AGRICULTURAL ECONOMICS

Local Strategies and Policy Options to Develop Rural Communities in Oklahoma
The overall objective of this proposal is to analyze alternative development strategies for rural Oklahoma communities to aid in diversifying and strengthening the local economy. Specific objectives include: 1) develop methodologies for targeted economic development of rural areas building upon the components of cluster analysis, industry linkages, and impact analysis, 2) assess trends and forces shaping retail/small business performance in Oklahoma communities, focusing on specific sector detail (2552)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Mike Woods

Economic Consequences of Land Use Changes within the Landscape
Generally, the objectives fall into three broad research areas including: 1) the measurement of changes in the spatial allocation of land use, 2) determine the relative importance of the factors responsible for these changes, and 3) impacts of the changes on commodity markets, environmental amenities and rural economic activity. (2566)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Mike Dicks

Economics of Agricultural Production Systems for Oklahoma
The overall objective of this project is to determine the economic consequences of agricultural production alternatives for Oklahoma. Impacts of alternative practices and systems on expected net returns, variability of returns, and input requirements will be determined. In addition, compatibility of the alternative production practices and enterprises with conventional practices and enterprises, resources, and institutional constraints, and potential external costs will be considered. The specific objectives are to: 1) determine the economic and institutional feasibility, with respect to expected net return, production and financial risk, and rate of return on resources, of alternative production systems compared to existing ones and 2) determine environmental tradeoffs between alternative and contemporary production systems. (2574)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Francis Epplin

Consumer and Agribusiness Decision Making with Primary Data
The primary objective of this research is to determine the reaction of consumers and producers to: a) the introduction of new products, b) new policies, and c) agricultural events, such as BSE. Specific objectives of this research include: 1) develop and compare existing methods for estimating consumer and producer demand for novel agricultural goods, 2) determine external validity of survey and experimental methods, 3) incorporate demand estimates from survey and experimental methods into market-level models to determine welfare implications of technological developments and agricultural policies, 4) create prediction markets and test their external validity and 5) explore the role of rationality and risk on producer and consumer decision making. (2576)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Jayson Lusk
Social Capital and Rural Economic Performance
The purpose of this project is to develop and apply the microeconomic foundations that demonstrate the relationship between economic performance measures and the organization of society in different locations. The objectives are: 1) evaluate alternative theoretical explanations of technology adoption, economic growth, and economic development, 2) define and determine how best to measure economic performance in specific locations, 3) develop alternative measures of social capital, social governance, and/or social cohesion, 4) determine if economic performance measures are related to social capital or cohesion indices across geographic areas, and 5) determine if specific firms in Oklahoma are here because of specific policies or indices of social capital or cohesion. (2577)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Daniel Tilley

Providing Health Services in Rural America: An Economic Impact of Selected Medical Services and Identification of Economic Opportunities
The overall objective of the research project is to develop economic tools and incorporate them into educational material and technical assistance programs for rural decision makers such that they can enhance rural health services or impact rural health policy. More specifically, the objectives are discussed by primary health care projects and health impact projects. (2604)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Gerald Doeksen, Brian Whitacre

Agricultural and Rural Finance Markets in Transition (NC-1014)
The objectives of the project are: 1) determine the effects of changes in international competitive balance and federal and state policies affecting agriculture on the financial and economic performance of farms, agribusinesses and rural financial markets, 2) determine the effects of market, policy, and structural change in the agricultural and financial market sectors on the financial soundness, safety, and management of financial institutions that supply capital to agriculture and 3) evaluate the management strategies, capital needs, and financial performance required for the long-term sustainability of firms in the food and agribusiness sector. (2608)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Notie Lansford, Damona Doye

Identifying Value in Agriculture
The objectives of this research project are: 1) research tools to reduce biases such as social desirability bias in valuation studies, and 2) conduct applied research on consumer preferences for food animal welfare, factors of successful college graduates, and other timely agricultural issues. (2620)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Bailey Norwood

Evaluation of Environmental Policies and their Impacts on Natural Resource Amenity Value and Land Use in Oklahoma and the U.S.
The objective of the research project is to address natural resource and environmental issues of policy interest to Oklahoma and the nation, and to contribute to developing the theoretical and empirical literature on land use economics, water economics, and valuation of environmental resources. Specific research projects underway include: 1) to analyze the determinants of adoption of conservation and environmental mitigation practices for water quality improvement and invasive species control, 2) to estimate tradeoffs between land uses that preserve wildlife and habitat preservation and economic development such as agriculture and windpower development, and 3) to estimate the value of
recreational resources and ecosystem resources under differing management and uncertainty assumptions. (2621)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Tracy Boyer

Interdisciplinary Innovation Education to Solve Real Business and Design Problems
When completed, this project will: A) create workplace-ready graduates capable of participating in and eventually leading private sector innovation, B) enhance the educational experience of students in agribusiness, engineering and communications so the enrollment in those disciplines will increase, and C) develop and disseminate interdisciplinary curricula for adaptation and use by other universities. (2634)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Dan Tilley
Biosystems and Agricultural Engineering: Paul Weckler
Agricultural Communications: Shelly Sitton, Cindy Blackwell
Agricultural Economics: Rodney Holcomb
Mechanical and Aerospace Engineering: Ronald Delahoussaye
California Polytechnic State University: Marcia Tilley, Richard Cavaletto, Mark Zohns, Wayne Howard
University of Nebraska-Lincoln: David Jones, Amalia Yiannaka

Biobased Energy Research and Information Exchange Committee
The objectives of the Biobased Energy Research and Information Exchange Committee are: a) to exchange information, strengthen partnerships and facilitate the coordination of research and educational efforts relating to renewable and bio-based energy; and b) to strengthen partnerships between research and extension professionals, industry partners, end users, government agencies, policy makers and other effected parties. The committee will be open to individuals in any region. The committee will have a multidisciplinary focus encompassing extension and research professions in fields of agronomy and plant science, agricultural and biosystems engineering, agricultural economics and agribusiness, animal and poultry science, environmental science, family and consumer science and other related disciplines to examine the social, scientific, technical and economic issues associated with using biological sources for energy. (2637)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Phil Kenkel

Economic and Environmental Impacts of Oklahoma Agricultural Production Systems
The overall purpose of this research is to identify those new agricultural technologies and techniques that would best enhance the productivity and profitability of Oklahoma production agriculture while maintaining a proper balance with environmental concerns and the sustainability of the natural resource base. Given the complexities involved in the adoption and extension processes, this research will conduct comprehensive economic evaluations of new technological developments within the Oklahoma agricultural sector. (2678)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Jeffrey D. Vitale

NE-1029 Rural Change: Markets, Governance and Quality of Life
This research will identify and analyze ongoing and potential changes in rural labor markets and the impacts of migration, commuting, and workforce development policies on rural labor markets. Investigate the potential for rural development policies based on entrepreneurship, industrial clustering,
value-added and nontraditional agricultural businesses and analyze the spatial implications of industrial restructuring on employment and earnings. (2680)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Brian Whitacre

### The Economics of Value Enhancement and Vertical Linkages in Livestock and Agri-Food Industries

In general, this research seeks to provide economic analysis of production and marketing challenges facing the agric-food system, including those induced by market forces, technology, and policy issues, with particular emphasis on the livestock industry and implications for Oklahoma livestock producers and processors. (2696)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Kellie Rape

### S1043 Economic Impacts of International Trade and Domestic Policies on Southern Agriculture

In this research, we will analyze the economic, welfare, and trade impacts of domestic and international policies on meats (beef, pork, and poultry). The impact of domestic and trade liberalization policies on trade and growth will also be researched. We will look at the new WTO rulings and the alignment of domestic policies with the rulings and will also analyze the economic impacts of NAFTA and meat trade among NAFTA countries. (2702)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Shida Henneberry

### S-1043 Modeling for TMDL Development, and Watershed Based Planning, Management and Assessment

This study will develop tools (standards, framework, or protocol) to link the physical modeling with the economic aspects of watershed planning and management and to develop tools with social scientists and other project partners to help accelerate implementation of watershed planning and management through behavior change. The research will also facilitate usability of watershed management planning models. (2704)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Art Stoecker

### Economic Valuation and Analysis of Natural Resource Problems in the Southern U.S.

Specific objectives will greatly depend on available resources, however some broad objectives include:  
1) Address critical natural resource issues in Oklahoma and the region, 2) Estimate the value of natural resources, and compare the welfare effects of competing natural resource policies, and 3) Contribute to the literature on natural resource problems, including water economics, invasive species economics, etc. (2713)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Damian Adams

### Economics of Integrated Pest Management for Stored Products and Food Processing Facilities

The general objective of the proposed research is to improve the ability of the grain marketing system to respond to increased pesticide regulations and to consumer demands for wholesome, insect-free foods. The specific objectives are: 1) Estimate costs and risks associated with chemical-based and IPM pest-control strategies in stored grain facilities, 2) Identify economically optimal insect-management strategies for grain storage managers under alternative situations 3) Describe the structural, operational, and other insect-related characteristics of various types of grain and food processing facilities and 4)
Estimate costs and risks associated with chemical-based and IPM pest-control strategies in grain and food processing facilities. (2720)

**Sponsor:** Oklahoma Agricultural Experiment

**PI/PD:** Brian Adam

**Providing Information and Decision Support Tools to Increase the Effectiveness of Traditional and Non-Traditional Cooperatives**

The overall objective of this project is to increase the effectiveness of traditional and non-traditional cooperatives and help stakeholders evaluate new cooperative development opportunities. (2721)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Phil Kenkel

**Assessing the Profitability and Risks of Alternative Agricultural Production Systems in Oklahoma**

The proposed research objectives are to develop appropriate economic models to evaluate alternative agricultural production and information systems in the Southern Plains using existing and newly developed models, evaluate the economic advisability and implication of adopting new agricultural production and information systems in the Southern Plains and disseminating research results through appropriate research outlets, including peer review publications, staff papers and professional presentation. Research results will also be made available to Cooperative Extension personnel for dissemination to producers, agricultural bankers and other relevant stakeholders. (2742)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Eric DeVuyst

**Using Agent-Based Models to Better Understand the Effects of Changes in Agribusiness Market Structure**

The long-term goal is to provide a better understanding of the effects of changes in market structure on the competitiveness of markets. The specific objectives of this project are to determine when buyers choose a bargaining strategy as opposed to a posted-price strategy and to determine the effects of mandatory price reporting on the relative market power of feedlot operators and beef packers and determining market equilibrium when market power is present both at the aggregate level and within local auction markets. (2761)

**Sponsors:** Oklahoma Agricultural Experiment Station, NIFA, USDA

**PI/PD:** Wade Brorsen

**Economics of Market Concentration and Commodity Advertising in Food and Agricultural Industries**

The overall objective of this research project is to provide an economic analysis of market concentration and commodity promotion in food and agricultural industries. Specific objectives include developing analytical and empirical models for horizontally concentrated and vertically integrated food and agricultural industries. The models will be used for the analyses of bilateral market power between retailers and processors, nonparametric estimation of market power. The next objective will be evaluating economic impacts of various commodity checkoff programs and assess the relationship between generic and brand advertising program in differentiated product markets. Generic advertising may help or hurt the brand advertising within the differentiated product environments. Conceptual models will be developed for comparative statics, and various hypotheses will be tested in empirical frameworks. (2765)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Chanjin Chung
Improving the Efficiency of Agricultural Market Transactions
The proposed research objectives are to increase the efficiency of the marketing system by increasing the precision of the price signals that producers receive from the market and reducing the transaction costs in markets by designing more efficient markets. (2766)
**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** Wade Brorsen

Sustainable Communities: Identifying, Analyzing and Measuring the Economic, Environmental and Social Resources in Rural Communities
The overall objectives of this research project are to develop indicators of sustainability for use by local communities; perform quantitative analysis to validate linkages between components of sustainability models and evaluate local institutions and dynamics influence on sustainability goals. (2768)
**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** Dave Shideler

Assessing the Impacts of Farm, Food, Conservation, and Energy Policies on the Economy and the Environment
The specific objectives of this research project include: Analyze the impacts of government policies on the agricultural and general economy. The analysis may include current policies found in the 2008 Farm Act and Energy, Independence and Security Act of 2007, as well as options for future policies related to farm commodities, conservation, food safety, nutrition, renewable fuels, and GHG emissions; determine the effectiveness of farm policies contained in the 2008 Farm Act that are designed to manage risk. Particular attention will be given to the interaction of the commodity policies in the 2008 Farm Bill and the economy-wide impacts of these programs during each year of sign-up; and disseminate results in appropriate professional outlets as well as Cooperative Extension programs. (2774)
**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** Jody Campiche

Economics of Horticultural and other Alternative Crops in Oklahoma
The overall objective of the project is to determine for Oklahoma researchers and farmers the economic and financial feasibility of horticultural crops, and other alternative crops under various production strategies. (2787)
**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** Merritt Taylor

**AGRICULTURAL EDUCATION, COMMUNICATION, AND LEADERSHIP**

Secondary Agricultural Education: A Valuable Learning Context for Improving Student Achievement in Core Curricula
Student achievement in math and science is a national concern. Agriculture could be an important learning context through which student achievement in core curricula is enhanced. Little is known about how to prepare student teachers in agricultural education for that purpose. As a follow-up study to earlier research that included an examination of teachers’ behaviors and their students’ math achievement in agricultural power and technology, investigators are studying the competence of student teachers to implement a contextualized teaching and learning approach when teaching agricultural content involving principles of select core curricula. (2600)
Educative Evaluation: Building Evaluative Capacity by Transferring the Technology of Evaluation to Program Stakeholders

This project will build evaluation capacity among program planners by viewing evaluation as educational intervention and by transferring the technology of evaluation from evaluator to program stakeholders. The project leader will work to shift the current paradigm of viewing evaluation as an external force that is imposed upon program stakeholders to infusing evaluation activity throughout the planning and delivery process as an opportunity to improve practice and document outcomes and impacts. Every interaction with an evaluation client, participant, stakeholder, and user is a teaching opportunity. Situating evaluation as educative is appropriate as each program requires a unique evaluation model, setting the stage for creating a culture of continuous improvement within social programs designed to improve participants, lives, and communities. This Hatch initiative is designed to answer the call for greater institutional accountability as well as to create an environment for continuous improvement that results in planning, delivering, and evaluating programs for maximum impact. It is the aim of this initiative to create new models for improving social programs delivered under the land-grant university umbrella. This project has the potential to impact society by empowering program planners to monitor, collect data, and make formative adjustments to programs that change citizens’ lives for the better. Participants will also have the necessary skills to conduct summative evaluation for program accountability. The impact of this project includes increasing the value and quality of programs offered by program planners; thus, engaging members to work smarter and more efficiently. Evaluation technologies should be seen as an opportunity to learn about our work and selves as professionals.

ANIMAL SCIENCE

Impact of Nutrition on Metabolism, Performance, Carcass Merit, and Nutrient Balance by Feedlot Cattle

This research is being conducted to: 1) determine the effect of previous management (e.g., type, quality, quantity, and duration of forage grazed) by growing steers on grazing and feedlot performance, carcass traits, body composition, critical organ mass, tissue oxygen consumption, liver enzymes, and net portal and hepatic flux of nutrients; 2) determine the effect of limit feeding on adaptation to a high-grain diet, and 3) determine the effects of protein source and level on performance and carcass merit, ruminal and postruminal nutrient digestion, and nitrogen balance by cattle fed high-grain diets.

Effective Caloric Value Applications for Poultry

This research seeks to place calorie values on husbandry so that ration formula may be adjusted. Adjustments will help broiler rations better match the husbandry environment and provide consumers with leaner birds for the following purposes: 1) to establish the caloric value of husbandry and management so that poultry rations may be better formulated to achieve specific body compositions, and 2) to modify current nutrient rations so that essential nutrients may be fed according to the provision of energy by the diet and corrected for management and husbandry.
Characterization of the Interactions of Solubilized Proteins in Processed Meat Formulations

There is a current trend in the food industry to find ways to reduce or minimize sodium chloride (salt) and phosphate intake. This project attempts to address these concerns by looking at alternative means to improve protein functionality by minimizing additives that may have negative health implications. This will be achieved through investigations into the application of alternative enhancement solutions into meat products. (2551)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Robert Teeter

Improve and Prediction of Tenderness, and Evaluation of Consumer Willingness to Purchase Tender Beef

Research has shown that good eating experiences are related to how tender the beef cut is perceived during mastication. The one concern for the meat industry is, “how can we, as an industry, improve the quality of our products and guarantee that the product purchased will be tender and flavorful?” Even though tenderness improvements appear to have occurred during the past five years, it is estimated that approximately 106 million “tough” retail cuts will be generated in the next year. The objectives of these experiments are to validate the effectiveness of instrument grading systems to predict consumer tenderness values. (2572)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Christina DeWitt

Improving Beef Carcass Quality via Pre and Post Harvest Management Techniques

Beef carcass quality is the basis for which a majority of livestock producers are paid for cattle in today’s beef industry. Management practices may affect beef carcass quality and subsequently carcass value. This project examines how management techniques impact the carcass quality and tenderness of beef produced and how niche marketing may improve the value of currently low priced beef cuts. (2583)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: J. Brad Morgan

Management and Electronic Monitoring to Improve Health and Efficiency of Beef Calves

Increasing the percentage of healthy calves and decrease the severity of health problems addresses one of the largest causes of performance and economic loss in the production of beef. Therefore, the long term goal of this research is to increase efficiency of beef cattle production through identifying production and health management systems to improve the health and biological efficiency of beef cattle. Specific objectives are to determine the effect of post-weaning management (timing, exposure to stressors, nutrition, and health management) and remotely monitored biosensors (physiological and behavior parameters) on morbidity, mortality, feedlot performance, and subsequent body composition and carcass merit. (2586)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Chris Richards, Clint Krehbiel, David Lalman, Deb VanOverbeke, D. Step

Functional Genomics of Adipogenesis in Beef Cattle

Every year the U.S. beef cattle industry produces over 2 billion kg of excess fat. One of the major reasons for this excess fat in feedlot steers is feeding grain and increased time on feed in an effort to improve
the palatability and acceptability of meat for the US consumer. This and other related production inefficiencies involving inferior muscling and excessive fat deposition cost the beef industry an estimated 7.4 billion dollars annually. The purpose of this study is to understand the genetic control of fat deposition during early fat cell differentiation and deposition. (2612)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Udaya DeSilva

**Use of Instrumentation and New Technologies to Predict and/or Improve Beef Quality and Cutability at Various Stages of Production**

Prediction of tenderness and cutability is important to improving economic position and customer satisfaction of beef. The purpose of this study is to evaluate new technologies to accurately predict tenderness and/or cutability of beef carcasses and cattle that produce those carcasses. (2615)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Gretchen Hilton

**Genetic Mechanism Underlying the Effect of Diet, Breed and Muscle Type on Fatty Acid Composition in Beef**

Beef is a highly nutritious and valued food. It is a rich source of protein and micronutrients (vitamins A, B6, B12, D, E, iron, zinc, selenium and more). However, beef is perceived as having high fat content with undesirable composition, i.e., high percentage of saturated fatty acids (SFA). Understanding the genetic mechanism responsible for turning undesirable SFA into monounsaturated (MUFA) and PUFA should lead to identification of DNA markers to be used in a marker assisted selection program. (2627)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Raluca Mateescu

**Dietary Manipulation to Reduce Nutrient Excretion from Swine**

Accurate quantification of nutrients exiting swine facilities via the waste stream or exhaust air is critical to the future success of the commercial swine industry. Estimation of nutrient excretion is an essential component in the development of a comprehensive nutrient management plan. In the case of the nutrients excreted by swine and the aerial emission of volatile compounds, the first line of defense is diet manipulation. A better understanding of the effect of diet on excretion of nutrients and the associated odorous compounds is needed. Also, accurate estimates of nutrient excretion under commercial conditions are warranted for compliance issues. (2647)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Scott D. Carter

**Use of Biofuels Byproducts as Supplements for Grazing Cattle and Timing of Weaning in Fall-Calving Beef Production Systems**

Little is known about the effectiveness of ethanol coproducts to replace traditional protein and energy sources for grazing cattle. Many producers with fall calving programs wean calves later in summer, rather than spring. While calf weaning weights are high with extended lactation, increased nutrient requirements of the cows may result in low reproductive performance. The purpose of this project is to determine the amount of alternative feeds needed to supplement grazing cattle. A second objective is to determine if weaning calves earlier during spring is beneficial to a fall calving beef production system. (2648)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** David Lalman
Supplementation of corn Coproducts from Ethanol Production to Grazing Beef Cattle Consuming Low Quality Forages

There is an increase in the use of corn coproducts in grazing situations. Little information is available on forage protein fractions that are commonly grazed by cattle. This project will document effective ways to use corn coproducts in grazing situations, and will allow nutritionist to better understand the relative feeding value of DDGS as a protein supplement. This project will document the yearly changes in forage protein fractions of warm season forages, allowing producers to make decisions on timing and amount of supplement needed to overcome nutrient (CP) deficiencies. (2650)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Gerald Horn

Utilization of Distillers Dried Grains in the Horse

Despite the fact that Distillers Dried Grains with Solubles (DDGS) has been widely accepted in both ruminant and non-ruminant diets, there is very little information available concerning its use in equine diets. In an effort to meet energy needs while limiting the incidence of carbohydrate overload, fibrous energy sources such as soybean hulls and beet pulp have been added to the diet with much success. Opportunities exist to explore the use of DDGS not only as a low starch energy source, but also as a high quality substitute for soybean meal. (2651)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Steven Cooper, David Freeman

Adipose Tissue Development in Feeder Cattle and Increasing Profitability of the Wheat/Stocker Cattle Enterprise

The purpose of this project is to increase the profitability and sustainability of dual-purpose wheat enterprises in the southern Great Plains. Objectives are to 1) develop supplementation programs that will decrease production risks and increase profitability of stocker cattle, 2) determine the effect of nutrition and management practices on development of intramuscular fat by cattle during the stocker phase of production and final carcass value, 3) determine the effect of developing replacement beef heifers on wheat pasture on pregnancy rate, and 4) determine the impact of tillage systems on economic and environmental sustainability of dual-purpose winter wheat enterprises in Oklahoma. (2654)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Gerald Horn, Clint Krehbiel, Udaya DeSilva, Gretchen Hilton, Robert Wettemann, Glenn Selk
Plant and Soil Sciences: Jeff Edwards
Agricultural Economics: Francis Epplin

Functional and Structural Analysis of Novel Antimicrobial Host Defense Peptides in Food Animals

The indiscriminate use of antibiotics for growth promotion and disease prevention in the food animal industry has been accompanied by contamination of food products and the environment with unwanted drug residues and rapid emergence of antibiotic-resistant microorganisms. This purpose of this study is to identify efficacious antimicrobial peptides that can be used as alternative non-antibiotic means to prevent and control various infectious diseases and to enhance preharvest food safety in the food animal industry. (2673)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Guolong Zhang
Increasing Profitability of the Wheat/Stocker Cattle Enterprise
This project is to develop science and technologies, uniquely adapted wheat varieties, decision-support economic models, and extension education programs to increase profitability of the dual-purpose wheat enterprises in Oklahoma and the southern Great Plains, and to strengthen the economies of rural communities. This is the only research/education program in the world that focuses on dual-purpose wheat as an economically important and renewable resource. By increasing the technical efficiency of forage and cattle production, this project has the potential to increase annual income of Oklahoma cattle producers by $85 million, and offers similar potential for other states in the region. (2674)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Gerald Horn, Jeff Edwards, Brett Carver, Francis Epplin

Integrated Approach to Enhance Efficiency of Feed Utilization in Beef Production
A major cost of beef production is the energy and protein necessary to maintain body weight (BW) and body condition of beef cows. Identification of cows with lower maintenance requirements and greater feed efficiency would increase production efficiency. Maintenance energy requirement of beef cattle is moderately heritable but indicators of feed efficiency have not been identified. Identification of biomarkers (such as genotypes, differentially expressed genes, or secretion of hormones, proteins, and metabolites) associated with cows with greater efficiency of feed utilization, will allow the selection of sires based on maintenance energy requirements. (2694)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Robert Wettermann

Nutritional Systems for Swine to Increase Reproductive Efficiency
A primary factor affecting the profitability of swine production is sow productivity, and optimum nutrition of the sow is essential to maximize sow productivity. An ideal nutrition program should provide adequate nutrients to maximize sow productivity while minimizing excreted nutrients and feed costs. The goals of this project are to improve the reproductive performance of sows. This research will include studies to evaluate feed additives and mineral sources to determine the effects on reproductive efficiency and to improve the economic return to swine producers. (2716)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Scott Carter

Role of Insulin-like Growth Factors and Growth Differentiation Factor-9 in Regulating Ovarian Cell Function and Gene Expression in Cattle
Poor reproductive efficiency in cattle ultimately results in lost income to farmers. Understanding the mechanisms of ovarian follicular growth may help devise ways to increase reproductive efficiency and hence farm profits. Utilizing an established model of bovine theca cell cultures, the goal of this proposal is to determine the physiological control of growth factors and their receptors and assess the mechanisms by which they act to regulate steroidogenesis and mitogenesis of theca cells. We will investigate the developmental regulation of growth factor receptors in theca cells and their mRNA in granulosa cells during follicular development in vivo using real-time quantitative reverse transcriptase-polymerase chain reaction. Development of a new radioimmunoassay for measurement of growth differentiation factor-9 (GDF9) concentrations in follicular fluid will have tremendous potential for future development as a tool to assess follicle quality. These studies will also provide insight into the physiological and endocrine control of GDF9 and its receptors as well as determine molecular mechanisms by which GDF9 regulates follicular theca cell functions. Acquisition of new fundamental and applied knowledge significant enough to be included in publications is anticipated. It is estimated that in Oklahoma, $26 million is lost each year due to reduced reproductive efficiency of dairy cattle. It is hoped
that new insights regarding techniques to improve fertility in dairy and beef cattle will be made from these studies. (2730)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Leon Spicer

**Effects of Genetic Potential for Milk and Management System on Postweaning Growth of Beef Cattle and Development of Technology to Estimate Forage Quality and Forage Intake**

Breed association genetic trend data indicate that purebred breeders continue to select for more milk yield in beef cows. At the same time, increased cost of feed grains have resulted in a shift in production systems to more forage inputs and less grain inputs during the postweaning growing and finishing periods. Breeding and selection decisions that result in increased milk production may simply result in larger calves at weaning with lower growth performance during the postweaning phase. It is hypothesized that this industry trend (higher milk yield) may result in lower biological and economic efficiency. Rotational grazing may result in better utilization of existing forages, control of undesirable plant species, and a longer rest period for desirable plants to recover from grazing. This research will investigate the impacts of preweaning grazing management and level of milk yield on postweaning growth and efficiency. Additionally, we will investigate new technologies to estimate forage quality and forage intake. This system will result in improved resource utilization as well as improved animal health, welfare and performance because nutritional deficiencies will be determined in a timely manner to allow precision of supplementation of grazing livestock. (2731)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** David Lalman, Mike Brown

**Food Safety: Farm to Table**

Food safety is a high priority with producers, processors, governmental agencies and consumers. Common foodborne pathogens such as *Salmonella*, *Escherichia coli* O157:H7, *Listeria*, and *Campylobacter* can cause severe illness. The long-term outcome of the research at Oklahoma State University in collaboration with SRD, Corp. is the development of a nationally recognized research group focused on emerging issues of food safety. The aim of the research output from our group is to produce unbiased, science based and directly beneficial information regarding the detection and control of foodborne pathogens to food producers and processors locally and nationwide, and to the consuming public. (2747)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Christina DeWitt

**Identification of biological mechanisms by which skeletal muscle influences intramuscular adipose tissue development in the bovine**

The objective of this project is to identify biological mechanisms regulating the development of intramuscular adipose tissue (i.e., marbling fat) in beef cattle. Marbling is the small flecks of fat deposited within the muscle. The amount of marbling has a large impact on the quality of the beef eating experience for the consumer, and thus has an influence on the value of beef. Compared to other fat depots, marbling fat has the lowest ability to deposit fat resulting in excess fat deposited in other depots in order to produce high-marbled, high-quality beef for the consumer. The excess fat deposited in other depots does little to improve beef quality and is an inefficient use of nutrients. The development of marbling adipose tissue appears to be limited by unknown mechanisms possibly related to muscle metabolism. The outcome of this project will be the identification of those unknown mechanism, thereby allowing us to develop management strategies and new technologies to improve the quality and efficiency of beef production. (2775)
Evolution of Viruses
We test hypotheses about how viruses spread and decline and how new viruses emerge. To achieve this, we will analyze the evolution of viral sequences integrated in chromosomes, refine methods for detecting multiple viruses in one plant, and characterize plant viruses by nucleotide sequences. We will also explore the functions of conserved viral nucleotide sequences, and study the distribution of viruses in nature with respect to each other and host and vector species. (1789)

Sponsors: Oklahoma Agricultural Experiment Station, USDA-ARS, National Science Foundation, OSU Foundation,
PI/PD: Ulrich Melcher

Structure/Function and Reaction Mechanism of Bioenergetic Apparatuses
Multiple approaches have been used to study the structure, function, and mechanism of quinonemediated electron and proton transfer complexes of mitochondrial and photosynthesis electron transfer chains. Significant progresses have been made on the atomic structure of the mitochondrial and photosynthetic bacterium cytochrome bc1 complexes. The structural information obtained has been further confirmed by the studies of the site-directed mutagenesis using Rhodobacter spheroids system and the fast kinetic measurement of electron transfer between the two neighboring components in the purified beef complex. Our results obtained from these studies have led us to propose a concerted bifurcated quinol oxidation mechanism in cytochrome bc1 complex. More structure-based mutagenesis will be performed. (1819)

Sponsors: National Institutes of Health, Oklahoma Agricultural Experiment Station
PI/PDs: Chang-An Yu, Linda Yu

Role of Heat Shock Protein 90 in Regulating Protein Kinases
We will utilize a high-throughput drug screen to identify new lead compounds and natural products for inhibition of Hs90, and in vitro systems to characterize their mechanism of action and the signal transduction pathways the compounds affect. (1975)

Sponsors: Oklahoma Agricultural Experiment Station, National Institutes of Health,
PI/PD: Robert Matts

The Structure of Pectins from Cotton Cell Walls
This project will complete structural analysis of the rhamnogalacturonan region of cotton cell wall pectin, determine how the various subsections of pectins associate with each other, characterize crosslinks between pectin and xyloglucan, and characterize mode of action of fungal cell wall degrading enzymes. (2099)

Sponsors: U.S. Department of Energy, Oklahoma Agricultural Experiment Station
PI/PD: Andrew Mort

Photosynthetic Electron Transfer Complexes
Residues 81-84 of subunit IV, with sequence of YRYR, are identified as essential for interaction with the core complex to restore the bc1 activity (reconstitutive activity). The positively charged group at R-82 and R-84, and both the hydroxyl group and aromatic group at Y-81 and Y-83, are essential. The interactions between these four residues of subunit IV and residues of core subunits are also
responsible for the stability of the complex. However, these interactions are not essential for the incorporation of subunit IV into the bc1 complex. (2372)

**Sponsors:** Oklahoma Agricultural Experiment Station, National Institutes of Health

**PI/PDs:** Linda Yu, Chang-An Yu

**Triglyceride Hydrolysis in Adipose Tissue**

Lipids, stored as triacylglycerol (TG), play an essential role as reserve of metabolic energy in all animals. We have identified and/or characterized several proteins located at the center of the regulation of TG metabolism in insects. This project intends to elucidate some of the mechanisms that control the rate of lipolysis. Failure of the mechanism of lipolysis is associated to several human diseases including diabetes and cardiovascular disease. The process of lipolysis is important in finding new ways to control the population of insects that negatively affect the production of crops or act as vectors of human diseases. (2398)

**Sponsors:** Oklahoma Agricultural Experiment Station, National Institutes of Health, Oklahoma Center for the Advancement of Science and Technology

**PI/PDs:** Jose L Soulages, Estela L Arrese

**Oxidative Stress Signaling in Plants**

Ozone, the most abundant air pollutant, poses a serious threat to crops and forest ecosystems. We are analyzing the genetic, biochemical and molecular basis of oxidative signaling induced by ozone in two model plant systems - *Arabidopsis thaliana* and *Medicago truncatula*. Identification of key redox regulated signaling genes from this research will provide rational targets for engineering of crop plants for improved tolerance to multiple stresses. (2528)

**Sponsors:** USDA, Oklahoma Agricultural Experiment Station

**PI/PD:** Ramamurthy Mahalingam

**Cloning and Characterization of Small RNAs from Medicago Truncatula and Glycine Max**

Recent discovery of small RNAs with regulatory roles has uncovered an active role for RNA in regulating gene expression. Thus far, efforts in identification of small RNAs have been limited to a few model species such as Arabidopsis and rice and legume-specific small RNAs are unknown. Leguminous plants are an important source of human and dietary needs second only to cereals. Here, we propose to identify the complete set of miRNAs and other endogenous small RNAs including their targets in two legumes. In addition, we propose to identify small RNAs that might be regulated during abiotic stress and symbiosis in M. truncatula and soybean. The proposed research is directed to identify and understand the roles of microRNAs and small-interfering RNAs in M. truncatula and soybean. A long-term objective is to investigate other legumes and crop plants such as peanuts that are a major component of Oklahoma agriculture. Therefore, output from the proposed study will not only contribute to our basic knowledge of plant biology but also have potential for biotechnological applications in agriculture. (2611)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Ramanjulu Sunkar

**Structure-Function Relationship in Mammalian Apoptosis and Aging**

The main objectives of this project are to resolve the three-dimensional structures of essential proteins that are involved in mammalian apoptosis and aging. Particularly, we would like to unravel the p66shc and mortalin apo protein crystal structures at atomic level. In addition, we would like to tackle the protein-protein complex structures of p66shc and cytochrome C, as well as p66shc and mortalin. Very recently, p66shc was reported to form stable complexes with cytochrome C and mortalin in the active
and inactive state, respectively. This complex formation was believed to be the basis for mammalian aging. Therefore, our research obtains/assumes extra dimensions since the p66shc was discovered as the first mammalian gene, silencing of which significantly prolongs lifespan. Hence, our studies, while focusing on unraveling the functioning of this marvelous protein-protein signaling pathway, are providing at the same time a platform for designing selective inhibitors that may in their turn be further developed into new therapeutics for aging. (2618)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Junpeng Deng

---

**Molecular, Biochemical and Physiological Responses of Medicago Truncatula to Combined Chronic Ozone and Water Deprivation Stress**

The first objective is to examine the physiological changes in JE154 and A17 accessions of Medicago truncatula in response to simultaneous application of chronic ozone and water deprivation. The second objective is to analyze the differences in redox status between the two accessions during chronic ozone and water deprivation stress. The third objective is to investigate the changes in gene expression due to combined effects of water deprivation and chronic ozone stress. Ozone fumigation will be done at 75 ppb for six hours during the light period, for six days. Samples will be collected before the initiation of the treatment, and on days 3 and 6 after the end of the treatment period. For the water deprivation experiment, plants will be withheld irrigation about three days before the commencement of the treatment. Samples will be collected on the 40th day, and on days 43 and 46. During these six days the plants are not watered and hence represent a progressive drought scenario. For the combined chronic ozone and water deprivation experiment we will follow the same procedure as described above. Water deprivation will be enforced by 37th day such that the soil moisture content is around 70% when the plants are subjected to chronic ozone fumigation commencing on the 40th day. Samples will be collected on days 43 and 46. Transpiration rate, Stomatal conductance and Net Photosynthesis rates will be measured using a Li-Cor instrument. Total reactive oxygen species, nitric oxide, ascorbate, glutathione will be measured by spectrophotometric assays. Changes in gene expression will be analyzed using the Affymetrix gene chips. (2635)

**Sponsor:** USDA, Oklahoma Agricultural Experiment Station

**PI/PD:** Ramamurthy Mahalingam

---

**Improving Abiotic Stress Tolerance by Engineering microRNA398-Resistant Superoxide Dismutases in Rice and Tomato**

Abiotic stress is one of the primary causes of crop losses worldwide. Superoxide dismutases (SOD's) are a family of enzymes capable of protecting plants from stress and the SOD transcripts are induced in response to environmental stress. Attempts were made to improve plant stress tolerance by manipulating SOD genes, including Cu/ZnSOD's (CSDs). However, stress tolerance assays of the transgenic plants overexpressing CSD1/CSD2 yielded mixed results. A recently discovered microRNA, miR398 targets two SOD genes (CSD1 and CSD2) and silence them at the post-transcriptional level. This proposal aims to improve abiotic stress tolerance in rice (monocot) and tomato (dicot) through engineering miR398-resistant Cu/ZnSOD genes. We will define the miR398 response to abiotic stress in rice and tomato and decipher the underlying mechanisms of CSD1 and CSD2 transcript accumulation during stress. We will also attempt to improve abiotic stress tolerance of rice and tomato by overexpressing a miR398-resistant form of CSD1 and CSD2 mRNAs. (2644)

**Sponsor:** USDA, Oklahoma Agricultural Experiment Station

**PI/PD:** Ramanjulu Sunkar
Increasing the Accessibility of Cellulose in Sorghum Stover to Cellulases Using Enzymatic Treatment

The expression levels of the enzymes will be determined using custom microarrays spotted with cDNAs representing all carbohydrate-active enzymes and potential lignin-degrading enzymes predicted from the genome sequences of Aspergillus nidulans and Phanerochaete chrysosporium. RNA will be isolated from both fungi at various stages of their growth on sorghum stover and used to produce labeled cDNAs to hybridize to the microarrays. In parallel, the amounts of polysaccharides remaining in the stover will be determined. Changes in the polysaccharides’ structures during the growth of the fungi will be determined by capillary electrophoretic profiling the polysaccharide fragments produced from them by pure enzymes. Enzymes which appear to be important in the degradation of the stover will be cloned into Pichia pastoris so that large amounts of them can be produced to test if application of them to native, ground stover or hot-water treated stover increases the accessibility of the cellulose to cellulases. (2646)

Sponsors: USDA, Oklahoma Agricultural Experiment Station
PI/PDs: Andrew Mort, Patricia Ayoubi
Biosystems and Agricultural Engineering: Mark Wilkins

Host Resistance against Aphis Gossypii in Melon: a model for the Molecular Understanding and Aphid Resistance

A cDNA AFLP analysis of plant responses to melon-aphid feeding in nearly isogenic resistant (AR 5, Vat+) and susceptible (PMR 5, Vat-) melon plants combined with sequencing the differentially expressed cloned amplicons has resulted in developing a set of expressed sequence tags (ESTs) for aphid-responsive genes in melon. Comparative sequence analyses will be conducted between our EST sets and published sequences induced by aphids or plant pathogens. Relevant gene ontologies for known signaling, metabolic, and defense pathways will be developed. The EST sets will be used to generate a custom cDNA microarray for melon. The custom EST array and the BTI melon cDNA array that is available from the Boyce-Thompson Institute will be used to determine the genes that are specifically induced in resistant (Vat+) versus susceptible (Vat-) genotypes treated with aphids; the genes that are induced or suppressed locally and systemically over time; the specificity of plant responses to cotton-melon aphid feeding; and the defense or metabolic pathways that are activated by aphid herbivory. Real-time RT-PCR will be performed on a select sub-set of clones to verify the results of the microarray analyses. The expression of genes that appear to play important roles in the defense mechanism will be localized to specific tissues and cell types by in situ PCR. The functional analysis of aphid-responsive genes will focus on developing techniques for gene silencing in melon combined with established aphid behavioral and reproductive assays. (2660)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Gary Thompson

Functional Characterization of a Conserved Zinc-Finger Protein Gene Family in the Regulation of Plant Stress Tolerance

Understanding the molecular and biochemical mechanisms used by the regulatory proteins AtA20 to mediate stress protection in plant cells is necessary for development of effective strategies for the use of A20 genes in crop improvement. Therefore, this project is focused on determining the role of AtA20.5 in stress signal transduction pathways of Arabidopsis plants. In preliminary experiments, we identified AtA20.5 as a ubiquitin ligase that specifically interacts with and mono-ubiquitinates LOS2 in vitro. This, along with the observation that Zat10 expression is strongly suppressed in transgenic Arabidopsis plants that over-express AtA20.5 suggests a regulatory mechanism in which the transcriptional suppression of Zat10 is mediated by mono-ubiquitination of LOS2 by AtA20.5. Since mono-ubiquitination has been shown to be required for the activation of several transcription factors in mammalian and yeast cells, we
will confirm that AtA20.5 mono-ubiquitinates LOS2 and identify the preferred site(s) of ubiquitination. The effects of this post-translational regulatory mechanism on DNA binding and gene expression will then be assayed. Important functional elements of AtA20.5 will be identified and a search for additional potential targets of AtA20.5 will be initiated. Specific Research Objectives include: 1) determining if AtA20 ubiquitinates LOS2 in vivo; 2) identifying the sites of LOS2 ubiquitination; 3) defining the structural features that determine A20.5 functions; 4) characterizing the effects of ubiquitination on transcriptional activity; 5) defining the role of ubiquitination on DNA binding activity of LOS2; 6) determining if ZAT10 negatively regulates Los2 expression; 7) identifying components of the A20-LOS2 complex; and, 8) screening for additional putative A20 targets. (2697)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PD/PD:** Randy Allen

---

**MicroRNA Regulation of Host Plant Resistance to Aphids**

This project will test the hypothesis that specific small RNAs regulate gene expression under the biotic stress caused by phloem feeding insects and are components of the resistance mechanism, possibly playing a direct role as plant defense molecules. The goal of the work outlined in this proposal is to identify small RNAs and their targets that are involved in aphid-host interactions and to establish their physiological function. Understanding such interactions will provide new tools for understanding and utilizing host-plant resistance. The specific objectives of this proposal are; 1) construct and analyze small RNA libraries to identify small regulatory RNAs and their candidate targets in melon (Cucumis melo) and melon aphid (Aphis gossypii); 2) characterize small regulatory RNAs that are responsive to aphid feeding in melon and determine if small RNAs are involved in A. gossypii resistance in melon; and, 3) determine if plant small regulatory RNAs are transferred during A. gossypii feeding and their effect on target genes in the aphid. (2708)

**Sponsors:** USDA, Oklahoma Agricultural Experiment Station

**PI/PD:** Gary Thompson

---

**S1036 Genetic Improvement Approaches to Sustained, Profitable Cotton Production in the United States**

Cotton genotypes that vary in cotton fiber characteristics including initiation, length, and maturity are in hand. These include mutant lines such as ligon lintless, immature, and various fiber-less mutants, along with previously developed transgenic cotton lines with altered expression of hormone signaling genes. Lint yield and fiber quality characteristics of these lines will be examined. Expression of genes that encode proteins involved in phytohormone signaling pathways in cotton will be quantified using real-time PCR assays. Primer sets specific for gene that encode receptors for phytohormones including brassinosteroid, auxin, gibberellic acid, abscisic acid, ethylene and cytokinin will be used, along with primers for genes that encode transcription factors regulated by these phytohormones. Cloning and characterization of these genes has already been completed by our laboratory and specific gene expression assays have been optimized. Responsiveness of cotton genotypes to phytohormones will be carried out in a cultured ovule system supplemented with phytohormones. Responses of fiber initiation, elongation and maturation will be analyzed quantitatively using structural and biophysical assays. Data will be analyzed for correlations between gene expression patterns, phytohormone responsiveness and fiber quality and yield in planta. (2714)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Randy Allen
Regulation of Spindle Positioning by Phosphorylation in the Yeast, *Saccharomyces cerevisiae*

Microtubules are dynamic polymers that are key for positioning the mitotic spindle prior to cell division. They are also critical elements of the spindle itself that segregates the genetic material into daughter cells at cell division. The dynamic nature of microtubules is controlled by microtubule binding proteins that can be modified by phosphorylation. The long-term goal of this project is to identify and understand how these phospho-modifications alter microtubule binding protein activity, and hence the microtubule behavior that positions the mitotic spindle. (2715)

**Sponsors:** Oklahoma Agricultural Experiment Station, Oklahoma Center for the Advancement of Science and Technology  
**PI/PD:** Rita Miller

---

**BIOSYSTEMS AND AGRICULTURAL ENGINEERING**

**Monitoring and Modeling Evapotranspiration and Soil Moisture: Applications of the Oklahoma Mesonet**

Automated soil moisture measurements at Oklahoma Mesonet sites will be calibrated and validated. Methods for quantifying evapotranspiration rates will be assessed. Estimates of evapotranspiration and irrigation water requirements for various Oklahoma crops will be developed. Monitoring and modeling to assess severity and spatial extent of drought conditions will be integrated. (2448)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Ronald L. Elliott

**Weather-Related Research and Modeling for Decision Support in Agriculture and Natural Resources**

Research will be conducted to improve and develop weather-based models for use in agriculture and natural resources. Numerical weather forecast output will be incorporated into these models, which will be implemented operationally on the Oklahoma Mesonet, the state’s automated weather station network. This will ensure effective dissemination of weather-related information to agricultural and natural resources clientele. A recent 3-year federal grant (OK-FIRE) is helping to improve our wildland fire management products by integrating an 84-hour forecast into the fire danger model, developing a stand-alone fire management web site, and offering regional training for federal and state fire managers. (2477)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** J. D. Carlson

**Electromagnetic Sensing of Soil Moisture Profiles**

One specific objective of the study is to develop a “moisture profile restoration algorithm” and test its ability to estimate soil moisture content within layered depths from continuous wave electromagnetic reflection coefficients of multiple frequencies. Another objective is to develop testing methods and hardware to verify through controlled test bed measurements that electromagnetic reflection coefficients within the radio frequency range of 80 MHz to 1 GHz can detect volumetric moisture from soil containing various moisture profiles. (2585)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Paul Weckler

**Renewable Fuels from Oklahoma Biomass**

The overall objective is to identify technologies and process conditions that will most efficiently convert feedstocks that can be grown in Oklahoma into sugars that can be used to produce fuel ethanol. Individual objectives are to identify pretreatments that maximize ethanol production from an enzymatic
hydrolysis process, evaluate thermotolerant microorganisms for ethanol production, and evaluate non-senescent sorghum as a feedstock for ethanol production in Oklahoma. (2593)

**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** Mark R. Wilkins

**Integration of Map and Sensor Based Precision Agriculture Technologies**
The application of precision agriculture technologies has generally followed one of two paths—one based entirely on map-based information allowing use of historical information, and the other based on real-time sensors to allow assessment of in-season conditions. With map-based variable rate application, the practitioner must collect and analyze data for use with a variable rate applicator. The sensor-based approach uses sensors to measure crop and/or soil properties in real-time as the applicator moves across the field. The focus of this research is to integrate map and sensor-based precision agriculture technologies, specifically for nitrogen management in corn, wheat and cotton management. (2617)

**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** Randal Taylor

**Development of Real-Time Sensing and Management Systems for the Production of Agricultural Products and Other Devices for the Benefit of the People of Oklahoma**
Design and construct advanced optical sensors and integrated sensors for the management of inputs into cropping systems. Work with manufacturers to commercialize sensors and systems. Develop and verify in-season optical sensor based algorithms to manage inputs into crop of interest to Oklahoma. Apply these technologies to animal agriculture, specifically cattle on pasture. (2632)

**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** John Solie

**Role of Directly Connected Macropores in Pathogen Transport to Subsurface Drainage**
This research will determine the importance of directly connected macropores on pathogen (E. coli) transport to subsurface drains. Tasks to be completed include laboratory soil column experiments using an innovative macropore design to investigate E. coli transport under controlled conditions; field experiments at the Nashua research site with natural and artificially-induced directly connected macropores to document E. coli transport to subsurface drainage; and verifying and updating a numerical model for predicting E. coli transport through directly connected macropores based on the laboratory and field experiments. (2633)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA
**PI/PD:** Garey Fox

**Stream/Riparian Zone Interactions: Influence on Sediment and Contaminant Transport in Streams**
The research is aimed at improving our understanding of surface and ground water interactions in the hydrologic cycle, and the impact of this interaction on contaminant fate and transport to surface and ground water. This research will improve our understanding of the role of subsurface water in the erosion of soil on steep hill slopes through field measurements, laboratory experiments, and conceptual/numerical modeling. This research will also improve our understanding of the potential role of subsurface water flow to streams as a source of phosphorus and other water quality contaminants through field data collection and analysis and numerical modeling. (2655)

**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** Garey Fox
**Biomass-Based Energy Research**

Important issues will be addressed in the conversion of biomass to liquid fuel utilizing primarily a gasification-syngas fermentation process. This will be done through the following objectives; 1) assess the feedstock potential of selected plant species and alternative biomass feedstocks; 2) evaluate the more critical parameters in maintaining syngas quality with low impurities; 3) improve syngas fermentation by enhancing gas to microorganism contact and advanced product separation techniques; 4) develop improved strains of current microbial catalysts and investigate potential alternative products; 5) explore production of liquid fuels through catalytic conversion of syngas; and, 6) explore other biomass conversion technologies including increasing the efficiency of enzymatic hydrolysis and investigating the feasibility of large-scale in-field fermentation of sweet sorghum juice. (2672)

**Sponsors:** Oklahoma Agricultural Experiment Station

**PI/PDs:** Raymond Huhnke, Danielle Bellmer, Mark Wilkins

Plant & Soil Science: Yanqi Wu

Agricultural Economics: Francis Epplin

**Development of Real-Time Management and Sensing Systems for Storing Oklahoma Agricultural Products**

This research focuses on the development of sensing and management systems to detect, identify and preserve quality characteristics in stored products. The specific objectives of this proposal are: (1) to investigate the use of capacitance-based sensors to estimate insect activity in stored grain; (2) to determine the feasibility of using sensors to improve the quality and handling of lignocellulosic biofuel feedstock from the harvest stage through introduction at the bioconversion unit; (3) develop modeling techniques for the harvesting, handling and storage of lignocellulosic material, primarily switchgrass; and (4) develop method of vacuum packaging bulk commodities to enhance densification of bulky materials for transportation and long-term storage. (2684)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Carol Jones

**The Science and Engineering for a Biobased Industry and Economy**

A large portion of the efforts are application oriented and will be useful to develop pilot projects, demonstrations and commercialization of biomass conversion to biobased products. Other outputs include educational materials that could be used in traditional classroom settings or for distance education and web based distribution; publications in peer reviewed journals, trade journals, and popular magazines; development of intellectual property; presentations to economic development groups, legislative groups, and to the general public; and development of management recommendations for producers of biobased products. (2703)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Raymond Huhnke

**The Science and Engineering for a Biobased Industry and Economy**

Liquid hot water, dilute acid and steam explosion pretreatment technologies will be evaluated. Technologies will be optimized and engineering analyses of processes will be conducted. Source of biomass investigated will include energy crops, agricultural residues and food processing residuals. Pretreatment effect is evaluated using common analytical protocols. Conversion of herbaceous crops into ethanol will be studied. Thermotolerant yeast and a high solids bioreactor for simultaneous saccharification and fermentation will be developed. Biomass gasification and hydrothermal pyrolysis processes of work will be undertaken. Use of steam-air fluidized bed gasification and downdraft gasification to produce syngas with higher carbon monoxide hydrogen content and maximum energy
efficiency will be examined. Research will compare the production of fungal, bacterial and archaeal enzymes by both native and recombinant organisms. Fermentation of xylose to produce the sweetener xylitol will be done with various xylose-fermenting yeast. This regional project will serve as clearinghouse for biomass-related knowledge and training by interfacing with organizations involved in research and development in the bio-based economy and higher education institutions. Tasks will include identifying key areas for which training materials are needed, coordinating experts to create training materials, fostering collaborations between experts, organizing workshop/training on delivery methods for distance education, and assisting in assessment of biomass-related training materials. New multi-disciplinary educational materials will be developed to disseminate knowledge related to biobased products. Courses will be developed to teach professional skills of relevance, including effective methods for distance education and skills for working in multidisciplinary teams. Significant milestones in education subtask area will include recruiting experts to develop educational materials in key areas, developing educational materials suitable for distance education, organizing peer-review assessment of educational materials, and establishing a distribution method for educational materials. (2706)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Mark Wilkins

**Integrated Systems Research and Development in Automation and Sensors for Sustainability of Specialty Crops**  
Develop sensors and sensing systems which can measure and interpret the parameters. Design and evaluate automation systems which incorporate varying degrees of mechanization and sensors to assist specialty crop industries with labor, management decisions, and reduction of production costs. Work in partnership with equipment and technology manufacturers to commercialize and implement the outcomes of this project. (2709)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Paul Weckler

**Integrated Systems Research and Development in Automation and Sensors for Sustainability of Specialty Crops**  
Develop sensors and sensing systems which can measure and interpret the parameters. Design and evaluate automation systems which incorporate varying degrees of mechanization and sensors to assist specialty crop industries with labor, management decisions, and reduction of production costs. (2710)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Ning Wang

**Nanoparticle-Based Biosensors for Rapid and Sensitive Detection of Contaminants in Food and Water**  
The overall objective of this project is to advance the detection of microbial and other contaminants using nanomaterials to enhance food safety as well as public health. This research has two specific objectives; 1) to evaluate oxide nanoparticles for fluorescence enhancement in bacteria detection; and 2) to investigate functionalization and modification fo carbon nanotubes for pesticide detection. (2717)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Yu Mao

**Development of Smart Fields with Networked Micro-Sensors to Improve Agricultural Production in Oklahoma**  
The utmost goal of the proposed project is to develop systematic approaches for infield monitoring and control for crop production based on wireless sensor network technology. The outcome of the project will contribute to the success of future deployments of wireless sensor network in the agricultural
domain. Specific objectives are; 1) development of a stationary wireless sensor network research platform for precision agriculture applications; 2) feasibility study on developing dynamic wireless sensor networks for precision agriculture applications; 3) development and deployment of strategy of network topology and management, energy harvesting/storage/management, network security/reliability/stability, communication protocols, and data gathering and processing algorithms for precision agriculture/livestock applications; 4) extensive field tests of the developed field wireless sensor networks; and(5) validation of the network strategy, protocols and algorithms. (2718)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Ning Wang

Biomass-Based Energy Research, MS & OK
The overall project goal is to further develop selected bioconversion technologies currently under investigation at Oklahoma State University and Mississippi State University. The cellulosic bioenergy technology of greatest significance is gasification-fermentation process. In gasification, biomass is injected into a reactor where all of the components (cellulose, hemicelluloses and lignin) are gasified to what is known as syngas (primarily carbon monoxide, carbon dioxide, and hydrogen). Syngas then flows through a cooling and cleaning system, and is subsequently directed to a bioreactor where it is microbially catalyzed to a mixture of ethanol, inert gases, water, and other potentially useful products. From the bioreactor, the mixture is further processed to separate and recover the essential products. This multidisciplinary, multi-institutional project is taking a holistic approach, addressing the more critical issues for the production of biomass to the production of liquid fuel. Project areas include feedstock development, gasification and syngas conditioning, syngas fermentation, microbial catalyst development, process modeling and economics. In this bioconversion process, the total biomass, including lignin, is utilized. Preliminary estimates suggest that at least three energy units could be achieved for one energy unit of input. An added benefit in using this technology is that much higher carbon conversion efficiencies are realized compared to other processes. (2751)

Sponsor: USDA
PI/PDs: Raymond Huhnke, Danielle Bellmer, Mark Wilkins
Plant & Soil Science: Yanqi Wu
Agricultural Economics: Francis Epplin

Pilot Technology Transfer Project
The objective of this project is to deliver high-quality engineering and manufacturing management assistance/technology transfer services to the small manufacturers of Oklahoma. The quality of service will be measured by survey responses from clients. Primary outputs from this project are the consulting and technology transfer services provided to small, mostly rural manufacturers. (2753)

Sponsor: USDA
PI/PD: Ronald Elliott

Biofuels and Bioproducts From Biomass-Generated Synthesis Gas
The overall goal of this project is to enhance and critically assess syngas utilization in various reactors to identify reactor designs that increase the alcohol (primarily ethanol) productivity and syngas utilization during the fermentation process. Mathematical models will be developed to describe the kinetics of syngas fermentation and predict the effectiveness of the various reactor designs. Specific objectives are to: (1) Design and construct a trickle bed reactor (TBR) for syngas fermentation and optimize its operating conditions. (2) Explore methods to enhance the gas-liquid mass transfer rate in a continuous stirred tank reactor (CSTR) and determine its optimum operating conditions. (3) Developed
mathematical models for alcohol production from syngas in the TBR and CSTR reactors. Data collected from this project will be useful in designing large scale bioreactors and process development. (2758)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Hasan Atiyeh

---

**Sustainable Feedstock Production Supply Systems to Support Cellulosic Biorefinery Industries**

The overall objective of this project is to develop the practices and technologies necessary to ensure efficient, sustainable, and profitable production of cellulosic biomass. This project addresses the needs and concerns of diverse stakeholders both within the cellulosic biorefinery industry and within the public at large. Using large-scale feedstock production research fields, the economic and environmental sustainability of switchgrass, mixed-species perennial grasses, and annual biomass cropping systems will be evaluated. Synergy between bioenergy and livestock production will be explored through dual-use (grazing plus biomass harvest) cropping system experiments. Feedstock quality characteristics, as desired by the biorefinery industry, will be assessed under varied harvest, handling, storage, and preprocessing scenarios. Sophisticated production and logistics economics models will use the data produced from the field-sized experiments to determine if an integrated landscape vision of diversified species can provide a flow of feedstock throughout the year to a cellulosic biorefinery at a cost that will enable cellulosic biofuel to compete with gasoline. (2764)

**Sponsor:** Oklahoma Agricultural Experiment Station, USDA/BRDI

**PI/PDs:** Raymond Huhnke, Carol Jones

Plant & Soil Science: Gopal Kakani, Tyson Ochsner, Jason Warren

Agricultural Economics: Francis Epplin

---

**Biomass Based Energy Research, OK & MS**

The overall project goal is to further develop selected bioconversion technologies currently under investigation at Oklahoma State University and Mississippi State University. Among these technologies, the cellulosic bioenergy technology of greatest significance is gasification-fermentation process. In gasification, biomass is injected into a reactor where all of the components (cellulose, hemicellulose, and lignin) are gasified to what is commonly referred to as syngas (primarily carbon monoxide, carbon dioxide, and hydrogen). Syngas then flows through a cooling and cleaning system, and is subsequently directed to a bioreactor where it is microbiologically catalyzed to a mixture of ethanol, inert gases, water, and other potentially useful products. In this bioconversion process, the total biomass, including lignin, is utilized. This multidisciplinary, multi-institutional project takes a holistic approach, addressing the more critical issues for the development of biomass to the production of liquid fuel. Project areas include feedstock development and production, gasification and syngas conditioning, syngas fermentation, microbial catalyst development, process modeling and economics. Preliminary estimates suggest that at least three energy units could be achieved for one energy unit of input. An added benefit in using this technology is that much higher carbon conversion efficiencies are realized compared to other processes. (2777)

**Sponsor:** Oklahoma Agricultural Experiment Station, USDA

**PI/PDs:** Raymond Huhnke, Hasan Atiyeh, Danielle Bellmer, Ajay Kumar, Krushna Patil, Mark Wilkins

Agricultural Economics: Francis Epplin

Plant & Soil Science: Yanqi Wu

---

**Subsurface Phosphorus Transport in Riparian Floodplains**

Objectives of this research are: 1) Identify hydrologic heterogeneities in the subsurface of alluvial floodplains in the Ozark Ecoregion; 2) determine if hydrologic heterogeneities in the subsurface induced by deposition and erosion of overbank, channel and point-bar deposits have a strong impact on the
interaction of stream and groundwater flow, and therefore on contaminant fate and transport; and 3) document and model spatially variable subsurface flow paths that connect to active stream systems and act as transient storage zones in alluvial floodplains where nutrient/contaminant loads concurrent with large storm events migrate from the stream into the adjacent floodplain, contaminating the alluvial storage zone and slowly releasing contaminants back into the stream system. This research has wide-reaching implications for how riparian floodplains are managed. The hypothesis of this research is that subsurface contaminant transport could also be a contributing factor in certain conditions. (2778)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Daniel Storm

**Development and Evaluation of Low Impact Development Technologies**

There are four general objectives for this research; 1) Quantify, in a form suitable for engineering design, any flow volume and peak reductions in LID technology including bioretention cells, permeable pavements and vegetative waterways; 2) Quantify long-term pollutant sorption and transformations in LID filter media. Pollutants of concern will include, but are not limited to, nitrate, phosphate, heavy metals and organic pesticides; 3) Identify and quantify new filter media additives that will increase filter media sorption and transformations of pollutants; and, 4) Based on the results of the previous research, create and publish engineering guidelines for LID design, construction and maintenance. These objectives are broad, and it is probable that not all will be fully met. However, it is expected that Objectives 1 and 4 will be met in large part, and Objective 3 will be met at least in part. Objective 3 is relatively high-risk. (2779)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Glenn Brown

**Feasibility Studies of rural Renewable Energy Based Distributed Power Generation Integrated with Electric Utility Grid as Demand Reduction Strategy**

There are four general objectives for this research; 1) Demonstrate a biomass based Combined Heat and Power System integrated as a utility demand reduction system using the OSU Swine Research facility AD unit or other suitable biomass energy system; 2) Determine which (other) biomass based distributed generation systems might be candidates to work as an aggregated power plant (consider small wind and solar systems also); 3) Determine how such distributed generation systems might be controlled and integrated by an outside entity (main utility); and 4) Determine economics of the distributed generation systems (using assumptions for power pricing and carbon economics, etc.). Objective 1 is somewhat high-risk in that it depends on the availability of the swine facility digester (ASBR) to be in operation. This facility is currently undergoing budget discussion and may be shut down. If the ASBR is shut down, an alternative biomass energy production process will need to be identified and integrated into this research. Examples of alternative processes include landfill biogas, biomass gasifiers, and ethanol production systems. (2780)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: R. Scott Frazier

**Pilot Technology Transfer, OK**

This project will continue to deliver high-quality engineering/manufacturing management assistance and technology transfer services to small manufacturers in Oklahoma. Primary outputs from this project are the consulting and technology transfer services provided to small (mostly rural) manufacturers in Oklahoma. (2781)

Sponsor: USDA
PI/PD: Ronald Elliott
ENTOMOLOGY AND PLANT PATHOLOGY

Insect Survey and Detection
Insect surveys assist farmers and others to more adequately protect their crops from insect attack. Surveys also assure more prompt detection of newly introduced insect pests. Survey data may lead to the development of a workable insect pest forecasting service. Survey reports may aid manufacturers and suppliers of insecticides and control equipment to determine areas of urgent need. In case of necessity, we provide a countrywide skeleton structure to be expanded as needed, to combat any attempt at biological warfare. (0914)

**Sponsor:** USDA, Oklahoma Agricultural Experiment Station
**PI/PD:** Don Arnold

Disease Resistance in Peanut to *Sclerotinia* Blight
Production of peanut in Oklahoma is adversely affected by *Sclerotinia minor*, the causal agent of *Sclerotinia* blight. Chemical management of this disease is available but adds to production cost which in turn negatively impacts the net return to peanut producers. Therefore, the objectives of this research are: 1) to develop improved methods for evaluating and quantifying resistance in germplasm and breeding lines to *S. minor*, 2) to evaluate new peanut entries both in the greenhouse and field plots to identify resistance to *S. minor*, and 3) to provide plant pathology expertise and support to the peanut breeding program at Stillwater. The information and technology produced from this project will enhance and accelerate the development of disease resistant cultivars and management strategies for use by Oklahoma growers which will contribute to improving the profit margin of peanut producers. (1661)

**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** Hassan Melouk
**Graduate College:** Mark Payton

Development of Disease Resistant Wheat and Studies of Selected Wheat Diseases
More than 1,200 breeder wheat lines were tested for reaction to leaf rust, *Soilborne wheat mosaic virus*, *Wheat spindle streak mosaic virus*, powdery mildew, tan spot and septoria. Results were used by private and public wheat breeders to develop improved wheat varieties. Lab and field research determined that isolates of *Pyrenophora tritici-repentis* (PTR; causal fungus of tan spot of wheat) collected from Oklahoma during the 2000s were more fit and virulent than isolates collected during the 1980s and 1990s, and were likely from a single lineage. (1871)

**Sponsors:** Oklahoma Agricultural Experiment Station, Oklahoma Wheat Research Foundation
**PI/PDs:** Robert M. Hunger, Kris Giles, Tom Royer
**Plant & Soil Sciences:** Brett Carver, Art Klatt, Jeff Edwards

Biochemistry of Arthropod-Host Interactions
Newly developed analytical approaches, including proteomics and metabolomics, are being used to study the interaction of aphids with important crop plants including alfalfa and wheat. An emphasis is being placed on understanding the response of insects to susceptible and resistant plants. Similar methods are being used to study the proteins in tick saliva and their role in feeding and disease transmission. (2001)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA-ARS laboratory Stillwater.
**PI/PD:** Jack Dillwith
Virulence Factors in Phytopathogenic Bacteria
Coronatine is a phytotoxin produced by the plant pathogenic bacterium *Pseudomonas syringae*. Although coronatine is important in pathogenesis, the mechanisms by which coronatine promotes disease remain elusive. This project addresses the roles of coronatine, intermediates in the coronatine pathway, and the phytohormone auxin during pathogenesis. The approach is interdisciplinary and uses a combination of molecular genetics and metabolic profiling. The proposed work will benefit society through an improved understanding of disease susceptibility and pathogen virulence, possibly leading to improved disease control. (2009)

**Sponsors:** National Science Foundation, Oklahoma Agricultural Experiment Station
**PI/PD:** Carol L. Bender

Pathogen-Host Interactions of Phytopathogenic Bacteria in Selected Plant and Insect Host Systems
The project will investigate 1) the molecular basis of pathogenicity, insect transmissibility, and niche adaptations of the phytopathogenic Mollicutes, 2) transmission factors and niche-specificity determinants of *Serratia marcescens*, the bacterium causing cucurbit yellow vine disease, 3) technology for detection and strain discrimination among plant pathogens for forensic applications, 4) interactions of human pathogens and plants, and 5) Oklahoma-related problems involving phytopathogenic prokaryotes. (2052)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA, Department of Homeland Security, Battelle Inc., Center for Produce Safety, OCAST.
**PI/PD:** Jacqueline Fletcher

Biology, Epidemiology, and Integrated Management of Peanut and Vegetable Crop Diseases
Basic studies on the biology and epidemiology of peanut and vegetable crop diseases will be conducted under this project. Results will be used to predict disease development and the need for disease management inputs. Sources of genetic resistance to important diseases of peanut and vegetable crops will be identified and evaluated for use directly by farmers or in breeding programs. Integrated management programs for peanut and vegetable crop diseases that use cultural practices, efficient fungicide and bactericide programs, and genetic resistance will be developed and evaluated. The overall project goal is to reduce pesticide dependence while maintaining good disease control and eliminating crop failure due to disease. (2159)

**Sponsors:** Oklahoma Agricultural Experiment Station, IR-4 Project, Oklahoma Peanut Commission, National Peanut Board, Vegetable Processing Industry
**PI/PD:** John Damicone

Integrated Pest Management of Wheat and Canola Insect Pests
The primary objective is to develop management programs for insect pests in wheat and canola. Specifically, the research evaluated: 1) the distribution and impact of Hessian fly in Oklahoma winter wheat systems, 2) the relationship between aphids and canola yields in Oklahoma, 3) the plausibility of a new binomial sequential sampling plan for aphids in canola, 4) the relationship among aphids, host plants, and natural enemy biology, 5) current insect management plans for wheat and canola production systems in Oklahoma, and (6) the ecology of aphidophagous natural enemies in simple and diverse wheat agroecosystems. (2334)

**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** Kristopher Giles
Investigating Virus Persistence in Plants
Research in our laboratory explores virus cell-to-cell and leaf-to-leaf spread. We employ tools of cell and molecular biology to study fundamental mechanisms of virus-host interactions necessary for infection to succeed without causing cell death. This laboratory identified novel viral induced vesicles carry viral cargo the plasmodesmata for cell-to-cell movement. We showed that viruses modulate the host protein degradation machinery in a manner that promotes virus infection. We identified viral proteins that can cause an exaggerated stress response in plants leading to cell death. By modulating these stress responses the virus enables its own ability to move between cells. (2371)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Jeanmarie Verchot-Lubicz

Biology, Ecology, and Integrated Management of Turfgrass Diseases
Turfgrasses in Oklahoma are damaged by a variety of pests. Objectives are to describe the biology and ecology of important turfgrass pests in Oklahoma and develop integrated management strategies for these pests. We are evaluating the diversity of several turfgrass pests. These evaluations include studying the interaction between several fungi and grasses and how environmental conditions influence these interactions. We will also evaluate integrated management approaches for these pests of turfgrass in Oklahoma. (2420)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Nathan Walker, Tom Royer, Stephen Marek, Eric Rebek, Damon Smith
Horticulture & Landscaping Architecture: Dennis Martin

Molecular Aspects of Insect Immunity
*Manduca sexta* peptidoglycan recognition protein-1 (PGRP1) specifically binds to soluble PG of *Escherichia coli* and insoluble PGs of *Micrococcus luteus*, *Bacillus megaterium* and *Bacillus subtilis*. Its addition to plasma of naïve larvae leads to concentration-dependent increase in prophenoloxidase activation. Phenoloxidase activity increases after the plasma was incubated with PGs. Such increases are significantly more prominent when *E. coli*, *M. luteus* or *B. megaterium* PG and PGRP1 are both present, suggesting a synergistic effect caused by the PG-PGRP interactions. Therefore, PGRP1 is a member of *M. sexta* prophenoloxidase activation system, which recognizes PGs from certain bacteria and initiates the immune response. (2450)

Sponsors: Oklahoma Agricultural Experiment Station, National Institutes of Health
PI/PD: Haobo Jiang

Biology, Ecology, and Pest Management of Wood-Destroying Subterranean Termites
New and continuing research is expanding our knowledge of termite species diversity and distribution across Oklahoma, validating that there are at least five native species of subterranean termites, and searching for species yet to be found in the state, especially in the high desert Black Mesa habitat. Additionally, studies of termite impacts on soil characteristics continue. Determination of the effects of termite foraging activity within a Tallgrass Prairie habitat, including effects on grassland plant biomass, carbon sequestration, soil fertility and turnover, and rainwater percolation are underway. Fate of termiticides in building construction gravel fill following standardized applications is being determined. Efficacy studies of improved termite management systems and termiticides are also underway. (2480)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Brad Kard
Biology and Functional Genomics of Plant Pathogenic Fungi

The research investigates the biology and virulence of plant pathogenic fungi affecting Oklahoma’s agricultural and horticultural crops and natural ecosystems. Functional genomics and molecular and cell biology are used to elucidate the molecular mechanisms of pathogenic fungi infecting model legumes and economically important crop plants. Fungal diseases under investigation include: 1) alfalfa, 2) leaf spots, 3) cotton root rot, 4) bermudagrass spring dead spot, 5) turfgrass dollar spot, 6) botrytis blight, and 7) switchgrass rust. (2536)

Sponsors: OAES, NSF-EPSCoR, Noble Foundation, ODAFF, OSRHE, USGA

PI/PDs: Stephen M. Marek, Nathan Walker, Carla Garzon

Sun Gro Horticulture: Todd Cavins

University of Oklahoma: Bruce Roe

Noble Foundation: Carolyn Young, Kiran Mysore, Rao Uppalapati

Ohio State University: Tom Mitchell

Exploring Mechanisms of Plant Resistance to a Phloem-associated Bacterial Disease by Analysis of Vector Feeding Behavior

Squash bug probing behavior on watermelon and watermelon relatives was described and analyzed using no-choice tests and electrical penetration graph (EPG) technology. In no-choice tests, squash bugs probed more frequently on preferred host, squash, as compared to watermelon, Citrullus lanatus, C. lanatus X C. colocynthus hybrid (USVL-200), C. colocynthus, and Praecitrullus fistulosa, as determined by the number of salivary sheaths deposited in a 24 hr period and stained with McBride’s stain. EPG analysis revealed that squash bugs probe less on melon relatives than on watermelon, but the primary structure of waveforms is the same on all tested plant hosts. Mechanical and insect inoculation of C. lanatus, C. colocynthus, P. fistulosa, and USVL-200 reveal that a small proportional of plants show CYVD symptoms 3-4 weeks after inoculation. (2580)

Sponsors: Oklahoma Agricultural Experiment Station and USDA

PI/PDs: Astri Wayadande, Jacqueline Fletcher

WWAREC: Benny Truton, Sam Pair

Managing Muscoid Fly Pests Associated with Livestock Production Facilities

Muscoid flies are among the most important pests in livestock production systems. Two species in particular, house fly (Musca domestica) and stable fly (Stomoxys calcitrans), are responsible for damage and control costs in excess of a billion dollars per year in the United States. Specifically, this project will address four areas concerning pest management of muscoid flies by: 1) characterizing stable fly origins and dispersal 2) improve understanding of house fly dispersal and behavior, and develop methods for monitoring them in indoor and outdoor environments 3) develop stable fly control tactics, and 4) develop house fly resistance management tactics. (2622)

Sponsor: Oklahoma Agricultural Experiment Station

PI/PDs: Justin Talley, Deborah Jaworski, Carmen Greenwood, Tom Royer, Jim Criswell

Animal Science: David Lalman

Tick Feeding Proteins and Macrophage Migration Inhibitory Factor (MIF): Targets for developing anti-tick vaccines

This research project focuses on host immune responses to ticks, and basic studies of tick physiology, biology and ecology leading to the investigation of innovative control strategies for ticks. The long-term goal of the research is to understand the molecular mechanisms of tick feeding and pathogen transmission. For these experiments, we are characterizing proteins involved in tick feeding for use in anti-tick vaccines. These studies will advance our understanding of the molecular mechanisms of tick
feeding and pathogen transmission; and lead to the development of vaccines to prevent tick feeding and/or transmission of tick-borne pathogens. (2623)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PDs:** Deborah Jaworski

Veterinary Medicine: Kathy Kocan, J. Fuente, Edmour Blouin

**Impacts of Disturbance on Soil-dwelling Microarthropod Communities and Soil-dwelling Entomopathogens in Annual, Semi-permanent and Permanent Management Regimes in Oklahoma**

This research focuses on how disturbance impacts abundance, diversity and community composition of soil-dwelling invertebrate assemblages and naturally-occurring entomopathogens. Individual invertebrate taxa, (bioindicators) and the composition of invertebrate assemblages are often very informative in making inferences related to the biotic integrity of a system. Naturally-occurring entomopathogens provide a vital ecosystem service in a variety of systems. Disturbance may occur naturally in a system or result from agricultural processes such as tillage, patch-burn grazing, soil amendments, compaction or invasive plant species. (2624)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Carmen Greenwood

**Flies Impacting Livestock, Poultry and Food Safety**

Muscid flies are among the most important pests in livestock production systems. Two species in particular, house fly (*Musca domestica*) and stable fly (*Stomoxys calcitrans*), are responsible for damage and control costs in excess of a billion dollars per year in the United States. Specifically this project will address three areas concerning muscid fly biology and pest management: 1) characterize dispersal and population biology of stable flies and house flies and develop monitoring methods for use in indoor and outdoor environments 2) establish extent of fly-borne dispersal of human and animal pathogens and, 3) improve management tactics for stable flies and house flies. Specific involvement of Oklahoma State University (Dr. Justin Talley) will be focused on all objectives. (2629)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Justin Talley

**Implementation and economic evaluation of the ‘Glance n’ Go’ greenbug+parasitism sampling and management plan on winter wheat in KS, OK, TX**

The aphid-parasitoid ‘Glance n’ Go’ sampling and management plan was evaluated in Kansas, Oklahoma and Texas. The plan was provided to extension educators throughout the region and producer knowledge of ‘Glance n’ Go’ was evaluated. Findings from this study will be incorporated into future extension IPM documents and websites. (2636)

**Sponsors:** USDA CSREES, PMAP

**PI/PDs:** Kristopher Giles, Tom Royer, Francis Epplin

**Biology, Epidemiology, and Integrated Management of Ornamental and Horticultural Plant Diseases**

In Oklahoma ornamental and horticultural crops have become a lucrative alternative to conventional row crops. Research focuses on the biology, epidemiology, and management of diseases of horticultural crops. Objectives include: 1) determining the geographic distribution of *Xylella fastidiosa* on various ornamental and horticultural hosts in Oklahoma 2) identifying the *Xylella fastidiosa* strains that exist in Oklahoma 3) validating weather-based grape black rot and turf dollar spot advisories for recommending fungicide applications in Oklahoma 4) screening Oklahoma State University grape breeding selections for resistance to crown gall, and 5) improving the epidemiological understanding of major disease epidemics of native and improved pecan varieties. (2667)
Insect Transmission of Plant and Human Pathogens to Plants
This project focuses on understanding the relationships between insect vectors and plant or human pathogens. One goal of this project is to understand transport of human enteric bacteria to fresh produce by filth fly vectors. To that end, we have determined that house flies retain *Escherichia coli* 0157:H7 on external surfaces for up to 13 days post acquisition and regurgitate live bacteria onto plant surfaces. Flies captured from animal production facilities range from 0-100% positive for *E. coli* 0157:H7 when tested by PCR. A model for using fly specks to estimate fly visitation on plants is being developed. (2668)

**Sponsors:** USDA-NIFSI (National Integrated Food Safety Initiative, Oklahoma Agricultural Experiment Station, Center for Produce Safety
**PI/PDs:** Astri Wayadande, Udaya DeSilva, Jacque Fletcher, Justin Talley, Li Ma
University of California Riverside: Alec Gerry, Jocelyn Millar
University of California Davis: Themis Michaelides

Identification, Biology, Ecology, and Management of Stored-Product Insect Pests
We conduct research on stored-product insects that are a threat or an emerging threat to stored grain. We investigate their biology and ecology to understand factors affecting population dynamics and key life processes of individuals and populations. We assess their economic impact in grain storages. We provide information that can be incorporated into pest management strategies. Sampling tools are developed to assess the size and impact of these insect pest populations and for IPM. Ecologically sound control methods are developed as alternatives to conventional insecticide treatments. (2695)

**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** George P. Opit

Population Diversity of Soilborne Pathogens of Peanut, Cotton and Ornamentals
The objective of this research program is to characterize populations of soilborne pathogens of relevant crops for Oklahoma. The population genetics analyses of *Phymatotrichopsis omnivora* has been completed. The population genetics analyses of *Pythium* isolates has revealed a potential new species within the *Pythium irregulare* complex and a phylogenetic revision of this group, description of the new species, and development of diagnostic tools are in progress. The population genetics assays on *Sclerotinia minor* from Oklahoma have been completed and data analysis is in progress. Five manuscripts are in progress or under revision. (2698)

**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** Carla Garzon

Determinates of Mosquito Borne Disease: Landscape, Larval, and Egg-laying Biology of Mosquitoes in Oklahoma
This research project examines the transmission of mosquito-borne diseases and the ecological factors that influence transmission. Specific projects include the response of larvae to variation in nutritive environment, the landscape ecology of disease vectors, and monitoring viral disease in mosquito populations. This project continues to conducted surveillance of West Nile and St. Louis encephalitis viruses in mosquitoes in four counties in Oklahoma (in conjunction with the Oklahoma Department of Health and Tulsa County Public Health), completed experiments examining larval response to variation
in leaf litter, completed experiments on the oviposition behavior of Oklahoma mosquitoes, and collected one field season data on landscape patterns of mosquitoes in Oklahoma. (2707)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Michael Reiskind

**Ecological and genetic diversity of soilborne pathogens and indigenous microflora**
Understanding the genetic diversity of populations of *Rhizoctonia solani* in Oklahoma agricultural soils compared to those in natural soils, can contribute information about the origin of inoculum that can be useful for disease management and prevention. Microsatellite markers and highly sensitive PCR and real-time PCR specific for anastomosis groups are being developed and evaluated on Oklahoma isolates and on collections of isolates obtained through collaborations with Clemson University and the University of Arkansas. (2711)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Carla Garzon

**S-1034 Biological Control of Arthropod Pests and Weeds**
I participated as Oklahoma PI associated with S1034 working group on: 1) implementation, evaluation and enhancement of biological control, and 2) evaluating the benefits and risks of introduced and indigenous natural enemies. The laboratory participants evaluated colonization of cropping systems by ground beetles from semi-permanent habitats (alfalfa). Field and laboratory studies continued to examine intraguild dynamics among aphid parasitoids and Coccinellidae predators. (2724)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA NIFA  
**PI/PDs:** Kristopher Giles, Carmen Greenwood

**Biology, Integrated Pest Management, Damage Thresholds, Poliation Dynamics, Incidence and Occurrence**
1) determine the distribution and incidence of thrips, aphids, fleahoppers, stink bugs and diseases in SW Oklahoma cotton  2) determine their impact on Oklahoma cotton yields  3) determine the distribution and incidence of current pest insects and diseases on wheat, grain sorghum, corn, alfalfa, and peanuts in SW Oklahoma  4) evaluate current damage thresholds and determine if adjustments are necessary, and 5) identify and implement IPM principals that can be implemented in crop production in SW Oklahoma to improve the economic return as related to crop pest control and IPM. (2725)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Terry Pitts

**Filth Fly Transmission of Human Enteric Bacteria to Pre-harvest Fresh Produce**
Filth flies have been previously implicated in transmission of human enteric bacteria to prepared foods and hospital patients, but not to leafy greens. House fly and blow fly transmission of E. coli O157:H7 and *Salmonella enterica* to lettuce and spinach will be determined. To accomplish this, an assay for measuring fly visitation to leafy greens and other plants was developed. Green-fluorescent tagged E. coli was found to adhere to fly appendages for up to 13 days after exposure to contaminated manure. Finally, we are elucidating the role of homopteran honeydew volatiles in attraction of filth flies to leafy greens. (2756)

**Sponsor:** Oklahoma Agricultural Experiment Station and USDA  
**PI/PDs:** Astri Wayadande, Justin Talley, Jacqueline Fletcher  
**Animal Science:** Udaya DeSilva  
**UC Riverside:** Alec Gerry and Jocelyn Millar  
**UC Davis:** Themis Michaelides
**Biology, Ecology & Management of Emerging Disease Vectors**

This research project focuses on several objectives: 1) strengthen basic understanding of mosquito disease vectors, 2) use knowledge to help predict disease outbreaks, 3) enhance surveillance activities, and 4) train the next generation of medical entomologists. To address these objectives, we have several projects. Specific projects include the response of mosquito larvae to variation in nutritive environment, the landscape ecology of disease vectors, and monitoring viral disease in mosquito populations. (2757)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Michael Reiskind

**Development and Application of Tools for Agricultural Biosecurity and Forensic Plant Pathology**

The project focuses on aspects of forensic plant pathology relevant to agricultural biosecurity in Oklahoma and the southern plains and the United States. It includes adaptation and development of methods for pathogen detection, diagnosis and discrimination. At the moment assessing new biomaterials seeking the development of new sampling devise and water sampling. Further research will develop new PCR based diagnostics; characterize the organization of plant pathogen genomes, molecular landmarks, conserved and divergent genomic sequences, and the implication of this variability on taxonomical relationships, morphology, host-pathogen associations and the dynamics of the plant pathogen bio-geographic distribution and global dispersal routes. The biodiversity of regulated-exotic, naturalized, and indigenous microorganisms and diseases of relevance to agricultural biosecurity will be also considered. (2773)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Francisco Ochoa Corona

---

**HORTICULTURE AND LANDSCAPE ARCHITECTURE**

**Development and Refinement of Production Systems for Currently Produced Vegetables and New Alternative Crops in Oklahoma**

Project evaluates new herbicides on appropriate crops. Promising materials will be evaluated in expanded rate-application studies. Data will be shared with IR-4, ag chemical companies, Oklahoma Department of Agriculture Food and Forestry, and EPA. Cultivar trials and crop management practices for new crops will be investigated including replicated trials, establishment methods, fertility, pest control, and harvesting. In addition, new management technology for established crops will be also investigated. (1441)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PDs:** Lynn Brandenberger, Niels Maness, Brian Kahn  
**Entomology & Plant Pathology:** John Damicone  
**Agricultural Economics:** Merritt Taylor

**Studies of Alternate Bearing in Pecan**

The research evaluates foliar applied nickel (Ni) to determine tree response and establish leaf elemental standards for Ni. Foliar applied copper and Ni are being evaluated to mitigate a problem with excess nitrogen on pecan from nitrate contaminated irrigation water. Ground cover management studies for pecan are being evaluated to enhance production and reduce alternate bearing. (1689)

**Sponsors:** Oklahoma Agricultural Experiment Station, Oklahoma Pecan Growers’ Association, Samuel Roberts Noble Foundation  
**PI/PD:** Michael W. Smith
**Plant Resistance to Abiotic Stress**
The research characterizes freeze tolerance of bermudagrasses to identify cultivars suitable for the transition zone between warm- and cool-season turfgrasses. The program is involved in screening experimental bermudagrass germplasm to select for superior freeze tolerance and identify factors contributing to increased freeze tolerance. A second emphasis area of the research program determines the role of the chemical and physical environment in susceptibility of proteins to loss of function through denaturation and aggregation at high temperatures. A cooperative project with soil and range scientists explores interactions between plant and soil ecosystems that regulate rangeland sustainability. (2002)

**Sponsors:** Oklahoma Agricultural Experiment Station, U.S. Golf Association, USDA

**PI/PDs:** Jeff Anderson, Dennis Martin

Plant & Soil Sciences: Shiping Deng, Yanqi Wu

**Improved Vegetable Crop Development Through Sustainable Cultural Practices**
The research will develop more environmentally benign pest control strategies for Oklahoma vegetable crops. Specifically, a disease-management system will be developed for beet curly top virus on tomatoes, and corn gluten meal will be tested for weed control in transplanted vegetable crops. The research also will determine continuous production periods that could meet market demand for selected Oklahoma vegetable crops, including cabbage and eggplant. (2026)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PDs:** Brian Kahn, William McGlynn

Entomology & Plant Pathology: John Damicone

**Development of Integrated Resource Management Systems for Turfgrass Culture in Oklahoma**
The winter of 2009/2010 resulted in the greatest amount of winter-kill on turf bermudagrass in Oklahoma in 20 years. On May 4 2010 forty bermudagrasses mowed at 0.5 inches were assessed for winter-kill following greenup. Commercially available types having 60% or greater winter-kill included Veracruz, Princess 77, Sunsport and NuMex Sahara. Cultivars having 15% or less winter-kill in the same trial included Hollywood, Riviera, Midlawn, a southern Illinois University source of U-3, Astro, Patriot, Yukon and experimental cultivars OKC1119, OKC1134 and OKC70-18. Consumers and commercial turf managers should utilized the improved varieties when possible to minimize problems with winter-kill. (2222)

**Sponsors:** Oklahoma Dept. of Transportation, United States Golf Association, Oklahoma Golf Course Superintendents Association, National Turfgrass Evaluation Program, Oklahoma Turfgrass Research Foundation, Oklahoma Agricultural Experiment Station, Oklahoma Cooperative Extension Service, Oklahoma State Regents for Higher Education

**PI/PDs:** Dennis Martin, Greg Bell

Plant & Soil Sciences: Yanqi Wu

Entomology & Plant Pathology: Nathan Walker

**Production, Establishment and Maintenance of Ornamental Plants in Oklahoma**
The research will evaluate woody ornamental plants for their response to adverse environmental conditions and identify potential physiological and morphological mechanisms that may contribute to drought resistance. Cultural practices will be evaluated for use in economical production and maintenance of quality landscape plants. Cultural practices include determining optimum combinations of controlled release and liquid fertilization to produce quality plants with minimal fertilizer inputs and runoff contamination. (2324)
Postharvest Preservation and Processing Systems for New and Conventional Horticultural Commodities
The research develops postharvest handling and quality analysis procedures necessary for new crop/new use production/harvesting/processing systems to provide alternatives for Oklahoma producers and food processors. Ambient temperature extraction is being investigated as a means of lipid extraction from various oilseeds, tree nuts, herbs and leafy vegetables. The mechanism by which the extraction process enhances the shelf life and flavor of various crops is under investigation. (2325)

Develop Environmentally Friendly Procedures to Monitor and Enhance Turfgrass Quality
The research investigates the use of optical sensors for evaluation of turfgrass quality and moisture status. The research determines the effects of selected products and techniques for filtering and/or reducing nutrient runoff from turfgrass. The research pursues the selection of a shade-tolerant bermudagrass cultivar(s) and rapid techniques for the selection of potential shade tolerant grasses. (2392)

Investigations into Alternative Fruit and Nut Crops for Oklahoma
The Oklahoma grape industry is in a phase of rapid expansion, but in-depth Oklahoma-specific information including cultivar selection, insect and disease management, and enology education is lacking. Along with the testing of cultivars comes the task of identifying appropriate cultural management techniques. This study’s data should allow grape growers and wine makers to make informed decisions regarding cultivar and rootstock selection based on their specific site requirements. Pecan and blackberry variety trials will give growers evidence of a cultivar’s appropriateness for the difficult continental climate conditions of Oklahoma. (2606)

Cultural Management of Vegetables for Sustainable, Local Food Production in Oklahoma
The study emphasizes development of production and marketing techniques for small-scale, direct-sale vegetable producers. Vegetable crops that are well suited for local production and distribution to local schools are being examined. Emphasis is placed upon crops that can be quickly harvested, easily shipped, and consumed with minimal processing. Climate modification techniques, including wind breaks and temperature shelters, are being examined to determine methods of producing food during the time of year that school is in session. Organic agriculture, including using poultry litter as a fertilizer material, is being studied to determine limitations and opportunities for organic food production in Oklahoma. (2619)

Sponsor: Oklahoma Agricultural Experiment Station, USDA-CSREES
PI/PD: Warren Roberts
Systems for Quality Preservation for Horticultural and Specialty Commodities
Low temperature drying technologies (25 to 60 C) are being integrated into production and harvesting systems to preserve quality of cilantro and other herb and specialty crops. The dried products will be partially extracted with liquefied gases at low temperature (10 to 25 C) and low pressure (80 to 230 psi) to produce flavorful and shelf stable dry products. Chemical markers for quality of the extracted material and the separated extracts, and which indicate a progressive loss in quality during storage are being identified and utilized for optimizing processing parameters and evaluating processes for extending shelf life. (2669)
Sponsors: Oklahoma Agricultural Experiment Station, USDA-CSREES
PI/PDs: Niels Maness
Biosystems & Agriculture Engineering: Paul Weckler, Carol Jones

Investigations of Turfgrass Drought Stress Physiology & Water Use Efficiency
Turfgrasses and other landscape plants serve an important role in society, yet improvements could be made to develop drought resistant turfgrass varieties and increase turfgrass water use efficiency in Oklahoma. The objectives of this research are to test and select Oklahoma adapted turfgrasses for improved drought resistant characteristics; identify, measure, and explain specific physiological mechanisms of turfgrass drought resistance; and identify water use characteristics of maintained turfgrass and landscape plants in Oklahoma and develop landscape irrigation water conservation best management practices. (2723)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Justin Moss

Use of Propagation, Evaluation, Hybridization, Genetic Manipulation, and Production Techniques to Improve Cultivation of Ornamental Taxa in Oklahoma
Native and non-native drought tolerant species are also being evaluated for regional adaptability and ornamental merit. Optimal sexual and asexual propagation practices are being developed to facilitate commercialization. Hybridization and genetic manipulation techniques are be utilized as tools for plant improvement, which consists of better adaptability to drought, winter hardiness, production practices, and pest and diseases. Chemicals reported to diminish drought stress are also being evaluated. (2726)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Bruce Dunn

Quality Preservation and Assessment for Horticultural and Alternate Commodities
Partial lipid extraction is being investigated as a means to extend shelf life, improve color retention and enhance flavor of dried herbs and vegetables. Production systems for mechanized harvest are being paired with bulk systems for washing and drying the crops prior to extraction. The impact of storage conditions prior to and after extraction is under investigation. Entire productions through extraction processing systems are under development for cilantro, spinach and various basils as new Oklahoma extraction crops. Selectivity of the extraction process for plant waxes is being investigated as a possible mechanism for shelf life extension/flavor profile improvement of extracted products. (2739)
Sponsors: Oklahoma Agricultural Experiment Station, USDA-CSREES
PI/PDs: Niels Maness
Biosystems & Agriculture Engineering: Paul Weckler, Carol Jones

Harvesting, Preservation & Processing for Horticultural and Alternate Commodities
Methods for automation of x-ray imaging for pecans are under development, to provide an alternative grading process which is non-destructive. Algorithms are under development to detect and quantify
percent kernel fill, to identify cracked shells and to identify internal insects such as pecan weevil larvae. Methods for complete oil extraction of pecans, with resultant products pecan oil and pecan flour, are under development using ambient temperature liquefied gas extraction. Performance of the oil and flour products in food products will be assessed and economic feasibility of the extraction process will be investigated in a multi-state initiative. (2776)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA-CSREES

**PI/PDs:** Niels Maness

Biosystems & Agriculture Engineering: Paul Weckler, Carol Jones

---

**HUMAN ENVIRONMENTAL SCIENCES**

**Family and Peer Contexts of Child Overweight in a Rural Setting: Follow-up and Forward 4th Grade Fostering Aspirations and Success through Educational Resources**

The project explored identity and goal development among recently-homeless families and youth in transitional housing (N=62). Nineteen families (18 parents; 27 adolescents) completed questionnaires, interviews, and activities surrounding intervention participation. Seventeen transitional parents with young children completed surveys. Results suggest issues related to identity and goal development, self-efficacy, and support are paramount. Post-intervention youth reported increased confidence and optimism; greater community awareness; improved relationships and life situations; and, wished the program was permanent. Findings will be used to provide guidance for working with and studying homeless families. (2687)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PDs:** Michael Merten, Ron Cox, Amanda Morris

---

**Unlocking the Secret to Optimal Health Status: The Oklahoma Centenarian Project**

This study examined how psychological, social, and economic provisions influence health status in extreme later life. Data were collected from N = 154 persons aged, 99 and older residing throughout Oklahoma. Initial results indicate that lifetime exposure to trauma, perceived economic status, and personality traits including neuroticism, extraversion, and consciousness are associated with health status outcomes among persons living very long lives. Findings from this study will be used to develop a fact sheet for the Oklahoma Cooperative Extension Service. (2688)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PDs:** Alex J. Bishop, Jan Johnston

---

**Osteoporosis Risk in Oklahoma Native American Women: The Role of Inflammation and Diabetes**

Current estimates related to the prevalence of osteoporosis are based primarily on Caucasian populations. Native American women may be considered a high risk group for osteoporosis due to lifestyle factors such as physical activity, calcium and vitamin D intake, as well as the incidence of Type II diabetes. This study assessed osteoporosis risk in Oklahoma Native American women and the role of Type II diabetes and inflammation. Additional data collection is underway and we anticipate the results of this study will provide new insights into Native American women’s risk for osteoporosis. (2690)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PDs:** Brenda Smith, Janice Hermann, Stephen Clarke

---

**Parenting, Peer, and Behavioral Correlates of Emotion Regulation during Adolescence**

The project examined correlates of adolescent emotion regulation (ER). Data have been collected from 103 high-risk families with adolescents (Mean age = 13.54 years; 55.3% male; 26.2% European American, 73.8% ethnic minorities; 51.4% single parents). Data collection is ongoing. However,
preliminary results are consistent with initial expectations. Specifically, youth ER was related to antisocial behavior, substance use, school grades, and prosocial behavior. Moreover, maternal harsh and punitive discipline strategies were significantly associated with poor anger and sadness regulation. Finally, peer ER and peer antisocial behavior were related to youth ER. Findings will be used to provide valuable information to social workers, parent educators, and other service providers who work to improve the lives of high-risk families. (2743)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Michael Criss, Amanda Morris, Ron Cox
The overarching purpose of the study was to increase understanding of the development of obesity among a high-risk population. Longitudinal health and psychosocial data have been collected among a representative sample of children in rural Oklahoma. 1200 first grade children began the study. FY10 funding allowed a final wave of weight and body fat data to be assessed among a cohort of 351 fourth graders in 24 schools. (2744)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Amanda Harrist, Glade Topham, Laura Hubbs-Tait
Department of Nutritional Sciences: Lenka Shriver
College of Arts and Sciences: Melanie Page

Microarchitectural, Structural, and Cellular Alterations in Bone: Role of Iron in Maintaining Optimal Bone Health
Diseases of iron metabolism continue to be a major health concern with iron deficiency remaining the most common single nutrient deficiency in the U.S. Little is known as to how iron deficiency during adolescence affects the risk for developing osteoporosis. Nutritional status is a key determinant in the acquisition of bone mass, and plays a critical role in an individual’s lifetime risk for osteoporosis. Iron deficiency worsens calcium deficiency by further impairing skeletal health. Using an animal model of iron deficiency, the project examined how a lack of dietary iron negatively affects bone health by examining structural properties of bone in addition to examining the expression of genes associated with bone metabolism. The results will provide information that will enhance our understanding of the long-term implications of iron deficiency. (2745)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Stephen Clarke, Brenda Smith, Edralin Lucas

Chromium and Antioxidant Intakes of Older Oklahomans with and without Metabolic Syndrome and Effects of Aspirin or Antacid on Chromium Absorption
Dietary chromium, antioxidants and macronutrient intakes of Oklahoma women over fifty years of age with and without metabolic syndrome are being analyzed by duplicate plate and food record analyses. Additionally, effects of two over-the-counter medications (aspirin or antacid) on chromium absorption are being measured by assessing chromium in serum and urine. Subject recruitment is continuing. (2754)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Barbara Stoecker, Janice Hermann

NATURAL RESOURCE AND ECOLOGY MANAGEMENT

Effects of Forest Management Practices on Water Resources, Riparian & Aquatic Ecosystems in Oklahoma
This study plan addresses a broad list of interrelated topics including evaluation of the effects of forest management practices on water quantity and quality on existing small and new large watersheds,
cumulative effects, forest road erosion, best management practice effectiveness, and the application of GIS and GPS to the development of models for evaluating different management strategies to better protect water resources. (1695)

Sponsors: Oklahoma Agricultural Experiment Station, Weyerhaeuser Southern Forestry Research, USDA Forest Service Southern Station, Oklahoma Conservation Commission

PI/PD: Don Turton

Silvicultural Practices Applicable to Multiple-Use Forests in the Interior Highlands of Arkansas and Oklahoma

This study seeks to develop efficient and effective methods of regenerating forest stands in the Ouachita Highlands utilizing artificial and natural methods, and to develop stand density management guidelines for applying intermediate cultural treatments, primarily thinning, to natural shortleaf and planted loblolly pine stands to increase productivity and meet diverse management objectives. (1879)

Sponsors: Oklahoma Agricultural Experiment Station, USDA Forest Service

PI/PD: Rodney Will

Genetics and Improvement of Forest Trees for Oklahoma

Functional analysis of the sweetgum AGAMOUS promoter will be examined by testing constructs in a model system, and in sweetgum. Research will determine natural diversity and hybridization present in 1950s and present day native loblolly and shortleaf pine, the level and direction of introgression between these two species, and compare the level of hybridization in native shortleaf stands from an area of intensive loblolly management to that in shortleaf from undisturbed native shortleaf loblolly pine stands. The efficacy of various marker systems will be examined. We will also obtain and evaluate exotic tree species with potential use in Oklahoma. (1886)

Sponsors: Oklahoma Agricultural Experiment Station, USDA Forest Service

PI/PD: Charles Tauer

Predicting and Monitoring the States of Forest Resources in the Interior Highlands and Great Plains

Study goals include the development and testing of improved methods for monitoring current states of forests, methods that use forestry data to estimate parameters of forest resources, growth models to predict future states of forests important in Oklahoma, management practices important in eastern Oklahoma, and monitoring tamarisk control in Great Plains riparian ecosystems. (1887)

Sponsors: Oklahoma Agricultural Experiment Station, USDA Forest Service Ouachita National Forest, USDA Forest Service Cimarron National Grasslands

PI/PD: Tom Lynch

Value-added Wood Composite Manufacture from Under-utilized Species in Oklahoma

Data to understand the properties of experimental particle board panels from whole-tree furnish of various low quality hardwoods and softwoods in Oklahoma will be developed. This study addresses a major need to use under-utilized species as raw material for particleboard panel manufacture and to test the properties of such panels to determine if they are similar to other panel products made from various species. (2517)

Sponsors: Oklahoma Agricultural Experiment Station, OSU Food and Agricultural Products Research and Technology Center, Oklahoma Redcedar Association

PI/PD: Salim Hiziroglu
Application of the Grazing-Fire Interaction on Great Plains Rangelands
Most approaches to managing native ecosystems are based on an equilibrium paradigm that rarely considers spatial or temporal variability within an ecosystem. Understanding spatial and temporal variability inherent within ecosystems or associated with variable patterns of disturbance can be critical in describing and managing the structure and function of ecosystems. Heterogeneity may actually be the root of biological diversity at all levels of ecological organization and should serve as the foundation for conservation and ecosystem management. Therefore, it is important that we develop management approaches that apply state-of-the-art ecological theories that incorporate an understanding of spatial and temporal variability in the structure and function of ecosystems. (2530)
**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** Sam Fuhlendorf

Restoration of Evolutionary Fire-grazing Interactions to Limit Invasion of Exotic Forages in the Central Grasslands
The goal of this research is to develop a framework to understand and manage invasive forage species by focusing on the plant-herbivore interactions and the evolutionary fire-grazing interaction that alters livestock selectivity and competitive relationships among plants. We will focus on four functionally different introduced forage species that are invading native grasslands and are adapted to grazing through mechanisms that limit palatability. (2599)
**Sponsors:** Oklahoma Agricultural Experiment Station, USDA-CSREES
**PI/PDs:** Sam Fuhlendorf, Karen Hickman

Coordination and Report of Research Efforts Related to Fisheries, Rangeland, and Wildlife Resources in Natural Research Ecology and Management
This project will coordinate the conduct and reporting of grants awarded to Natural Resource Ecology and Management investigators that are supported by OAES for the purpose of exploring novel approaches to current issues related to natural resources, ecology, and conservation issues. It is intended that the results of these grants will lead to more extensive research in areas that require preliminary data to stimulate creative approaches to address the sustainable management and conservation of fisheries, forestry, rangeland, and wildlife resources. (2610)
**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** M. Keith Owens

Assessment of Public Perceptions and Attitudes to Prescribed Fire in Oklahoma
Due to fire suppression activities, Oklahoma has experienced wildlife habitat degradation, changes in plant communities, and increased risk of catastrophic wildfires. The purpose of this study is to examine landowner attitudes toward and willingness to adopt prescribed burning, and to investigate the potential for cooperative action. (2645)
**Sponsors:** Oklahoma Agricultural Experiment Station, Utah State University Department of Environment and Society
**PI/PDs:** R. Dwayne Elmore, Karen Hickman
Utah State University: Mark Brunson

Silviculture of Forest and Shrub Communities in Oklahoma in Relation to Productivity and Ecosystem Services
Oklahoma has a forest products industry with associated annual revenue of over 1.8 billion. Higher demand for forest products is predicted to drive stumpage prices upwards between 8 and 82% by 2040. To increase yield and optimize management prescriptions, a better understanding of the biology of
managed forest stands is needed. Additionally, forests and trees in Oklahoma provide important ecosystem services such as wildlife habitat, water quality, and carbon sequestration. Understanding how silvicultural manipulations can be used to meet objectives related to ecosystem services is critical. The goal of this research is determine silvicultural practices that will improve economic value of traditional forest products and to enhance ecosystem values. (2665)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Rodney Will

**Invasive Plant Species in Oklahoma Grasslands: Ecology, Management and Restoration**

Oklahoma’s unique natural resources are in danger from invasive species, such as Eastern Red Cedar, Old World Bluestems, Sericea Lespedeza, and Salt Cedar. These invasions reduce agricultural production, lower water quality and quantity, alter wildlife habitat, increase fire danger and reduce potential for rural economic development. To successfully control and eliminate invasive species that threaten rangelands, successful conversion techniques need to be developed that restore invaded areas and reduce or eliminate the invasive spread at both small and large scales. The information to develop new techniques is lacking. This project will provide information necessary to eradicate Old World Bluestems and establish native plant communities. (2670)

**Sponsors:** Oklahoma Agricultural Experiment Station, U.S. Fish and Wildlife Cooperative Research Unit  
**PI/PD:** Karen Hickman

**Ecology and Management of Chickasaw Plum in North-central Oklahoma**

Sand plum is an important component of rangelands in the Southern Great Plains. This study has four projects to determine information on the ecology and management of plum. The first project involves best methods of establishing sand plum where it is deficient for some management goal. The second project involves estimation of the rate of spread of sand plum thickets. Knowledge of this rate is useful for management planning for wildlife and livestock forage management. The third project involves determining how nesting birds respond to different ages of plum stems and associated stands. The fourth project will determine how bird communities respond to different amounts and configurations of sand plum. This project will lead to original knowledge on the ecology and management of sand plum that can be applied in management of livestock forage and wildlife. (2682)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Fred Guthery

**Ecophysiological Investigations of Loblolly Pine Plantation Forests in Oklahoma**

New forest management practices must be developed to meet the Nation’s expected demand for timber, while providing other forest benefits (clean water, wildlife habitat and recreational opportunities). These practices must be based on a sound understanding of forest biology, to include knowledge of key processes that drive forest production. This project focuses on mechanisms controlling carbon, nutrient and water vapor fluxes at the tree and forest stand level, and in response to silvicultural treatments. Results will lead to the development of forest management practices designed to increase forest productivity and sustain forest ecosystems in a changing physical and chemical climate. (2683)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Tom Hennessey
Management Implications of Anthropogenic Changes to the Fire Regimes of Upland Oak Forests in the Southern Great Plains
The goal of this project is to acquire new knowledge about forces controlling forest composition, structure and ecosystem function in the upland oak forests of the southern Great Plains. The objectives of this project are: 1) determine how stand structure and composition in the Cross Timbers have changed since European settlement and the extent to which these changes were due to fire exclusion and exploitation of the forest, 2) determine the history of fire in the Cross Timbers region and how it has changed since European settlement, and 3) determine how ecosystem functions may have changed due to changes in the fire regime and forest structure and composition. (2734)

**Sponsors:** Oklahoma Agricultural Experiment Station, Oklahoma Department of Agriculture, Food, and Forestry, Southern Forest Experiment Station – USDA Forest Service, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma Department of Wildlife Conservation

**PI/PD:** Steve Hallgren

Small Scale Forestry in Oklahoma: an Efficiency Analysis and Economic Monitoring Program
Oklahoma small scale forestlands comprise some of the most productive in Oklahoma, and small scale forestry has a significant ecological and economic impact on communities and ecosystems and provides such ecosystem services as wildlife habitat, water quality, and carbon sequestration. This project will conduct two studies: 1) an efficiency analysis of Oklahoma small scale forestry and its forest industry, and 2) economic monitoring of small scale forestry in Oklahoma and forestry accountancy network. (2738)

**Sponsors:** Oklahoma Agricultural Experiment Station, ODAFF

**PI/PD:** Difei Zhang

Ecohydrological Consequences of Woody Species Encroachment in Tallgrass Prairie
Woody species encroachment into grassland and riparian zones is a worldwide problem and is particularly severe in Oklahoma and other Great Plains states. The goal of this study is to obtain an improved understanding of how redcedar encroachment affects the tallgrass prairie water cycle. Our specific objectives are to quantify how encroachment will alter each of the components of the water cycle in both space and time. These components include precipitation, outflow, evapotranspiration, inflow, and change in stored water. This new information will be brought together in a hydrologic model that describes the water balance of the tallgrass prairie with and without encroachment. (2740)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA ARS Southern Plains Range Research Station, Oklahoma Water Science Center

**PI/PD:** Chris Zou

Belowground Meristem Populations as Regulators of Rangeland Stability
The primary objective of this research project is to study the role of belowground bud bank dynamics as key regulators of the productivity, sustainability, and ecological health of rangeland ecosystems. (2760)

**Sponsors:** Oklahoma Agricultural Experiment Station, Kansas State University, USDA Rangeland Research Program, National Science Foundation

**PI/PD:** Gail Wilson

Improving Multi-functionality and Resiliency of Central U.S. Rangelands
The goal of this study is to produce knowledge necessary to sustain multifunctional agricultural production management systems in rangelands of the central U.S. The objectives are: 1) to build on the science of patch-burn grazing, assessing the impacts on multifunctionality and system resilience, 2) to assess ecological and socioeconomic barriers to implementation of fire and grazing technologies
including patch-burn grazing, and 3) to assess management options and ecosystem services provided by novel plant communities (i.e., tallgrass prairie invaded by tall fescue and juniper woodland subjected to stand-replacing fire). (2746)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** David Engle

**Role of Rangeland Heterogeneity in Biodiversity, Riparian Stability, Livestock Production, and Landowner Landscape Preference**

Traditional management of rangelands has predominantly focused on maintaining dominant forage species and reducing variability. This has lead to homogenization of rangelands and loss of biodiversity. The goal of this study is to optimize the biodiversity, agricultural productivity, and riparian stability of privately owned rangeland by focusing on heterogeneity achieved through the fire-grazing interaction. (2763)

**Sponsors:** USDA AFRI, Oklahoma Agricultural Experiment Station

**PI/PD:** Sam Fuhlendorf

---

**PLANT AND SOIL SCIENCES**

**Evaluating Cotton Varieties for Oklahoma Producers**

The objectives are: 1) to determine the relative performance of commercially available cotton varieties under Oklahoma environmental conditions and to make that information available to cotton producers in the state, 2) to study genotype by environment interactions relative to the major factors of cotton production in the state and region, and 3) to provide information to cotton research and extension personnel and to cotton breeders that would help them release varieties better adapted to Oklahoma. (0714)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PDs:** Melanie Bayles, Laval Verhalen, Rocky Thacker, J. C. Banks, Don Hooper

**Management and Interference of Weeds in Cultivated Agronomic Row Crops and Pastures**

The objectives are: 1) to develop effective and profitable row-crop weed management systems for conventional and reduced-tillage production systems as well as pasture sites using all available methods and with special attention to avoid the development of herbicide-resistant weeds, 2) to determine the relationship of specific weed species with cultivated agronomic row-crops, pastures, assess the biology and ecology of weeds, and define the weed-crop threshold protection level a crop needs to produce optimum, high quality yields, and 3) to develop knowledge-based, computer-assisted decision-aids from the information obtained, which will provide economic assessment and environmental alerts for various weed control options. (0933)

**Sponsors:** Oklahoma Agricultural Experiment Station, Cotton, Inc., Monsanto, DuPont Ag. Products, Dow AgroSciences, BASF, Syngenta, Valent

**PI/PDs:** Don Murray, N. Craig Talley

**Pasture, Range, and Turfgrass Breeding**

The main objective of this project is to develop new grass cultivars bred for improvements in selected yield, quality, adaptation, and other performance traits. Cultivars will be bred for pasture, turf, and bioenergy feedstock uses. This will involve collecting, evaluating, and enhancing germplasm of selected grass species, elucidating reproductive behavior, genetic variation, and breeding improvement potential in selected grass species, as well as development and testing of new plant breeding models that incorporate molecular techniques. Development of DNA molecular markers, encompassing simple
sequence repeat (SSRs) and amplified fragment length polymorphism (AFLP) in bermudagrass and switchgrass is one of the currently focused research investigations. The developed DNA markers will be used in molecular analysis of important traits and construction of genetic maps for the selected important species. A new bermudagrass cultivar for forage and pasture use, "Goodwell" bermudagrass was released by Oklahoma Agricultural Experiment Station in March, 2007. A new switchgrass cultivar ‘Cimarron’ (SL 93 2001-1) was released by Oklahoma Agricultural Experiment Station for biofuel feedstock and forage production in February, 2008. Two new turf bermudagrass clonal selections had outstanding performance in both 2008 and 2009 in multiple locations of the National Turfgrass Evaluation Program Bermudagrass Test. The two turf bermudagrass clones, OKC 1119 and OKC 1134 were released by Oklahoma Agricultural Experiment Station in July 2010. (1361)

Sponsors: U.S. Golf Association, USDA, Oklahoma Agricultural Experiment Station, Oklahoma Turf Research Foundation, Oklahoma Bioenergy Center, Sun Grant Initiative

PI/PD: Yanqi Wu

Wheat Breeding

Pureline winter wheat cultivars are developed in this project through field-based breeding procedures, supplemented by contemporary DNA marker-assisted selection techniques. The principal aim is to develop and release marketable bread-wheat cultivars for commercial production in Oklahoma and surrounding states. Additionally, fundamental research is conducted on breeding methodology and on quantitatively inherited traits of direct importance to the breeding program. The leading wheat cultivar in Oklahoma certified seed production and total acreage planted for crop year 2009-2010 was Endurance, which was released as a public variety in 2004 with special adaptation to both dual-purpose and grain-only management systems, acid soils, and drought stress. Endurance and most cultivars subsequent to its release are products of the GrazenGrain breeding system, which combines bulk breeding methodology with target selection in early-planted dual-purpose production systems. Duster, another product of this breeding system, has gained significant acreage since its release by the Oklahoma Agricultural Experiment Station in 2006. In addition to grazing tolerance and other traits critical to dual-purpose adaptation, Duster offers two other key traits to southern Plains wheat production: leaf rust resistance conferred in part by gene Lr34 and Hessian fly resistance conferred by gene(s) yet to be identified. Identification of an effective Lr34 gene was accomplished by a perfect gene marker developed by Dr. Liuling Yan, a cooperator on this project. Surveying the advanced materials in our program in 2009, we found that more than one-third of the lines carried an effective Lr34 allele, apparently induced by annual selection for adult-plant resistance in the field. This relatively high gene frequency was induced by two parents common to the advanced materials, 2174 and Duster. Two HRW cultivars were released in 2009, for which registered seed production occurred in 2010. These were Billings, with broad adaptation, very good foliar disease resistance, and exceptional milling and baking quality, and also Pete, an awnless genotype with earlier maturity than Deliver and exceptional milling quality. (1426)

Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Wheat Research Foundation, USDA-ARS, USDA-CSREES

PI/PDs: Brett Carver, Liuling Yan, Jeff Edwards, Art Klatt, Bjorn Martin, Tom Peeper

Entomology and Plant Pathology: Bob Hunger, Kris Giles, Tom Royer

Food and Agricultural Products Research Technology Center: Patricia Rayas

Integrated Weed Control Programs for Small Grains

The objectives are: 1) to develop chemical weed control technology for use in small grains that is more effective, reliable, and/or economical than that presently available, 2) to investigate the influence of
cultural practices and grazing on weed infestations and their control, and 3) to develop integrated weed management programs for major weeds in wheat. (1644)

**Sponsors:** Washington State University, Oklahoma Wheat Commission, Oklahoma Wheat Research Foundation, Oklahoma Agricultural Experiment Station, Monsanto, Syngenta, Bayer CropScience, Dow, U.S. Canola Association.

**PI/PDs:** Tom Peeper, Mark Boyles

**Biosystems and Ag Engineering:** John Solie

**Agricultural Economics:** Francis Epplin

### Soybean Variety Testing and Improvement

Soybean variety test were conducted at several location during the 2008 growing season. Early season cultivars were planted at 5 different locations throughout Oklahoma, while full season tests were conducted at 7 locations in several tillage systems. Soybean cultivars and breeding lines evaluated represented maturity groups III through VI. Grain yield and agronomic data were collected at all locations. Field trials were established to cooperate in the Uniform Soybean Tests for the Southern States, which evaluates beginning and advanced cultivars across the region. Results have been published for each location and distributed to county extension offices. Summaries have also been posted to the Oklahoma State University Soybean Production website ([www.soybean.okstate.edu](http://www.soybean.okstate.edu)). Results were also presented at meetings the fall and will be presented at meetings in the future. (1653)

**Sponsors:** Oklahoma Agricultural Experiment Station, Oklahoma Soybean Board

**PI/PD:** Chad Godsey

### Soil-Forming Processes in Oklahoma

The objectives are: 1) to evaluate the effects of erosion and deposition on soils formed at sites occupied by prehistoric people, 2) to measure long-term stream and river incision rates for soil-landscapes in western Oklahoma using buried soils, 3) to characterize soil lithologic discontinuities by using particle-size analysis and mineralogy for key soil profiles sites and series, and 4) to characterize soil phytoliths, 13C:12C ratios and soil radiocarbon age of buried soils. (1892)

**Sponsors:** Oklahoma Agricultural Experiment Station, University of Oklahoma, Oklahoma Archaeological Survey, Oklahoma Department of Environmental Protection

**PI:PD:** Brian Carter

### Improvement of Nitrogen and Phosphorus Fertilization Use and Environmental Safety

Active NDVI GreenSeeker sensors developed at Oklahoma State University are the benchmark for biomass sensing in the world today. The development of the affordable Handheld Optical Pocket Sensor (HOPS) ensued and that will be used by farmers in the developing and developed world. The new pocket sensor measures NDVI and can be used to determine mid-season fertilizer N rates for corn, wheat, rice, and sorghum. Using one of the 26 algorithms developed by our precision agriculture team, farmers can increase their profit by over $15.00 per acre when they use our sensor-based approach. Most recently, farmers in the Yaqui Valley, Ciudad Obregon, Mexico showed average revenue increases exceeding $40.00 per acre using the GreenSeeker nitrogen fertilization approach. We now have 26 viable, on-line algorithms that can improve nitrogen use efficiency in corn, wheat, rice, cotton, bermudagrass, sorghum, and canola. Furthermore, prescribed by-plant N fertilization has now become a reality. This is incredibly exciting since we can deliver across the board increases in nitrogen use efficiency for cereal crops, worldwide. Parallel research has shown that specific corn seed orientation at planting can influence emerging leaf angle. The effects of controlled leaf geometry facilitate planting higher populations with the potential for increasing grain yield and/or allow the maintenance of grain yields while reducing seed rates. (2192)
**Environmentally Sound Management of Animal Waste in the Southern Great Plains**

Develop appropriate methods to incorporate animal waste into the N budget for selected production systems of the Southern plains and monitor soil nutrient levels from repeated applications of animal waste resources for potential environmental concerns. (2281)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Bill Raun

---

**Microbial Activities of Environmental and Agricultural Importance**

Microbiological and biochemical reactions in soils dictate transformation of soil nutrients and amendments such as animal waste and soil contaminants. We continue to evaluate the impact of human activities and land use and management on ecosystem health and function, and to investigate the role of enzyme activities and microbial diversity, activity, and community structure in ecosystem health and function. We focus on addressing fundamental questions, bridging research and application to promote the use of beneficial microorganisms in agricultural production and bioremediation of contaminated soil and water, and to enhance environmental health, function, and sustainability. (2394)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PDs:** Shiping Deng, Jeff Hattey

---

**Optimizing Management Practices for Establishment and Performance of Cool-Season Perennial Grass Forages**

The objectives of the project are: 1) to evaluate the effect of soil temperature (planting date) on establishment of cool-season perennial forage species, 2) to compare minimum tillage and conventional tillage seedbed practices on establishment of cool-season perennial forages, and 3) to determine if late-spring defoliation adversely affects stand establishment and performance the year following establishment. (2520)

**Sponsor:** USDA-ARS Grazinglands Research Laboratory, El Reno, OK  
**PI/PD:** Yanqi Wu

---

**Plant Genetic Resources Conservation and Utilization**

The purpose of this regional project is to conserve genetic resources and associated information for a broad spectrum of crop species and to transfer related information to plant breeders in the Southern Region. Plant germplasm distribution records received from S-9 indicated that 352 plant accessions maintained at the Plant Genetic Resources Conservation Unit at Griffin, GA were distributed to organizations or individuals in Oklahoma the last year, from August, 2009 through July, 2010. The accessions were distributed in 21 respective requests. Respective annual plant germplasm distribution numbers for 2005, 2006, 2007, and 2008 were 597, 169, 295 and 431. The requested plant species in 2009 include sorghum (*Sorghum bicolor*) (214), sweet potato (*Ipomoea batatas*) (81), Guar (*Cyamopsis* sp.) (33), squash (*Cucurbita* spp.), Okra (*Abelmoschus* sp.), vigna (*Vigna* spp.), switchgrass (*Panicum virgatum*) and Miscanthus (*Miscanthus* sp.) and other warm-season grasses, and legumes. Receivers of the plant accessions represent researchers of Oklahoma State University, the Noble Foundation, USDA-ARS laboratories, and individual Oklahomans. (2547)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Yanqi Wu
Basic and Applied Aspects of Bacterial Source Tracking
The quality and quantity of water resources are in grave threat from contaminations. In this study, *Enterococci*, a fecal indicator microbe, in creeks were evaluated with respect to temporal and spatial variation, potential sources, abundance, and diversity in surface water and sediments at eight locations under four temporal conditions. The four temporal conditions included baseflow June 2005, baseflow July 2008, baseflow November 2008, and highflow May 2008. With the exception of one location, Enterococci concentrations exceeded the USEPA recommended level for impaired watershed, suggesting the crucial role of creek water in governing water quality in the environment. Moreover, effective storm water management is critical in maintaining water quality because concentrations of Enterococci in the surface water during highflow were approximately 100 times of those sampled during baseflow. Sediment could serve as a reservoir of Enterococci for the water system, evidenced by their high levels in sediments. Of 702 isolates evaluated, six Enterococcus species were found with Ent. *faecalis* being most dominant. The less dominant species such as Ent. *hirae*, Ent. *avium*, and Ent. *dispar* may be more useful in microbial source tracking for the watershed evaluated. (2578)

**Sponsor:** Oklahoma Agricultural Experimental Station

**PI/PDs:** Shiping Deng, Jeff Hattey

Quantifying Physiological Parameters Important for Vegetative Development of Wheat in a Dual-Purpose Production System
The wheat/stocker cattle production enterprise dominates Oklahoma and Southern Great Plain’s agriculture. A mechanistic model that accurately predicts fall forage production of wheat would greatly increase the efficiency and productivity of this integrated system. The long-term objective of this experiment is the development of a mechanistic crop simulation model that accurately predicts fall forage production by hard red winter wheat cultivars. The current experiment works towards the first step in accomplishing this objective, which will be to identify and quantify the physiological and morphological parameters that are most influential in determining fall forage production of wheat. (2581)

**Sponsors:** Department of Plant and Soil Sciences, Oklahoma Wheat Commission, USDA-NIFA

**PI/PD:** Jeff Edwards

Mechanisms of Crop Water-Use Efficiency
The goal of this project is to gain understanding of those physiological mechanisms that control the efficiency by which plants use water to grow and produce a crop. In order to study this topic, we use transgenic wheat lines that were created several years ago. The mtlD gene from the bacterium *E. coli* was introduced into these lines, and this transgene allows the wheat lines to accumulate the sugar alcohol mannitol in the cells. Mannitol has previously been shown to confer drought tolerance to several other species. We have studied leaf gas exchange, the antioxidant system, and membrane lipid peroxidation. We have also tested nontransgenic wheat materials for germination frequency and coleptile length under well-watered and water-stressed conditions. The main objective here is to identify materials that can be planted deeper where water is more likely to be found. (2614)

**Sponsors:** Oklahoma Agricultural Experiment Station, USDA-NRI

**PI/PD:** Bjorn Martin

Development of molecular markers for the developmental phase transition and their application in breeding of winter wheat
Genetic variation in stem elongation, winter dormancy release, heading date, and physiological maturity was found associated a major QTL encompassing the VRN-A1 locus by mapping a population of 96 recombinant inbred lines (RILs) generated from a cross between two winter wheat varieties: Jagger and
VRN-A1 was cloned based on variation in vernalization requirement between spring wheat and winter wheat; therefore, it is hypothesized that VRN-A1 plays a pleitropic role by different mechanisms or a novel gene close to VRN-A1 controls the variation in development in winter wheat. We have developed a large size of backcross populations and delimited the gene responsible for the QTL within 0.5 cM in genetic distance. This gene can be manipulated to delay a vegetative phase to produce more forage biomass and a longer grazing season in dual purpose wheat.

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Liuling Yan

Isolation and Characterization of Wheat and Switchgrass Growth Promoting Bacteria
Plants depend on bacteria for enhanced mineral nutrition, defense against pathogens, and plant growth promotion via a variety of mechanisms. Some of these mutualistic bacteria are endophytic in that they live within plant tissues without causing noticeable disease symptoms. Others inhabit the plant rhizosphere. This project seeks to identify, isolate and characterize endophytic and rhizosphere plant growth promoting bacteria in wheat and switchgrass. Over 1500 endophytic bacteria have been extracted from shoots and roots soil grown wheat. A significant proportion of these bacteria produce the plant growth promoting hormone indole acetic acid (IAA). We have screened over 200 of these bacteria and found that 17% of them produce IAA with 5% producing at high levels. The auxin producing bacteria will be tested for plant growth promoting ability using our greenhouse assay. Phylogenetic relationships will be determined for all isolates that significantly enhance plant growth using the 16s rRNA gene sequence. Those that show promising functional or plant growth promoting characteristics will be inoculated into field plots for increased biomass determinations. Promising isolates will be investigated for further commercial development.

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Michael Anderson

Enhancing Sustainable Cropping Systems Through the Use of Cover Crops
An on-farm research location was identified in 2007 and grain sorghum was planted in May. This past year activities have included analyzing data from grain sorghum, corn, sunflower, and planting the first round of cover crops at the experimental location. With the inclusion of legume cover crops and using optical sensor technology we have reduced the total applied nitrogen by 10-40% compared to traditional nitrogen management practices, while maintaining grain yields. Results for the study have been presented at 2 extension meetings in western Oklahoma.

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Chad Godsey

Reducing Phosphorus and Nitrogen Losses to the Environment Through the Use of Soil and Manure Amendments.
Various industrial by-products have been collected for investigation in regard to their ability to absorb nutrients (phosphorus and nitrogen). This includes drinking water treatment residuals, foundry sands from metal casting, fly-ash, and waste gypsum. The materials will be characterized for physical and
chemical properties, safety, and sorption capacity. In addition, the kinetics of phosphorus sorption will be studied in order to determine if the materials will be viable in water quality improvement structures. A study involving the use of zeolites to re-claim nitrogen from swine effluent has also been initiated.

(2658)
**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** Chad Penn

**Animal Waste Management for Semiarid Agroecosystems**
The purpose of this project is to develop systems that maximize efficient use of animal manures as nutrient sources for crop production in the southern Great Plains while reducing deleterious effects to water and air quality. This project will evaluate application timing and method of swine effluent in an irrigated, no-till cropping rotation. It will also measure changes nutrients entering the waste stream or atmosphere in a commercial production setting as a result of dietary modification in swine feeding operation. A result of this work will be management tools to allow producers to make informed decisions about their operations based on waste management system, diet selection, and cropping systems. (2691)

**Sponsors:** USDA, Oklahoma Agricultural Experiment Station
**PI/PDs:** Jeffory A. Hattey, Shiping Deng, Jason Warren
Animal Science: Scott Carter
Biosystems and Agricultural Engineering: Doug Hamilton
Agricultural Economics: Jeff Vitale

**Genetic relationship between dormancy and temperature in winter wheat**
Dormancy of wheat seeds may be broken by many stimuli, such as cold and heat (Kottearachchi et al. 2006). The effectiveness of low temperature is a feature common to the three phenomena: breaking to dormancy, releasing of brachyblasty and vernalization (Chouard 1960), whereas high temperature may prevent seed germination and stand establishment. We have tested the recombinant inbred lines (RILs) population generated from a cross between two winter wheat varieties: Jagger and 2174 and found that QTLs controlling seed dormancy was not associated with any known vernalization genes but a major QTL for high temperature germination sensitivity was located on the short arm of chromosome 3A (Qhtgs.osu-3A). The gene responsible for this QTL could be the same as the one that was reported to control seed dormancy under a normal temperature. The proposed project will test this hypothesis and unravel genetic basis of seed dormancy in winter wheat under various temperature conditions. (2700)

**Sponsor:** Oklahoma Agricultural Experiment Station
**PI/PD:** Liuling Yan

**Interactions between plant and soil ecosystems that regulate rangeland sustainability**
Rangeland is the dominant land type in the Southern Great Plains with livestock production being the leading agricultural income. Past research efforts in rangeland ecology have focused primarily on the above-ground plant community and wildlife biodiversity, while less emphasis has been placed on below-ground soil ecosystems, linkages between the soil and plant communities, and drivers in these ecosystems that regulate rangeland sustainable integrity. We hypothesize that the soil microbial community plays a crucial role in maintaining ecosystem health and sustainable integrity, with plant-microbe interactions contributing to success or failure of ecosystem conservation and restoration. The specific objectives of this project are (1) to evaluate the above-ground plant community and below-ground soil physical, chemical, and biological properties of rangeland (native prairie or abandoned cropland) subjected to different grazing intensities, in comparison with the adjacent undisturbed native prairies (never being grazed or cultivated); (2) to use the acquired data and geostatistical analysis to
reveal the drivers and interrelationships between the above-ground and below-ground variables to provide insight into the importance of plant and soil parameters in ecosystem health and restoration; and (3) to utilize ecosystem health parameters to identify sustainable practices, and to evaluate the potential and develop strategies for restoration or rehabilitation of degraded rangelands based on system status. We have identified two study sites in Grant County, OK for this study. At each site, there are three ecosystems, native range, rangeland that was once cultivated and currently enrolled in the conservation reserve program with perennial grass established, and land under winter wheat cultivation. During the summer of 2009 and 2010, two samplings were conducted in each year and hundreds to thousands of plant and soil samples were obtained. Currently these samples are being processed and analyzed. Our goal is to provide integrated scientific data and strategies to promote restoration of degraded ecosystems and enhance the sustainable integrity of rangelands.

Sponsor: Oklahoma Agricultural Experimental Station
PI/PDs: Shiping Deng
Natural Resources Ecology & Management: Sam Fuhlendorf
Horticulture and Landscape Architecture: Jeff Anderson

Harvest-Aid Evaluations in Oklahoma Cotton Production Systems
Three harvest aids demonstrations were initiated in high traffic areas to demonstrate the effectiveness of various harvest aid treatment programs. These demonstrations were established in more mature cotton to allow earlier application prior to normal producer application season. In addition, information was presented in three harvest aid meetings in cotton producing areas. Also, three replicated harvest aid experiments were established to determine effectiveness of specific harvest aid programs. One tour was held and the final results will be published in our annual report “Cotton Demonstrations in Oklahoma”. (2722)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: J. C. Banks

Improving Agroecosystem Function by Understanding and Managing Soil Water Dynamics
Mono-cropped winter wheat in Oklahoma results in a precipitation use efficiency of around 20%. Radiation use efficiency of Oklahoma agricultural systems is also low, averaging about 26%. The agroecosystems of the State are clearly functioning at low levels of efficiency. Below optimal agricultural productivity hurts the economy and ecology of Oklahoma. Significant knowledge gaps exist which must be filled in order to develop more intensive, productive, and efficient agricultural systems. General descriptions of the annual water and energy balances for the State's agroecosystems are currently lacking. For example, little is known about the spatial distribution of evapotranspiration (ET) in the State or how it is partitioned between transpiration (T) and evaporation (E). Another key knowledge gap relates to the availability of soil moisture. Soil moisture is often the most limiting factor for plant growth, but there is no current means to monitor plant available water across large regions. The last and most challenging knowledge gap is the lack of integrated field studies which assess agroecosystem performance in terms of both net productivity and environmental impact. In light of the knowledge gaps identified above, the objectives of this project are to: 1) quantify critical components of the soil water balance and energy balance for the agroecosystems of Oklahoma, 2) measure the soil properties necessary to facilitate monitoring of plant available water via the Oklahoma Mesonet, and 3) evaluate the potential for biological intensification to improve net productivity, water use efficiency, and soil physical properties in Oklahoma agricultural systems. (2735)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Tyson Ochsner
**Bioenergy Crop Production: Towards Realizing Yield Potential**

The challenges of overcoming the dependence on imported fossil fuels, increased national security, climate change mitigation, and sustainable crop production call for implementing a diversified bioenergy crop production in the State of Oklahoma. Agronomic adaptation of bioenergy crops in Oklahoma and best management practices will be evaluated using field research stations across the state by conducting replicated, multi-location small plot tests. Morphological and physiological traits for improved tolerance to abiotic stresses of bioenergy crops will be identified through field, green house and controlled environment studies. The identified traits will be further analyzed through tissue culture, proteomic and other techniques and integrated into the appropriate breeding programs in Oklahoma. Both field and controlled environments will be used to evaluate bioenergy crop performance under current and future climates and necessary input will be provided for breeding crops for future climates. Data generated from the agronomic and physiological studies will be used to develop or improve decision support tools that will use available resources such as Mesonet, GIS, Websoil Survey. (2736)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Gopal Kakani

---

**Soil Carbon Sequestration in Soil Conservation Management Systems**

The development of a carbon credit market has initiated a great interest in the sequestration of atmospheric CO$_2$ into agricultural soils through conservation management. This is very much the case in Oklahoma. In fact, in 2001 Oklahoma legislature passed the Oklahoma Carbon Sequestration Enhancement Act which authorized the Oklahoma Conservation Commission to establish and administer a carbon sequestration certification program for the state. This action sparked a significant interest in establishing more accurate estimates of carbon sequestration rates under soil conservation management practices specific to Oklahoma. Therefore research has been initiated to assess soil carbon sequestration under conservation management practices, specifically no-till crop management and grassland establishment. Three basic approaches will be utilized to assess the rate of soil carbon sequestration under soil conservation management practices. The first two approaches will utilize farmer-cooperator fields. The first approach will compare fields under conservation management to conventionally tilled fields. This will provide a quick assessment of carbon sequestration potential of multiple soils from throughout the state. The second approach will be long-term monitoring of farmer-cooperator fields under conservation management. The third approach will involve the collection of soil samples from ongoing small plot experiments in Oklahoma that include treatments that represent soil conservation management practices such as no-till crop production and grassland establishment in previously cultivated soils. This research will provide estimates of the soil carbon sequestration potential using large and small scale assessments that will provide insight into how management, soil type, and geographic location influence carbon sequestration in Oklahoma cropland. (2748)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Jason Warren

---

**Animal Waste Management in Semiarid Ecosystems**

The semiarid agroecosystem of the Oklahoma panhandle is one of the most concentrated regions of livestock and bioenergy feedstock production in the U.S. with 11 million cattle and 3 million swine. Oklahoma is nationally ranked as 7th in cattle on feed, 4th in all cattle, and 8th in U.S. swine production. Several factors have contributed to the concentration of livestock and bioenergy in this region with include: available land for animal production, grain production, land for manure application, and a swine processing facility. The non-farm sector has benefited from 2000 processing and 1000 other non-farm jobs as a result of the growth of this industry. This unique combination of production factors and ecosystem is important for meeting food and energy need of the U.S. The objectives of the study are to:
determine best management practices for long-term utilization of animal waste in reduced tillage cropping systems; determine methods to reduce gaseous emissions from animal waste systems; evaluate the effect of animal waste management on antibiotics in the soil environment; use diet modification to alter swine manure nutrient content; and evaluate the economic impact of indoor air quality and diet modification for swine. These objective are being evaluated through long-term field studies no-till crop production conducted at the Oklahoma Panhandle Research and Extension Center, Goodwell, OK. Objectives related to diet modification and economic impact will be conducted using the new state of the art swine research facility, Stillwater, OK. (2755)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PDs:** Jeffory A. Hattey, Shiping Deng, Jason Warren
Animal Science: Scott Carter
Biosystems and Agricultural Engineering: Doug Hamilton
Agricultural Economics: Jeff Vitale

**Characterizing Mass and Energy Transport at Different Vadose Zone Scales**

Knowledge about physical transformations occurring in the vadose zone is crucial for understanding, predicting and managing biotic and abiotic processes occurring in Earth's terrestrial critical zones. Because they form an interface with the atmosphere, near-surface soils within the vadose zone are particularly important for controlling mass fluxes and transforming energy, nutrients, and organic materials. The near-surface environment of the vadose zone also sustains plants with water and essential microbiological communities. Although public awareness of the role of soils - and by extension the vadose zone - is meager, good stewardship of vadose zone functions should be among the highest priorities of our society. Meanwhile, changing societal food and energy demands, land use and climatic conditions, and introduction of man-made substances are imposing ever greater stresses on the vadose zone. The protection and sustainability of this crucial resource can only be assured through a better understanding of vadose zone processes at different spatio-temporal scales. This project consists of multistate research cooperation to advance understanding of mass and energy transport in the vadose zone. The methods will include field and laboratory experiments, the development of new theories and instrumentation, and intensive numerical modeling. (2771)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Tyson Ochsner

---

**ROBERT M. KERR FOOD AND AGRICULTURAL PRODUCTS RESEARCH AND TECHNOLOGY CENTER**

**Coordinating the Research Efforts within the Robert M. Kerr Food and Agricultural Research and Technology Center**

The mission of the Robert M. Kerr Food and Agricultural Products Center is to discover, develop and deliver food and fiber value-added products and processes to help in the growth and expansion of the Oklahoma economy. After thirteen years of service, the FAPC has contributed to over 250 start-up businesses in Oklahoma, has worked on over 1,200 client projects for product and process development and business development, has contributed significantly to more than 50,000 direct, indirect and induced food processing jobs in Oklahoma, and, has contributed significantly to more than $6 billion in direct, indirect and induced annual food processing sales revenue in Oklahoma. Core strengths of the FAPC include food safety and microbiology, horticultural products processing, grain products processing, meat and poultry products processing, oilseed products processing, food sensory technology, food process engineering, wood products processing, food manufacturing technology, food processing economics, quality manufacturing and management, and, business planning and marketing of food
products. The FAPC has and continues to significantly contribute to the economic development of every geographical quadrant of Oklahoma. (2501)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** J. Roy Escoubas

**Characterization of the Interaction of Solubilized Protein in meat**

The reduction of salt in our food supply has become a consumer hot topic. Recently published reports by the CDC and IOM and local efforts by municipalities and states indicate that the food industry needs to be focused on minimizing their use of sodium containing compounds. In addition, some sodium containing compounds, such as phosphates, are also considered a health detriment for a small segment of the public (e.g., those suffering from CKD or chronic kidney disease). It is in the best interest of the food industry to try and meet the needs of all consumers by providing products with minimal negative health impacts. Brine injected meats are a fairly recent phenomenon in the retail market (last 10 years). Brine injection of meats can improve consumer perception of juiciness, which in turn has a “halo-effect” on the perceived tenderness of the product. In addition, the commonly utilized ingredients in brines, phosphate and salt, both alter protein structure and functionality sufficiently to improve measurable tenderness. The goal of this project is to investigate processes that maintain the quality and palatability of injected fresh meat and processed meat products while minimizing use of sodium and phosphate containing ingredients. (2551)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Christina DeWitt

**Use of Sweet Sorghum as a Bioenergy Crop for Oklahoma**

For a number of reasons, production of renewable, sustainable transportation fuels such as ethanol will continue to increase. Sweet sorghum has the potential to be used as a renewable energy crop, and is a viable candidate for ethanol production in Oklahoma. Advantageous properties of this crop are that it is a low input, drought tolerant, high carbohydrate producer, and can be cultivated in nearly all temperate climates. In addition, ethanol production from sugar crops is a low technology process which can potentially be conducted on-farm, requiring considerably less capital investment than starch-based ethanol ventures. The simplicity of ethanol production from sweet sorghum comes from the fact that the biomass is simply pressed, resulting in the collection of six-carbon sugars, which are directly fermentable to ethanol. The challenges involved in this process have been the high costs involved in transportation and fermentation of the entire biomass at a central processing plant that may be operated only seasonally. The central hypothesis is that producing ethanol from sweet sorghum can be made economically viable by using decentralized, low-cost processing systems, rather than constructing and operating a large central processing plant. The goal of this project is to develop economically viable processes to convert sweet sorghum into bioenergy products in this region of the U.S. On-farm production of ethanol presents a new set of opportunities and challenges compared to the centralized approach of existing ethanol production facilities. The goal of this research is to develop new, innovative ways of converting sweet sorghum to ethanol and other coproducts. The main objectives are to investigate alternative methods for processing sweet sorghum juice into ethanol and to evaluate the potential uses for sweet sorghum bagasse. (2638)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Danielle Bellmer

**Advanced Processing Techniques for Biobased Product Development**

Biofuels are essential and strategic components of a secure economy and diversified energy policy. Developments in the biofuels industry will certainly play a critical role in replacing fossil fuels. The main...
objective of this project is to develop new processes that will convert low value feedstocks such as lignocellulosic biomass, animal fat and frying oils to biofuels. The effect of various processing parameters on the overall economics of conversion of animal fat and vegetable oils to biodiesel will be examined. This study will allow us to determine the most economic process for feedstock preparation and the technical and economical optimization of biodiesel production from various sources. Advanced imaging techniques will be used to understand reaction pathways involved in the lignocellulosic biomass hydrolysis. Low value biomass such as wheat and barley straw and sorghum stover will be examined as feedstocks for ethanol production. Recovery of high value products from biofuel production by-products will improve the feasibility of the overall process. (2639)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Nurhan Dunford

### Economic Assessments of Value-added Agribusiness and Biofuel Ventures in Oklahoma

Work continues on agribusiness feasibility templates, specifically those related to bioenergy feedstock acquisition, handling, and distribution. Feasibility templates for the on-farm production of ethanol from sweet sorghum and biodiesel production from food processing waste (fats, oils, and grease) have been developed and are available on the OSU Food & Agricultural Products Center website. Work has been completed on a Farm-To-School (FTS) project to determine the optimal logistics and potential school participation for Oklahoma. Deliverables from this effort include a distribution cost template for producers delivering produce to FTS participating schools; a “tips and tools” guide for schools, producers and distributors wanting to participate in a state FTS program; and a manuscript explaining the correlations between school characteristics and the choice to participate in FTS. The distribution cost template and guide are available online through the Oklahoma FTS website. Two case studies were also completed, one on the American Native Beef cooperative published in a peer-reviewed journal and one on Shepherd’s Grain LLC, to be presented at an upcoming agricultural economics conference. (2640)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Rodney Holcomb

### Identifying & Investigating the Potential & Food Safety of Alternate Crops

This project involves studies to enhance the retention and functionality of inherent health promoting compounds, improve the quality and safety, and improve the processing characteristics of Oklahoma’s processed horticultural foods. The overall goal is to increase economic returns for horticultural product producers and processors. (2641)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** William McGlynn

### Rapid Detection, Analysis, and Inhibition of Foodborne Pathogens, Toxins, and Spoilage Microorganisms

This project involves detecting, isolating, quantifying, and characterizing pathogenic microorganisms in food and food processing environments. The purpose is to reduce the incidence, survival, and/or proliferation of pathogenic and spoilage microorganisms in food by physical, chemical, or biological control mechanisms. It further involves the approaches for genetic analysis and rapid diagnostic detection of foodborne pathogens. (2642)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Peter Muriana
Improving Industrial Uses of Cereal Grains
This project involves evaluating and characterizing the biochemical and rheological properties of proteins and enzymes from agricultural products, with special emphasis in cereal proteins and extended interest to other important functional proteins. We seek the discovery of new uses and processes to produce value added materials with specialized functions. Examples of specific approaches include the production of novel products and films, and the development of analytical tools for the key properties of interest to the industry. (2643)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Patricia Rayas

Ventilation Waste Heat Recovery in Food Processes
Ventilation waste heat is an example of an underutilized waste heat that can be exploited in the food industry. The overall objective of this project is to reduce energy costs in food processes by recovering ventilation waste heat. The goal of the project is to identify appropriate waste heat recovery technologies and techniques and develop and promote them for long-term implementation. Development will be at the pilot level while demonstration will occur in both pilot and full scale installations. (2759)

Sponsor: Oklahoma Agriculture Experiment Station
PI/PD: Timothy Bowser

VETERINARY MEDICINE

Physiology and Pathophysiology of Equine Athletic Performance
Superior athletic performance in horses requires optimal physiological adaptation in the musculoskeletal and cardiopulmonary systems, and improvements in these systems often lead to improved performance. Conversely, disease in these systems will invariably cause decreased performance, and in some cases the exercise itself is the cause of the disease. The goals of this program are to investigate the mechanisms underlying the physiological adaptation to exercise in horses, identify methods that will improve the horse's adaptation to exercise, and determine strategies that can prevent exercise-induced disease. (2729)

Sponsor: Oklahoma Agricultural Experiment Station, Oxley Chair in Equine Sports Medicine
PI/PDs: Michael Davis

Bovine ResPI/PDratory Disease: Risk Factors, Pathogens, Diagnosis, and Management
The project determines changing patterns, geographical differences, risk factors, and management practices related to bovine resPI/PDratory disease. The influence of various bacteria and viruses is studied. In addition, the pharmacokinetics and efficacy of newer theraPI/PDes and new-generation vaccines are evaluated. The host-pathogen relationship is characterized at the molecular level. (2597)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Anthony Confer, Robert Fulton, R. J. Panciera, Ken Clinkenbeard, R. J. Morton

M. haemolytica Chimeric Protein Vaccine for Delivery of Multiple Outer Membrane Protein and Leukotoxin Antigens
Two directions for future M. haemolytica vaccine development are being examined using recombinant immunologically important outer membrane (IiomP) antigens. These are: 1) supplementation of traditional M. haemolytica vaccines with multiple recombinant IiomPs or chimeric proteins that contain the major surface epitopes of several IiomPs or leukotoxin and 2) development of a standalone complex M. haemolytica chimeric protein-based vaccine that expresses numerous IiomP and leukotoxin
Characterization of Tick-protective Antigens and Development of a Vaccine for the Control of Lone Star Tick Infestations on Cattle.

Identification of tick protective antigens will allow for the development of vaccines for control of lone star tick infestations on cattle. In this research, discovery of tick protective antigens will be done by screening pools of RNA in ticks by use of RNA interference. Antigens that have significant impact on tick biology will be selected and tested as vaccine antigens in cattle. The most effective antigens will then be tested in a prototype vaccine in cattle.

Sponsor: USDA CSREES, Agriculture and Food Initiative Competitive Grant
PI/PDs: Anthony W. Confer, Sahlu Ayalew


The vectorial capacity of ticks for *Anaplasma marginale* is most likely dependent upon both tick cell and pathogen interactions that involve pathogen adhesion proteins, tick cell receptors and a series of tick cell proteins that mediate the trafficking of the pathogen throughout ticks. In this research we will identify and characterize genes differentially expressed in tick cells in response to infection with *A. marginale*. These key genes will then be tested as vaccine antigens aimed at reducing the vectorial capacity of ticks for transmission of *A. marginale*. (1669)

Sponsor: USDA NRI Competitive Grant
PI/PDs: Katherine M. Kocan, José de la Fuente, Edmour F. Blouin, D. L. Step.

Functional Genomic and Proteomic Analysis of Differential Gene Expression in Tick Cells in Response to Infection with the Cattle Pathogen *Anaplasma marginale*.

Control of ticks and tick-borne pathogens by vaccination will avoid the use of acaricides that result in selection of drug-resistant ticks and environmental pollution. We have demonstrated the feasibility of developing vaccines targeted at the reduction of tick infestations and interruption of pathogen transmission. In this research we will identify genes expressed by tick cells in response to *A. marginale* infection that may prove to be useful in vaccine development. (1443)

Sponsor: Oklahoma Agriculture Experiment Station, Animal Health Funds
PI/PDs: Jose de la Fuente J, Katherine M. Kocan, Edmour F. Blouin

Role of Vitamin A in Modulation of Gene Expression in the Cumulus-Oocyte Complex

The central hypothesis of this work is that specific patterns of early gene expression in the cumulus-oocyte complex during the maturation phase affects subsequent developmental capacity; these patterns are subject to influences of the local environment and can be characterized by examining the stimulatory effect of certain nutrient, including vitamin A (9-cis Retinoic Acid (RA)). It follows that identification of the positive effects of 9-cis RA will provide a view of a transcript profile having positive influence on subsequent embryo development. The effect of 9-cis RA stimulation on maternal transcriptional activity and transcript profile, and the impact on the oocyte transcript profile will be separated by analysis of the cumulus cells alone, the oocyte alone, versus the cumulus-oocyte complex as a whole, using subtractive hybridization. These results are expected to yield a better understanding of the early transcriptional profile and those genes critical to developmental potential. Benefits may
include targets for testing developmental potential of preimplantation embryos and better production methods. (2277)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** Jerry Malayer

**Interactions of Viral Infection and Nitric Oxide within the Reproductive Tract of Horses and Cattle**

During the normal physiologic breeding season ovarian/follicular dynamics and associated changes within the reproductive tract will be assessed via transrectal ultrasonography and plasma concentrations of estradiol, progesterone, FSH and LH will be through the follicular phase and periovulatory phase to ovulation. At specific phases of the reproductive cycle, immunolocalization techniques will be utilized to determine the sites of NOS isoform active in the follicular wall of mare ovaries following tissue excision. Western blot and mRNA RT-PCR analyses of follicular fluid and follicle wall tissues will be used to quantitate NOS isoform expression associated with various sized follicles during the folliculogenic and ovulatory periods. Specific NOS isoform activity will be determined in granulosa cells from various sized follicles. Granulosa cells will be aspirated from mare ovaries during the follicular phase of the estrous cycle. As follicles reach each specific size range, follicular fluid will be aspirated for granulosa cell harvest. Specific NOS activity will be assessed relative to follicle size as will plasma and follicular fluid hormone concentrations and NO metabolite concentrations. Follicular fluids and plasma without extraction will be analyzed and quantified for estradiol, progesterone, prostaglandin F2 alpha, prostaglandin E2, and FSH and LH respectively radioimmunoassay. Twenty breeding age mares, seronegative for anti-EAV antibodies will be used in this study. During the normal physiologic breeding season parallel samples will be taken of buffy coats and nasopharyngeal (NP) swabs for virus isolation. Ovaries and oviducts will be obtained from the remaining control and infected mares at various stages of the pre and periovulatory period during the viremic phase of infection. After removal the ovaries and oviducts, specific NOS isoform presence and staining intensity will be investigated using in-situ immunohistochemistry relative to virus immunolocalization and histopathology. Clinical signs of infection, follicular dynamics and ovarian edema will be assessed via ultrasonography and plasma concentrations of estradiol, progesterone, FSH and LH will be assessed twice daily for all mares. Specific NOS isoform activity will be determined in granulosa cells from various sized follicles during the acute phase of EAV infection. During the normal physiologic breeding season mares will be synchronized and exposed to a field isolate of EAV (KY-84). Granulosa cells will be aspirated from their ovaries during the follicular phase of the estrous cycle. As follicles reach each specific size range follicular fluid will be aspirated for granulosa cell harvest. Virus isolation, specific NOS activity, plasma and follicular fluid hormone concentrations and NO metabolite concentrations will be assessed relative to follicle size and clinical signs of infection. Follicular fluids and plasma without extraction will be analyzed and quantified for estradiol, progesterone, prostaglandin F2 alpha, prostaglandin E2, and FSH and LH respectively radioimmunoassay. (2539)

**Sponsor:** Oklahoma Agricultural Experiment Station

**PI/PD:** G. R. Holyoak

**Effects of Management and Medical Treatment on the Health and Performance of High Risk Receiving Cattle**

The information gained from this study demonstrates the benefit for producers on the health of high risk calves using this management tool. It also demonstrated the variability between sources of cattle and locations in the US in which producers and veterinarians must develop sound management programs to deal with bovine respiratory disease. Outcomes and impacts of objective B: The information gained from this study has indicated that the use of exhaled biomarkers may potentially be of benefit as a diagnostic tool; however, the information obtained from this study did not demonstrate the value as a
predictor of bovine respiratory disease. The information available in printed scientific refereed literature will assist other researchers and companies focus their efforts in bovine respiratory disease. Outcomes and impacts of objective C: The information gained from this study has indicated that intact feeder calves (bulls) may experience higher morbidity, higher mortality, and decreased performance than castrated male feeder calves (steers). This information will assist producers in determining the price to possibly purchase feeder calves (bulls vs steers). As important as to price to pay for the commodity, but also the ability to efficiently utilize their facilities and available labor to address the health concerns of newly arrived feeder cattle. (2589)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: D. L. Step
Animal Science: Clint Krehbiel

Bovine Viral Diarrhea Virus: Diversity of BVDV Strains and Impact on Diagnosis, Vaccinations, and Control Programs
Bovine viral diarrhea viruses (BVDV) isolates from persistently infected (PI) cattle will be obtained from feedlot cattle. The isolates will be subtyped by sequencing a region of the 5′-UTR. Subgenotypes to be detected will include those of worldwide epipdemiology. The BVDV subgenotypes expected in North America are: BVDV1a, 1b, 2a, and 2b. Molecular diagnostic tests including reverse transcriptase PCR and real time PCR will be evaluated to detect these diverse BVDV subgenotypes in peripheral blood, serums and ear notch samples of infected animals. Cytopathic BVDV 1b strains as potential vaccine strains will be sequenced to permit detection by genomic tests allowing differentiation of vaccine strains from field strains in vaccinated animals. The prevalence of PI/PD animals in Oklahoma beef herds will be determined using immunohisto-chemistry and antigen capture ELISA (ACE) on ear notches. The PI/PD strains will be subtyped. Vaccination records will be obtained to determine use of BVDV vaccines or lack thereof in herds with PI/PD animals. Potentially new subtypes may warrant additional subtypes in the vaccines. (2630)

Sponsor: Oklahoma Agricultural Experiment Station

Bovine Viral Diarrhea Virus (BVDV) in Oklahoma Beef Operations: Impact of Infections and Economic Benefits to Control Programs
This study will identify infected beef breeding herds and develop a control program for beef herds stressing biosecurity and vaccination. Samples to be tested will be ear notches for the immunohistochemistry and antigen capture ELISA (ACE) using the newborn calves. BVDV isolates will be collected from infected animals and subtyped. Stocker cattle entering the OSU Sparks facility will be tested as well. Educational programs will be provided for producers regarding BVDV control. The enhanced economic benefit for marketing BVDV free stocker calves will be investigated. (2630)

Sponsors: Team Initiative Program, Oklahoma Agricultural Experiment Station
PI/PDs: Robert W. Fulton, D. L. Step
Animal Science: Clint Krehbiel

Rapid Diagnosis of Viruses Involved in Bovine Respiratory Diseases
The purpose of the study will be to determine if use of reverse transcriptase PCR testing aids in the diagnosis of viruses involved in bovine respiratory disease. Samples including nasal swabs, serums, and lung samples collected at necropsy will be tested for viruses using the PCR tests for bovine viral diarrhea viruses, bovine herpesvirus 1, bovine respiratory syncytial virus, and bovine coronavirus. The tests results will be compared to use of standard tests including cell culture isolation for viruses.
Genomic tests have advantages as cell culture tests are not often rewarding for viral identification. A higher recovery rate for these viruses is expected by PCR. (2630)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PD:** Robert W. Fulton

**Bovine Coronavirus: Role in Respiratory Disease**  
Bovine respiratory diseases (BRD) also referred to as “Shipping Fever” represents significant losses to cattlemen. There are several viruses contributing to the BRD which has a polymicrobial etiology. These include bovine herpesvirus, parainfluenza-3 virus, bovine respiratory syncytial virus, and bovine viral diarrhea viruses along with *Mannheimia haemolytica, Pasteurella multocida, Histophilus somni,* and *Mycoplasma spp.* The bovine coronavirus (BCV) has emerged as another virus which contributes to BRD. Measuring the BCV role in BRD has been hampered by lack of tools for the study of this virus both in vitro and in animal studies. The purpose of this study will be to develop means of propagating the BCV in cell cultures, developing and validating a serologic test for BCV antibodies to demonstrate active infections, developing an immunohistochemistry assay to detect BCV in infected cells and tissues, and a challenge model to demonstrate the disease induced by BCV. An attempt will be made to develop live and inactivated BCV vaccines for cattle. (2630)

**Sponsor:** Oklahoma Agricultural Experiment Station  
**PI/PDs:** Robert W. Fulton, Anthony Confer, R. Eberle, D.L. Step

**MicroRNAs and Bovine Respiratory Disease**  
Bovine respiratory disease complex (BRD) is a major problem that results in over $1 billion annual losses of cattle in North American. BRD is caused by multiple factors including stress, viral and bacterial infection. Inflammatory response is associated with lung injury due to bacterial infection and an important aspect of BRD. The pathogenesis of BRD is still not completely understood. MicroRNAs are novel and emerging non-coding small RNAs that regulate many biological processes and participate in various diseases including inflammatory diseases. However, very little is known regarding the role of microRNAs in the progression of BRD. The overall and long-term goal of this project is to understand molecular mechanisms of the pathogenesis of BRD. The current project aims to identify microRNAs involved in the cellular regulation of host inflammatory mediators in BRD. The completion of this project will contribute to our understanding of the causes for BRD and develop potential treatment for BRD. (2737)

**Sponsors:** Oklahoma Agricultural Experiment Station, U.S. Department of Agriculture  
**PI:** Lin Liu

**Wes Watkins Agricultural Research and Extension Center**  
**Cover Crops, Bio-fumigants, and Forages Used in Rotation with Organic Vegetables and Bio-Fuel Crops**  
The goal of this project is to provide information for organic vegetable producers and American consumers by evaluating particular aspects of the use of cover crops, bio-fuels, forages, and bio-fumigants in rotation with organic vegetable crops. **OBJECTIVE:** The objective of this project is to evaluate the use, timing, and sequence of cover crops, bio-fuel crops, bio-fumigant crops, and forage crops in certifiable organic vegetable production systems that provide highly marketable produce, control or manage pests such as weeds, diseases, and insects, enhance soil quality, and protect the environment. These vegetable crops are to be grown in rotation with crops that will fix nitrogen, protect the soil from erosion, control pests, or be used for bio-fuel, bio-fumigant, or forage production. Specific sub-objectives are 1-Weeds - Evaluate management systems that integrate cover crop management, mechanical weed control methods, and organic herbicides for the control of annual weeds in vegetable crops. 2-Soils - Evaluate the use of cover crops and organic soil management techniques to enhance soil
quality and promote crop development. 3-Diseases & Insects - Evaluate the use of cover crops, cultural practices, soil amendments, and bio-control organisms relative to their effect on crop diseases and insects. 4-Economics - Evaluate the costs and benefits for organic vegetable crops grown in rotation with crops whose primary emphasis is as a cover crop to fix nitrogen and/or prevent soil erosion with secondary benefits of being harvested for bio-fumigation, bio-fuel, or forage crops. 5-Extension - Develop extension and outreach programs that address current needs of organic vegetable, bio-fuel, and forage producers in the U.S. (2676)

**Sponsors:** USDA, Oklahoma Agricultural Experiment Station  
**PI/PDs:** Merritt Taylor, Warren Roberts, Jim Shrefler, Kefyalew Desta

**Integrated Production Systems for Organic and Other Alternative Crops**  
The goal of this project is to develop organic and conventional techniques that will enhance and extend crop production and harvest throughout the school year and to incorporate those crops into the school foodservice program. In order to achieve this goal, the project will concentrate on the following objectives: 1) develop season extension techniques that will extend harvest of tomatoes and leafy greens; 2) identify weed problems and develop weed control techniques for vegetable producers using season extension technology; 3) transfer new season extension production information to farmers and University Extension Personnel; 4) evaluate the costs and benefits of season extension technology (2741)

**Sponsors:** USDA, Oklahoma Agricultural Experiment Station  
**PI/PD:** Merritt Taylor