the southern Appalachians.

Genetic Improvement of Soybean Yields

More than half of all gains in USA agricultural production have been through genetic improvement. Genetic improvement of soybeans is vital to sustaining the livelihood of farmers in Tennessee and the Mid-South. We used DNA technology to rapidly develop the new Roundup Ready soybean variety USG 'Allen'. This variety ranked #1 for yield in the 2007 Standardized Test, across all counties tested in Tennessee and Kentucky. We continue to translate new knowledge to improve soybean yield.



Improving Milk Quality on Tennessee Dairy Farms

The Tennessee Quality Milk Initiative is a collaborative effort between UT AgResearch, UT Extension, the TN Dept. of Agriculture, and agri-industries. Science-based educational modules were developed. About 50% of all Tennessee dairy producers participated in the modules. Average milk somatic cell counts, an indicator of milk quality, was measured as a main outcome. The state average decreased from 504K cells/ml prior to the program to 365K cells/ml afterward.

Combating Pigweed in Cotton and Soybeans

A major weed pest for Tennessee cotton and soybean producers, Palmer pigweed has developed resistance to glyphosate. We continue to conduct research on new options to control Palmer at several of our AgResearch and Education Centers across the state. Based in part on this research, we have worked with the herbicide manufacturer to rebate some costs, and we have defined new recommendations for managing this weed.

