Division of Agricultural Sciences and Natural Resources – FY 2012 Research Abstracts

AGRICULTURAL ECONOMICS

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

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 wind power 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

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) Multistate Project NE-1029
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 Raper

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 polices 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) S-1043
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Shida Henneberry

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)
Multistate Project S1042
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Art Stoecker

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, CSREES, 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 check-off 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

Integrated Production Systems for Alternative Crops (OK) – Organic Vegetables for Local and Farm to School Markets
The goal of this project is to develop and disseminate technology that would increase markets for vegetable producers through early and late season extension techniques that allow harvest to coincide with the public school year. In order to achieve this goal, the project will concentrate on the following objectives: 1) Develop plant density and arrangement techniques that will allow extended production and harvest of vegetables (both early and late), 2) Identify weed management needs and develop control techniques applicable to vegetable production using season extension technology, 3) Evaluate the costs and benefits of season extension technology, and 4) Transfer new season extension production information to farmers, consultants, agribusiness and University Extension Personnel. The major expected output of this project is an increase in the number of farmers marketing organic vegetables to schools either through wholesalers or through direct sales to the schools during normal school sessions. These outputs will be obtained as a result of conferences where results from the tests and demonstration sites on season extension techniques have been presented in workshops and training sessions for farmers, extension personnel and school produce buyers. (2791)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Merritt Taylor

The Political Economy of Modern Food Production
The overall purpose of this research project is to determine the economic consequences of consumers' food preferences and food policies directed toward modern industrial farming practices and food policies directed toward modern industrial farming practices. Specific research objectives are both qualitative and quantitative and include: Developing an integrative framework to conceptualize the various components of the seemingly disparate reaction s to modern farming practices including factors such as local, production origin, rejection of certain technologies, and sustainability; Identifying the economic consequences of

food preferences and food policies directed toward modern industrial farming practices and Determining the role of interest groups (farm organizations, consumers, and activists) in the emerging food controversies. (2805)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Jayson Lusk

Assessing the Consumer Behavior, Market Coordination and Performance of the Consumer-Oriented Fruit and Vegetable Sector
Develop demand and market valuation models for the produce sector that can be used to evaluate effects of increasingly complex product differentiation schemes (organic, enhanced health claims, biodynamic), trade, commodity marketing programs, labeling programs (local, food miles, Fair Trade), traceability systems, and food safety events in the U.S. produce markets. Other objectives are: Analyze the relative benefits and costs, to producers and consumers, of government and industry led marketing and policy programs (certifications, leafy greens marketing order, country of origin labeling, farmers markets) using both theoretical approaches and empirical evidence from multi-state applied research projects; and to Assess the changing coordination and supply chain management strategies being implemented in the fruit and vegetable sector and identify strategic organizational and marketing implications for a set of firms that are diverse in terms of commodity, marketing approach and size of operation (including small and mid-size farms). (2806) S-1050
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: R. Joe Schatzer

The Neuroeconomics of Controversial Food Technologies
The overall purpose of this research is to enhance understanding of consumers' preferences for new food technologies by capitalizing on recent developments in economics and neuroscience. Specifically, this research will accomplish the following objectives: 1) Determine how the human brain responds to the controversial newer food technologies of animal cloning and nanotechnology as compared to standard, "rational" food attributes such as product price, 2) Determine whether and how brain activations predict consumers' choices (and thus willingness-to-pay) for cloning and nanotechnology, and 3) Determine the relationship between brain activations when consumers are making ex ante choices between food options as compared to that when consumers are ex post experiencing the desirability of the food option received. (2810)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Jayson Lusk

Economics of Oklahoma Crop and Livestock Production Systems and Land Use
The overall objective of this project is to determine the economic consequences of agricultural crop and livestock 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. Specific objectives are to: 1) Determine the economic and institutional feasibility, producer impacts, with respect to expected net return, production and financial risk, and rate of return on resources, of alternative crop and livestock production systems compared to existing ones, and 2) Determine environmental tradeoffs between alternative and contemporary crop and livestock production systems. (2824)

Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Francis Epplin

The Innovation and Invention Process in Agricultural Experiment Stations: Evaluation, Improvement, and Implementation
The overarching objective of this project is to define practices, structures, and processes that will allow experiment station management to improve the efficiency of the intellectual property management decisions made by experiment station directors. The specific objectives are to: 1) Describe and summarize intellectual property policies currently used by experiment station directors in the U.S., 2) Develop a conceptual framework (theory) for intellectual property decisions made by experiment station directors, 3) Create a set of evaluation/report card metrics for intellectual property management within land-grant institution experiment stations, 4) Apply the metrics developed to a sample of land-grant university experiment stations and test whether a correlation exists between the metrics and outcomes, 5) Create a set of best practices and policies for intellectual property management to be used by agricultural experiment station directors and associate directors, and 6) Develop a set of on-line educational programs (based on 5) to teach university experiment station directors as well as faculty to evaluate their intellectual property management practices and implement improvements in their practices. (2830)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Dan Tilley
Biosystems & Ag Engineering: Paul Weckler

Food Security in the 21st Century
The overall objective of this research is to measure long run excess capacity in the United States and World agriculture. Secondary objectives include measuring the change in volatility over time and the relative importance of various factors in creating excess capacity. (2831)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Mike Dicks

AGRICULTURAL EDUCATION, COMMUNICATION, AND LEADERSHIP

Educative Evaluation: Building Evaluative Capacity by Transferring the Technology of Evaluation to Program Stakeholders
Educative evaluation builds evaluation capacity among program planners by viewing evaluation as an educational intervention and by transferring evaluation technologies to stakeholders. Project goal is to shift attitudes toward evaluation from an external force that is imposed upon stakeholders to infusing evaluation activity throughout the planning and delivery process as an opportunity to improve practice, outcomes, and impacts. The Hatch initiative results in improved institutional accountability by creating a culture of organizational learning for maximum programmatic impact. Outcomes include testing new models for improving programs delivered under the land-grant university umbrella. Participants gain necessary skills to conduct developmental, formative, and summative evaluation. Impacts include higher quality programs through better informed program planners, and more effective and efficient use of university resources. (2719)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Kathleen D. Kelsey

Examining Agricultural Education in the United States and Abroad: Implications for Improving the Global Competence of American Students
Phase I of this project will be twofold: 1) continue a review of literature regarding the phenomenon under study, and 2) conduct an investigation of the IA and GC of students enrolled in international dimension (ID) undergraduate courses offered in the CoA at the researcher's institution. The review will assist the researcher in understanding the findings of other investigators, their implications and recommendations for future research, as well as what may be "gaps" in the literature supporting additional inquiry. The study will describe students' attitudes and knowledge on IA and GC. It will compare students' attitudes and knowledge on IA and GC, pre and post course. Further, the study will describe selected personal characteristics of students to examine relationships between their attributes and measures of IA and GC. Phase II will be twofold: 1) continue a review of literature regarding the phenomenon under study, and 2) conduct a comparative analysis of the IA and GC of students enrolled in ID undergraduate courses offered in the CoA at the researcher's institution. The review will assist the researcher in understanding the findings of other investigators, their implications and recommendations for future research, as well as what may be "gaps" in the literature which support additional study. The second phase will compare students' attitudes and knowledge on IA and GC depending on course content and mode of instruction delivery. The study will also describe selected personal characteristics of students to examine relationships between their attributes and measures of IA and GC. Phase III will depend on the findings derived from Phases I and II and attainment of funding to support multi-institutional/transnational studies. (2804)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Craig Edwards

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. (2438)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Clinton R. Krehbiel

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

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 co-products 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 Co-products from Ethanol Production to Grazing Beef Cattle Consuming Low Quality Forages
There is an increase in the use of corn co-products 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 co-products 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/PDs: 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

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) W1010
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Robert Wettemann

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) S1044
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/PDs: 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: Peter Muriana

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)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Phillip Lancaster, Clint Krehbiel, Gerald Horn, Udaya DeSilva

Food Safety: Farm to Table
The goal of this project is to improve Food Safety from Farm to Table. We will determine how ammonium hydroxide, when incorporated into a brine applied to fresh meat, impacts pathogenic microorganisms Escherichia coli O157:H7 and Salmonella serotype Typhimurium. We will develop a quantitative real-time immuno-PCR approach for rapid and sensitive detection of mycoflora in poultry feed/ingredients and airborne dust on the farm, and determine the effect of surface treating pork with lactobacillus to reduce both Escherichia coli O157:H7 and Salmonella serotype Typhimurium. Also, we will advance the chemical detection technology, based on a solid-state sensor array, to autonomously detect, identify, and quantitate histamine, cadaverine, and putrescine in real-time, and develop an inexpensive and cost effective method incorporating nanotechnology as a convenient delivery system for application of antimicrobials on the surface of (raw or processed) meats. (2783)
Sponsors: Oklahoma Agricultural Experiment Station, USDA
PI/PDs: Peter Muriana, Deborah VanOverbeke, Gretchen Hilton, B. Marquis

Evaluation of Pre- and Post-Harvest Quality and Safety Attributes in the Beef and Pork Industries
The objectives of this project are: 1) determine the impact of the quality defects of market cows and bulls on economic value, and 2) determine the impact of post-harvest interventions on the quality and safety attributes of pork and beef products. Objective one is expected to be completed by the end of year 3; objective two by the end of year 5. (2785)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Deborah VanOverbeke, Christina DeWitt, Gretchen Hilton
Agricultural Economics: Darrell Peel

Impact of Poultry Health on Effective Caloric Value
The broad goal of this project is to expand knowledge related to bird energy expenditure whereby the caloric costs of immunity development and disease progression may be incorporated into predictive models enabling calorific definition of nonnutritive health factors. Further, the study seeks A. To define the impact of immunity development resulting from Eimeria vaccination to prevent coccidiosis on broiler performance, energy metabolism and ECV under conditions of varying nutritional regimen. b. To define the impact of cocci challenge in birds with and without developed immunity throughout the broiler growth curve on broiler performance, lesion score, energy metabolism and ECV under conditions of varying nutritional regimen. (2786)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Robert Teeter

Intraovarian Factors and Gonadotropin-Mediated Regulation of Follicular Maturation in Cattle
The long-term goal of this research is to describe the contributions of WNT and gonadotropin signaling in the bovine ovary. The immediate goal of this project is to determine granulosa cell specific targets of the WNT signaling pathway and delineate how these targets are hormonally regulated. To accomplish the overall objective of this project the following specific aims will be pursued; 1) identify the WNT genes that are present in the bovine ovary, 2) determine the mechanisms by which FSH and WNT work together to regulate ovarian steroid enzyme gene expression, 3) determine the functional requirement of specific WNT pathway response elements on aromatase promoter activity, and 4) identify the role of the WNT target, Axin2 in steroid regulation. Identification of factors and mechanisms, such as WNT, that contribute to

ovarian steroid production will provide insight as to how these signals may impact estrogen levels to increase reproductive efficiencies in cattle. (2789)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Gifford Hernandez

Metagenomics of the Bovine Rumen
The overall objective of this proposal is to determine the key metabolic pathways utilized by rumen microbes under different environmental conditions and to identify microbial species that carry out these metabolic functions. We also plan to evaluate the population dynamics of anaerobic fungi that inhabit the rumen and to establish a comprehensive, public database of phylogenetic information of rumen microorganisms. (2790)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Udaya DeSilva

Technology Assisted Management for Improved Feed Utilization and Biosecurity in Beef Production Systems
Continuing advancements in cattle identification and remote monitoring technologies offer opportunities to improve animal management and efficiency of labor use. These electronic technologies have the potential to provide feed to cattle while restricting access to non-intended species. These feeding systems can then serve as a centralized location that has potential for collecting and remotely distributing information about the presence, health, wellbeing, and behavior patterns of cattle in grazing environments. Therefore, the longterm goal of this research is to increase efficiency of beef cattle production through development and testing of remote monitoring systems to improve the health and feed utilization of beef cattle and beef cattle systems. The specific objective outlined in this project is to test animal identification technologies and sensors that will reliably detect the presence of calves, evaluate feed consumption between calves that have free choice access and an electronic automated feeder, and evaluate if introduction of an electronic automated feeder will reduce the interaction of calves with other non-intended animals at the feeder. (2792)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Christopher Richards, Clint Krehbiel, David Lalman
Agricultural Economics: Dan Tilley
Biosystems & Agricultural Engineering: Ning Wang

Efficacy and Acceptability of Various Retail Packaging Methods for Meat at Retail
The overall objectives of the project are: 1) Compare the case life and consumer acceptability of retail packages utilizing black, yellow or white trays when placed in traditional PVC overwrap and modified atmosphere packaging systems. 2) Compare traditional overwrap, modified atmosphere, and vacuum packing types of strip loin steaks and pork chops using different lighting. 3) Determine consumer acceptability and preferences of strip loin steaks and pork chops packaged using traditional overwrap, modified atmosphere or vacuum packages. Increasing case-life continues to be an issue at retail to avoid pulls and discounts, use of vacuum packaging at retail would greatly decrease both of these. However, it is necessary to determine if consumers would be willing to purchase vacuum packaged steaks. (2834)
Sponsors: Oklahoma Agriculture Experiment Station
PI/PD: Gretchen Mafi

BICHEMISTRY AND MOLECULAR BIOLOGY

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 Quinone mediated 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: Oklahoma Agricultural Experiment Station, National Institutes of Health
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: Oklahoma Agricultural Experiment Station, U.S. Department of Energy
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: Oklahoma Agricultural Experiment Station, USDA
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

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

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 plantae. (2714) S1036
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

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

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 hillslopes 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 A. Fox

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 of 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 gasificationi-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: Oklahoma Agricultural Experiment Station, USDA
PI/PDs: Raymond Huhnke, Danielle Bellmer, Mark Wilkins
Plant & Soil Science: Yanqi Wu
Agricultural Economics: Francis Epplin

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 microbially 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. (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). (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

Improving Quality and Yield of Producer Gas from Biomass Gasification by Optimizing Operating Conditions and using heterogeneous Catalysts

The overall goal of this research proposal is to investigate various methods to improve quality and quantity of producer gas from biomass gasification. The goal is broken down into three objectives. Objective 1: Study the effects of gasifier operating conditions on yield and composition of producer gas using selected biomass (different plant species) and optimize the operating conditions to maximize net energy efficiency. Objective 2*:* Evaluate in-bed catalysts for improving yield and composition of producer gas. The purpose of this objective is to screen naturally occurring mineral-based catalysts and evaluate their effectiveness in improving gas composition, and reducing amount of tar in producer gas. Objective *3:* Evaluate selected commercially-available reforming catalysts in a secondary-bed reactor downstream from a biomass gasifier to reduce tar and improve gas composition. The purpose of this objective is to screen and evaluate the effectiveness of selected commercially available reforming catalysts to upgrade producer gas. (2801)

Sponsor: Oklahoma Agricultural Experiment Station

PI/PD: Ajay Kumar

The Science and Engineering for a Biobased Industry and Economy

The objectives are: (1) Reduce costs of harvesting, handling and transporting biomass to increase the competitiveness of biomass as a feedstock for biofuels, biomaterials and biochemicals. (2) Improve biofuel production processes. Outputs: (1) A large portion of the efforts outlined in Objectives 1 through 4 are application oriented and will be useful to develop pilot projects, demonstrations and commercialization of biomass conversion to biobased products. (2) Other outputs include educational materials that could be used in traditional classroom settings or for distance education and web based distribution, (3) Publications in peer reviewed journals, trade journals and popular magazines. (4) Development of intellectual property. (5) Presentations to economic development groups, legislative groups, and to the general public. (6) Development of management recommendations for producers of biobased products. Outcomes or projected Impacts: (1) The committee has served and will continue to serve as a resource for: Bioresearch and Development Initiative (BRDI), Biomass, Research and

Development Board working groups, SBIR panel Biofuels 8.8, USDA/DOE Biomass Initiative Project Review Teams, NRI 71.2 panel and reviewers for the Sun Grant Initiative. (2) The multi-state membership will contribute to the implementation of the REE energy science strategic plan. (3) Multi-state membership will contribute to identification of funding priorities and shaping policy of Federal agencies. (4) Research as a result of this project will create technology adopted by industry with at least two licensed technology per year. (5) Research will enable reduced dependency on foreign-based fuels and chemicals. (2816)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Michael Buser

Engineering Solutions for Agricultural Air Quality Issues
The long-term mission of this project is to address current and future critical air quality issues facing U.S. agricultural production operations and processing facilities. The focus of this project plan is to establish a highly interactive research program that addresses agricultural air quality compliance-related issues, with an emphasis on particulate matter. Over the next 5 years we will focus on the following objectives: Objective 1: Develop scientifically sound agricultural air quality emission factors; Objective 2: Develop and evaluate abatement technologies and/or management practices for controlling agricultural emissions; Objective 3: Develop and evaluate technologies and/or methodologies for measuring, characterizing, and classifying agricultural emissions. It is expected that the Engineering Solutions for Agricultural Air Quality Issues project will provide Oklahoma the potential to be in front of future regulations effecting agriculture by assessing the problems using scientifically sound approaches, developing and evaluating mitigation strategies, and providing the appropriate recommendations to change processes and practices for air quality compliance using a engineering based research and extension based strategy. This proposed project incorporates an established national working group with the expectation to address the current and future air quality issues in the state of Oklahoma. (2822)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Michael Buser

Advancement of a Whole-Chain, Stakeholder Driven Traceability System for Agricultural Commodities: Beef Cattle Pilot Demonstration
Objectives: (1) Develop a working, scalable stakeholder-driven "whole chain" agricultural commodity traceability system. (2) Develop consumer information links to the traceability system using mobile and social media. (3) Deploy the traceability system as a pilot beef cattle demonstration. (4) Evaluate the benefits and costs of using the system. (5) Transfer lessons learned about benefits and costs of using the system to producers, industry professionals, retailers, and other stakeholders, with the goal of extending the technology to other commodities and products. Outputs: Stakeholder engagement. This approach insures current and cutting edge industry, governmental, and consumer information needs are incorporated into the system. This approach seeks to develop and grow stakeholder "buy-in" to avoid the negative response commonly found in systems that are forced on industry without industry input. Deploy the data repository traceability and marketing system in a demonstration project. Cutting edge technology will allow immediate access to location data so that government and health resource units can mitigate outbreaks or attacks on food supplies without economically and socially devastating the industry and interrupting the food supply chain throughout the US unnecessarily. Producer selected real-time marketing data will be accessible by connected consumers. Demonstrate the integration of end software and equipment add-ins to help producers, processors, and consumers. Show stakeholders the full potential of stakeholder-

driven, "whole-chain" data repository traceability and marketing system. Initiate, deploy and manage a working web-model of a "whole chain" product traceability system that is provided under open source licensing backed by secured intellectual properties for low cost and rapid adoption by the domestic (and potentially international) agricultural and food supply chains. (2823)
Sponsors: Oklahoma Agricultural Experiment Station, USDA/NIFA
PI/PD: Michael Buser

Marketing and Delivery of Quality Grains and BioProcess Co-products
The general objective of the project is to enable and facilitate the marketing and delivery of quality grains and their products for the global food, feed, fuel and fiber supply chains. This will be accomplished using the following three objectives: (1) to characterize quality attributes and design systems to measure quality of cereals, oilseeds and bioprocess co-products; (2) to develop methods to maintain quality, provide value, and preserve safety at key points in the harvest to end product value chains; and (3) assess and disseminate the impact of market chain technologies on providing value, safety and security for global markets and bioprocess industries. (2825)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Carol Jones

Investigation of the Long-term Viability of Rainwater Harvesting for Supplementing Water Supplies and Stormwater Management in Oklahoma
The overall goal of this research is to answer questions regarding the long-term viability of rainwater harvesting in Oklahoma. The objectives of the proposed research are (1) investigate the occurrence and potential for soil accumulation of organic compounds in rooftop runoff; (2) characterization of the first flush from rooftop runoff; (3) redesign and automate the rainwater harvesting first flush diverter; (4) investigate the impacts of widespread rainwater harvesting on in-stream flows in rivers and streams in Oklahoma; (5) design a web-based design tool that utilizes Oklahoma mesonet data for optimal, site-specific designing of rainwater harvesting systems; and (6) investigation of the effects of climate change on rainwater harvesting system design in Oklahoma. The expected outputs are a series of refereed journal articles and extension fact sheets to communicate the results of these studies to other scientists and to the public. The results of this project will also be presented at state and national conferences and communicated to the public at extension workshops on rainwater harvesting and low impact development (LID). Extension fact sheets will be available on the OSU DASNR Print on Demand system and will also be available on the OSU LID web site (lid.okstate.edu). (2832)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Jason Vogel

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)
Sponsors: Oklahoma Agricultural Experiment Station, USDA
PI/PD: Don Arnold

Disease Resistance in Peanut to Sclerotinia Blight
Production of peanut in Oklahoma is affected by several fungal pathogens. Chemical management of diseases reduces profit. This research addresses: 1) improving methods for quantifying disease resistance, 2) evaluating new peanut entries both in the greenhouse and field plots to disease, 3) studying genetic variability of Sclerotinia minor, and 4) investigating the effect of peanut seed maturity on the Oleic/Linoleic acid ratio. Data from this project will accelerate the development of disease resistant cultivars, and improve management strategies for use by Oklahoma growers. (1661)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Hassan Melouk
Graduate College: Mark Payton

Development of Disease Resistant Wheat and Studies of Selected Wheat Diseases
Approximately 1,200 breeder wheat lines from the Central/Southern Plains were tested for reaction to leaf rust and to the wheat soilborne mosaic/wheat spindle streak mosaic virus complex. Oklahoma lines also were tested for reaction to powdery mildew, tan spot, septoria and barley yellow dwarf. Results were provided to private and public wheat breeding programs to facilitate selection of lines for advancement to variety release. Two varieties ('Gallagher' and 'Iba') were released in 2012 by Oklahoma State University. Other testing evaluated foliar fungicides to control disease and protect yield; results are used to help formulate recommendations to wheat producers. (1871)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Wheat Research Foundation, Chemical Companies
PI/PDs: Robert M. Hunger, Kris Giles, Tom Royer
Plant & Soil Sciences: Brett Carver, Art Klatt, Jeff Edwards, Liuling Yan

Biochemistry of Arthropod-Host Interactions
Newly developed analytical approaches, including proteomics and metabolomics, as well as traditional lipid analytical platforms are being used to study the interaction of aphids with important crop plants including alfalfa and wheat. Studies are also being conducted on improving the fatty acid composition of peanut.(2001)
Sponsors: Oklahoma Agricultural Experiment Station, USDA-ARS Laboratory, Stillwater
PI/PD: Jack Dillwith

Biology, Epidemiology, and Integrated Management of Peanut and Vegetable Crop Diseases
Lab, greenhouse, and field studies on the biology and management of important diseases of field and vegetable crops are conducted under this project. Recent emphasis is on the biology and management of canola black leg, spinach anthracnose, and peanut Sclerotinia blight diseases. Focus has been on characterizing the fungicide sensitivity and genetic variability of local strains of the pathogens. In addition, work with crop breeders to screen crop germplasm for resistance to the local strains has been ongoing. Results will be used to make better disease management recommendations to farmers and to reduce reliance on fungicides through the development of disease resistant crop varieties. (2159)

Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Soybean Board, Oklahoma Oilseed and Peanut Commission, USDA/ NIFA, and private 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

Molecular Aspects of Insect Immunity
MiRNAs participate in posttranslational regulation of gene expression during development. We constructed four small RNA libraries from embryos, larvae, pupae, and adults of Manduca sexta, obtained 21 million reads by Illumina sequencing, and identified 163 conserved and 13 novel miRNAs. After data normalization and comparison, we detected stage-dependent changes in miRNA and miRNA* levels. We also studied miRNAs in fat body and hemocytes from naïve or bacteria-injected M. sexta larvae and found 18 other conserved and novel miRNAs. The miRNA abundance changes after the immune challenge and miRNA target site prediction suggested that certain miRNAs regulate expression of immunity-related genes. (2450)
Sponsors: Oklahoma Agricultural Experiment Station, National Institutes of Health
PI/PD: Haobo Jiang

Biology, Ecology, and Pest Management of Wood-Destroying Subterranean Termites
Current research is expanding our knowledge of termite densities, foraging behavior, and species diversity on the Tallgrass Prairie Preserve habitat in northeast Oklahoma. Studies concentrate on influence that termites have on soil fertility, aeration, gas production, plant diversity, carbon sequestration, and rainwater percolation. Effectiveness of wood preservatives against termites will identify successful treatments. Ability of termites to degrade dead redcedar trees will provide insight into natural field recycling. Distribution of liquid termiticides around termite-infested buildings is being investigated. Studies of termite management systems and new termiticide formulations are ongoing. (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: alfalfa leaf spots, cotton root rot, bermudagrass spring dead spot, Botrytis blight, switchgrass rust and smut. (2536)
Sponsors: Oklahoma Agricultural Experiment Station, NSF-EPSCoR, Noble Foundation, ODAFF, OSRHE, USGA, USDA-NIFA-AFRI
PI/PDs: Stephen M. Marek, Nathan Walker, Carla Garzon
Ohio State University: Tom Mitchell
Noble Foundation: Carolyn Young, Kiran Mysore, Rao Uppalapati
Sun Gro Horticulture: Todd Cavins
University of Oklahoma: Bruce Roe
Virginia Tech University: Bingyu Zhao, Brett Tyler
Iowa State University: Bing Yang

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 horn fly (*Haematobia irritans*), 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 horn fly populations in different landscapes, 2) improve understanding of house fly dispersal and behavior, and develop methods for monitoring them in indoor and outdoor environments, 3) develop horn 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, Chris Richards
Natural Resource Ecology and Management: David Engle

Tick Feeding Transcriptomes: Identification and Testing Targets for Anti-tick Feeding and Transmission Blocking Vaccines
This research project focuses on tick feeding 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 and pathogen transmission 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, Jack Dillwith, Justin Talley
Kansas State University, Roman Ganta,Yoon Seong Park

Impacts of Disturbance on Beneficial Insect Communities in Oklahoma
This research focuses on how disturbance impacts community composition of soil-dwelling invertebrate assemblages, invertebrate assemblages that serve as a forage for wildlife, invertebrate taxa of special concern (due to threatened or endangered status), naturally-occurring entomopathogens and other beneficial invertebrate organisms and communities. Individual invertebrate taxa, (bioindicators) and the composition of invertebrate assemblages are often informative in making inferences about the biotic integrity of a system. 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)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Department of Wildlife Conservation
PI/PD: Carmen Greenwood

Flies Impacting Livestock, Poultry and Food Safety
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 three areas concerning muscoid fly biology and pest management: 1) characterize dispersal and population biology of house flies and develop monitoring methods for use in indoor and outdoor environments and 2) establish extent of fly-borne dispersal of human and animal pathogens. Specific involvement will be focused on both objectives. (2629)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Justin Talley, Astri Wayadande

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 grape cultivars for resistance to black rot in Oklahoma, and 5) improving the epidemiological understanding of major disease epidemics of native and improved pecan varieties. (2667)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Damon Smith, Eric Rebek, Phil Mulder, Nathan Walker
Horticulture & Landscape Architecture: Mike Smith, Mike Schnelle

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. Both blow flies and house flies transmit higher numbers of *E. coli* O157:H7 cells than *Salmonella enterica* cells to lettuce. For Hemipteran vectors of plant disease agents, PCR primers were developed to distinguish between *Bemisia tabaci* biotypes. (2668)

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

Identification, Biology, Ecology, and Management of Stored-Product Insect Pests
We conduct research on stored-product insects that are a threat to stored commodities. We investigate their biology and ecology to understand factors affecting populations, and also assess their economic impact. We provide information that can be incorporated into pest management strategies. Our research develops sampling tools to assess the size and impact of these insect pest populations and for IPM. We investigate pesticide resistance in stored-product pests. Ecologically sound control methods are developed as alternatives to conventional insecticide treatments. (2695)
Sponsors: Oklahoma Agricultural Experiment Station, USDA
PI/PDs: George P. Opit
USDA-ARS-SJVASC: Spencer Walse

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. Highly sensitive simplex and multiplex PCR assays for detection and discrimination of *Pythium, Phymatotrichopsis* and *Sclerotinia* species are being validated on infected and healthy plant samples. Population genetics analyses to define species boundaries within the *Pythium irregulare* complex are in progress. A bioinformatics protocol for detection of *Pythium ultimum and P.aphanidermatum* from metagenomic samples has been developed. The fungicide sensitivity of *Sclerotinia minor* isolates was assessed. The effects of subinhibitory doses of fungicides on *S.minor, P.irregulare,* and *Botritys cinerea* are being studied. (2698)
Sponsors: Oklahoma Agricultural Experiment Station, USDA, ODAFF
PI/PD: Carla Garzon

Determinants of Mosquito-Borne Disease: Landscape, Larval, Adult and Egg-laying Biology of Mosquitoes
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 three counties in Oklahoma (in conjunction with the Oklahoma Department of Health), completed experiments examining larval response to variation in leaf litter, completed experiments on the oviposition behavior of Oklahoma mosquitoes, collected two field seasons of data on landscape patterns of mosquitoes in Oklahoma, and completed one study of the mosquito-borne canine pathogen *Dirofilaria immitis*. (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 were developed and real-time PCR specific for anastomosis groups are being developed. Primers are being 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

Biological Control of Arthropod Pests and Weeds
In association with regional working group S1034, I am working with on research projects related to: 1) implementation, evaluation, and enhancement of biological control, and 2) evaluating the benefits and risks of introduced and indigenous natural enemies. Field and laboratory studies continued to examine intraguild dynamics among aphid parasitoids and Coccinellidae predators. In addition studies are continuing on describing landscape level movement of insect predators among canola, wheat, and pasture via a unique protein marking system. (2724) S-1034
Sponsors: Oklahoma Agricultural Experiment Station, USDA CSREES
PI/PDs: Kristopher Giles, Carmen Greenwood

Biology, Integrated Pest Management, Damage Thresholds, Pollution Dynamics, Incidence and Occurrence
To develop sustainable, integrated approaches to arthropod management in cotton and other crops grown in SW Oklahoma including: 1) determine the incidence and seasonal abundance of arthropod pests in SW Oklahoma cotton and their impact on yields, 2) to determine effective oversprays for managing Heliothine escapes in transgenic cotton and its impact on yield, 3) determine the incidence of arthropod pests on wheat, grain sorghum, canola and corn, in SW Oklahoma, 4) evaluate current damage thresholds and determine if adjustments are necessary, and 5) identify, evaluate, and disseminate IPM tactics for implementation in crop production in SW Oklahoma. (2725)
Sponsors: Oklahoma Agricultural Experiment Station, Cotton Incorporated, USDA NIFA
PI/PDs: Jerry Goodson, Randy Bowman, Tom Royer

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 transmitted E. coli O157:H7 and Salmonella enterica to lettuce at different rates per fly. Green-fluorescent tagged *E. coli* was found to adhere to fly appendages for up to 13 days after exposure to contaminated manure. E. coli O157:H7 from fly regurgitation spots multiplied 17 fold on the spinach leaf surface. House fly attraction to mealybug honeydew was higher compared to a water check, and the honeydew volatile components were measured against fly electroantennogram responses.(2756)
Sponsors: Oklahoma Agricultural Experiment Station USDA
PI/PDs: Astri Wayadande, Justin Talley, Jacqueline Fletcher
Animal Science: Udaya DeSilva

UC Riverside: Alec Gerry, Jocelyn Millar
UC Davis: Themis Michaelides

Biology, Ecology and Management of Emerging Disease Vectors
This multi-state 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) NE1043
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Michael Reiskind

Massively Parallel Sequencing (MPS) as a Diagnostic and Forensic Analysis Tool for Plant Pathogens
A new E-probe Diagnostic Nucleic acid Assay (EDNA) supports sequence-based detection without the need for NGS data assembly. To minimize bioinformatic processing time, unique pathogen-specific sequences (e-probes) were designed for use in searches of unassembled, raw sequence data. Targets included an RNA virus, a DNA virus, bacteria, fungi, and an oomycete. E-probes of 80 or more nucleotides provided satisfactory precision. The number of e-probes for each organism varied with genome size. A statistical expression of the likelihood of a given pathogen's presence in a sample was developed by comparing target e-probe detection signals to background signals from decoy e-probes. (2770)
Sponsors: Oklahoma Agricultural Experiment Station, USDA NIFA
PI/PDs: Jacqueline Fletcher, Francisco Ochoa Corona, Carla Garzon
Biochemistry & Molecular Biology: Ulrich Melcher
USDA ARS, Ft. Detrick, MD: William Schneider

Development and Application of Tools for Agricultural Biosecurity and Forensic Plant Pathology
The project focused on forensic plant pathology and biosecurity and studied waterborne plant viruses and microbes. The project included inventing, innovating and/or improving tools for collection, detection, discrimination and diagnosis of microbial specimens i.e. a newly and patent pending, 'Elution Independent Collection Device', and assessment of biomaterials for developing efficient water sampling devises. Two scientific articles were published, and six grant proposals were submitted and one was granted. Mentored two graduate students and co-mentored other four. Also, it made progress developing decision support tools for prioritization, emergency management, and prediction of biosecurity threats, i.e. Massive Parallel Sequencing. (2773)
Sponsors: Oklahoma Agricultural Experiment Station, OSU Office of the Vice President for Research and Technology Transfer, USDA-CSREES.
PI/PD: Francisco Ochoa Corona

Foodborne Pathogens and Fresh Produce: Diagnostics, Colonization, and Controls
Contamination of fresh produce by human pathogens is a serious threat to human health and fresh produce industry. Research studies have been conducted during this period that include 1) to develop a Multiple Locus Variable-Number Tandem-Repeat Analysis (MLVA) for molecular strain discrimination of Non-O157 STEC and 2) to elucidate the contamination and survival

characteristics of *Salmonella* on cantaloupe. The results indicated that the selected loci allow high inter-serogroup discrimination for the "big 6" non-O157 STEC serogroups whereas the human pathogen internalization of cantaloupe is a rare event; however, the pathogen can survive on the blossom end surface until fruit maturity. (2793)
Sponsors: Oklahoma Agricultural Experiment Station, USDA
PI/PD: Li Maria Ma

iWheat: A Web-based IPM Information and Delivery System to Unify Reduced Risk Management Strategies for Winter Wheat in the Central and Southern Plains
This was initiated as a four-year project to unify IPM in wheat in the Central and Southern Plains. Developing and delivering an information-based web-accessible pest management program termed 'iWheat' for winter wheat stakeholders in the Central and Southern Plains (CSP). The unified iWheat program includes; 1) a pest detection and evaluation network for knowledge based deployment of preventive IPM tactics, 2) unified sampling schemes for aphid pests, and 3) delivery of low risk IPM tactics in an easy to access/use web-based IPM application. This first version of this dynamic network has been developed and will serve as a model that can be adapted to other agricultural commodities. Deployment and assessment are planned for the next year. (2799)
Sponsors: Oklahoma Agricultural Experiment Station, USDA-RAMP
PI/PDs: Kristopher Giles, Tom Royer, Robert Hunger,
Agricultural Economics: Francis Epplin
Plant & Soil Sciences: Joe Armstrong
Texas A&M: Gerald Michels, Allen Knutson
Colorado State: Frank Peairs
Kansas State: Brian McCornack, Ming Chen, Jeff Whitworth
Nebraska: Jeff Bradshaw
USDA ARS: Norman Elliott, Gary Puterka

Biology, Ecology, and Integrated Management of Turfgrass Diseases
All turfgrasses grown in Oklahoma can be damaged by a variety of diseases and pests. Objectives are to characterize the biology and ecology of important turfgrass pathogens and pests and to develop appropriate integrated management strategies for these turfgrass pests. The genetic diversity of several fungi and insect turfgrass pests are currently being investigated. Additional efforts include characterization of disease response for grasses that differ genetically in disease resistance. Current integrated pest management approaches used for turfgrass in Oklahoma are being evaluated and modified as needed. (2833)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Nathan Walker, Stephen Marek, Eric Rebek

The Effect of Fertilization and Low-Risk Fungicide/Herbicide Programs on Diseases and Weeds Common in Amenity Bermudagrass
Nitrogen and potassium fertilizers can influence turfgrass growth, weed infestation and disease. Excess fertilizer application or deficient rates can cause these problems to become more or less severe depending on the pest and rate of fertilizer. Two cultivars of bermudagrass will receive inputs of nitrogen and potassium fertilizers ranging from none to industry standards. Disease and weed encroachment will be evaluated as well as the efficacy of standard, reduced risk, and no fungicide and herbicide programs. The expected outcomes from this study are determining

the most cost effective approach to minimizing fertility and pesticide inputs to maintain high quality turfgrass.(2828)
Sponsor: Oklahoma Agricultural Experiment Station, Pest Management Alternatives Program
PI/PDs: Nathan Walker
Plant and Soil Science: Hailin Zhang,
University of Wisconsin: Damon Smith
University of Tennessee: Brandon Harvath, Jim Brosnan

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, agriculture 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. (1441)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Lynn Brandenberger, Niels Maness, Brian Kahn
Entomology & Plant Pathology: John Damicone
Agriculture Economics: Merritt Taylor

Studies of Alternate Bearing in Pecan

Pecan alternate bearing was identified as the leading problem by representatives of the production, shelling, and processing industries in a 2011 nationwide meeting to identified industry priorities. Research conducted by this project focuses on stabilizing pecan production while maintaining or improving quality. Examples of studies include mineral nutrition, ground cover management, and abiotic stress mitigation. In addition, research using sensors to diagnose nutritional problems in the field allowing timely correction is being investigated. Previous research in this project has reduced alternate bearing by changing pecan management. Current research promises to further reduce alternate bearing and improve quality. (1689)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Pecan Growers' Association, U.S.D.A Crop Germplasm Committee, U.S.D.A Specialty Crops Research Initiative
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, USDA

PI/PDs: Jeff Anderson
Plant & Soil Sciences: Shiping Deng

Improved Vegetable Crop Development through Sustainable Cultural Practices
The research will develop sustainable cultural systems for Oklahoma vegetable crops. Specifically, strategies will be identified to effectively manage pest populations in urban vegetable gardens with minimal insecticide use by encouraging natural enemies, and to enhance pollination services by increasing pollinator diversity and abundance. The research also will determine continuous production periods that could meet market demand for selected Oklahoma vegetable crops, including sweet corn and eggplant. (2026)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Brian Kahn

Development of Integrated Resource Management Systems for Turfgrass Culture in Oklahoma
Five hundred sixty experimental lines of St. Augustinegrass, bermudagrass, zoysiagrass and seashore paspalum from a multi-state consortium of five universities were screened during 2011 and 2012 for general field performance as well as drought resistance. Lines with elite drought resistance were found within each species and will be tested more extensively in 2013. Seven experimental putting green bermudagrasses with improved cold hardiness from our program were screened for general field performance against industry standards in 2012. Three elite OSU lines producing less thatch were selected for testing in the National Turfgrass Evaluation Program trials throughout the U.S. in 2013.
(2222)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Cooperative Extension Service, Oklahoma State Regents for Higher Education, United States Golf Association, Oklahoma Golf Course Superintendents Association
PI/PDs: Dennis Martin, Greg Bell, Justin Moss, Jeff Anderson
Plant & Soil Sciences: Yanqi Wu
Texas A&M Univ.: Ambika Chandra, Lloyd Nelson
Univ of Georgia: Brian Schwartz, Paul Raymer
North Carolina State Univ.: Susana Milla-Lewis
Univ of Florida: Kevin Kenworthy

Production, Establishment and Maintenance of Ornamental Plants in Oklahoma
Research has evaluated the response of several woody ornamental plant species for their response to adverse environmental conditions. One study found differences among three viburnum species in their response to drought stress. Some of the difference among species can likely be attributed to leaf area per plant and leaf characteristics that help reduce moisture loss, though these parameters were not measured in the study. Another experiment evaluated the effect of several fertilizers applied in the planting hole on growth and yield of tomatoes. Upon completion of data analysis, this study should provide an opportunity to better recommend fertilizers for maximum growth and yield and also should provide information on allocation of various nutrient elements in the plants. A third study investigated the use of plant growth regulators on growth of oakleaf hydrangeas. Shearing results in slowed growth and a decline in plant quality, so if growth can be slowed by chemical means rather than shearing, a greater number of quality plants can be grown and sold by nursery producers. (2324)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Janet Cole

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)
Sponsor: Oklahoma Agricultural Experiment Station

Develop Environmentally Friendly Procedures to Monitor and Enhance Turfgrass Quality
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)
Sponsors: Oklahoma Agricultural Experiment Station, United States Golf Association, Oklahoma Turfgrass Research Foundation
PI/PDs: Greg Bell, Dennis Martin, Justin Moss
Plant and Soil Sciences: Yanqi Wu, Chad Penn

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)
Sponsors: Oklahoma Agricultural Experiment Station, USDA-CSREES
PI/PD: Warren Roberts

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. Non-destructive sensors are being utilized to improve nitrogen efficiency in potted greenhouse crops (2726)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Department of Agriculture, Food & Forestry
PI/PD: Bruce Dunn

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 SCIENCES

Coordination and Reporting of Research Efforts in Human Sciences
Coordination and reporting of research efforts related to human nutrition, health, human development and family risk/resilience and consumer issues in Human Sciences. (2500)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Christine Johnson

EFNEP Related Research, Program Evaluation and Outreach
The Expanded Food and Nutrition Education Program (EFNEP) was established by Congress in 1968, when the plight of low-income American families, including hunger and malnutrition, came to public attention. The goal of EFNEP is to assist low-income audiences in acquiring the knowledge, skills, attitudes, and changed behaviors necessary for nutritionally sound diets, and to contribute to their personal development and the improvement of the total family diet and nutritional well-being. In 1969, the primary nutritional problems of EFNNEP participants were energy inadequacy and vitamin and mineral deficiencies which resulted in growth deficits. Current nutritional problems of limited-resource families include energy excess, resulting in overweight and obesity, and early development of chronic diseases. Further, the science of nutrition has revealed new diet-disease relationships, national dietary guidelines continue to evolve, and new food choice behaviors emerge as more food is purchased and consumed away from home. Given these significant societal changes, the methods EFNEP currently uses to evaluate dietary quality and program impact need to be reexamined. EFNEP and Extension leaders recognize the need to verify the validity of current approaches and/or develop new approaches for evaluating the EFNEP. (2692)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Nancy Betts, Josh Phelps

Nutrient Bioavailability-Phytonutrients and Beyond
Osteoporosis remains a major health problem in the United States and worldwide. Dietary recommendations have the potential to attenuate some problems associated with osteoporosis but data are needed on potential beneficial and harmful effects of nutrients and phytochemicals on bone. For understanding effects of micronutrients in human beings, work with populations in which deficiencies are common has the advantage of enhancing basic scientific knowledge about the effects and interactions of these deficiencies. Furthermore, data about nutritional status is being made available to stakeholders and policy makers which will hopefully be the basis for better agricultural and health policy decisions. (2693)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Barbara Stoecker

An Integrated Approach to Prevention of Obesity in High Risk Families
Parenting behaviors, attitudes, and styles have been identified as contributing high rates of childhood obesity and overweight. Research is needed that compares the relation to childhood obesity and overweight of parenting behaviors, attitudes, and styles that are focused on food with those that characterize aspects of family life other than meals and eating. (2767)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Laura Hubbs-Tait

The Role of Exercise in the Prevention of Bone Metabolic Changes Associated with Diet-induced Obesity
Nationwide, the prevalence of obesity is on the rise and Oklahoma is no exception. Approximately 31% of the state's population is obese and the prevalence of overweight in children is growing at alarming rates. Obesity is known to predispose adults and children to the early onset of chronic diseases, including cardiovascular disease, certain types of cancer and type 2 diabetes mellitus. In terms of skeletal health, obesity has been traditionally associated with decreased risk of osteoporotic fracture; however, recent evidence has suggested otherwise. This project is to begin to understand how exercise alters the bone metabolism in a model of diet-induced obesity and the implications of these changes on bone density, microstructure and strength. Understanding how obesity affects bone metabolism in the context of the growing animal is important for the development of appropriate prevention and treatment strategies in humans. (2795)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Brenda Smith, Edralin Lucas, Stephen Clarke
Oklahoma Medical Research Foundation: Tim Griffin

Personal Protective Technologies for Current and Emerging Occupational Hazards
Current events from hurricanes to sabotage of transportation systems highlight the importance of improving personal protective equipment for "first responders" and "first receivers" as well as members of the agricultural community. The project addresses the needs of all three groups and facilitates transfer of best practices among them. (2826)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Semra Peksoz, Adriana Petrova, Mary Ruppert-Stroescu

Safety and Wellbeing Issues of Wildland Firefighters Personal Protective Clothing
Fit and comfort concerns related to protective clothing of female wildland firefighters will be communicated to apparel manufacturers and federal government agencies. This initial dialog

will be the first step to making necessary changes in styles to personal protective clothing for female wildland firefighters with enhanced functionality via improvements in protective, physiological, and aesthetic attributes. (2827)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PDs: Adriana Petrova, Semra Peksoz

Food Systems, Health, and Well-being: Understanding Complex Relationships Dynamics of Change
While the importance of food to health and well-being is clear, the specific ways in which food systems contribute to individual and community health are not well understood. This is a complex issue, which requires improving food systems as well as changing mindsets and behaviors of individuals within the food system. The purpose of this project is to investigate these complex relationships, involving key stakeholders in analyzing and addressing problems and solutions. Our goal is to increase understanding of food and nutrition practices and systems, and to facilitate food-related institutional, community, family, and involved behavioral changes that can improve health and well-being. (2829)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Stephany Parker

NATURAL RESOURCE AND ECOLOGY MANAGEMENT

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 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: Samuel Fuhlendorf

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, Oklahoma Cooperative Fish and Wildlife 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: Thomas 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, USDA Forest Service Southern Forest Experiment Station, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma Department of Wildlife Conservation
PI/PD: Stephen 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, Oklahoma Department of Agriculture, Food, and Forestry
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

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

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

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 led 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: Oklahoma Agricultural Experiment Station, USDA AFRI
PI/PD: Samuel Fuhlendorf

Closure of Swine Lagoon Using Short-rotation Woody Crops
The objectives of this project are to: 1) determine the feasibility of using short-rotation woody crops to close lagoons in Oklahoma, 2) compare sycamore and cottonwood for use in such efforts in Oklahoma by evaluating survival and growth rate, 3) measure the rate of nutrient removal from sludge by measuring the nutrient capture by the aboveground biomass, and 4) test whether nutrient removal can be accelerated in woody crop systems. (2796)
Sponsors: Oklahoma Agricultural Experiment Station, OCAST, USDA Forest Service, USGS
PI/PD: Rodney Will

Improving Sportfish Management in Southern Reservoirs
The overall goal of this research is to provide knowledge necessary for the wise management of sportfish populations in lake and reservoir systems in the U.S. Specifically, the objectives are: 1) to assess commonly used fisheries gears to quantify bias and compare alternative sampling strategies to develop the best available fish population assessment approaches, and 2) provide knowledge needed to effectively manage catfishes, an understudied group of sport fish. (2797)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma Department of Wildlife Conservation
PI/PD: Daniel Shoup

Assessing Functions and Ecosystem Services Provided by the Wetlands Reserve Program in Oklahoma
This project seeks to improve our understanding of the effectiveness of Oklahoma WRP wetlands to provide functions and services. Objectives will be to: 1) use HGM to classify WRP wetlands throughout Oklahoma, 2) assess functional attributes of WRP wetlands and compare those attributes to natural wetlands, 3) develop functional models of WRP wetlands, and 4) create a long-term data set of biological and abiotic attributes of WRP wetlands that can be used to track development of WRP wetlands. (2798)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Cooperative Fish and Wildlife Research Unit, USDA Natural Resource Conservation Service, Oklahoma Conservation Commission, Oklahoma Water Resources Board
PI/PD: Craig Davis

Analysis of Ice Storm Damage in Shortleaf and Loblolly Pine Forests
The purpose of this study is to measure and assess ice storm damage on naturally-occurring shortleaf pine forests and on loblolly pine plantations in southeastern Oklahoma and western Arkansas. (2800)
Sponsors: Oklahoma Agricultural Experiment Station, USDA Forest Service
PI/PD: Thomas Lynch

Assessing the Effects of Environmental Stressors on Reptiles
The objective of this project is to improve our ability to conduct environmental risk assessments of reptiles relative to multiple stressors including parasitic diseases, environmental contaminants that result from pesticides, herbicides, and other anthropogenic causes, and rangeland and forest management practices. Specific objectives include: 1) evaluate the sensitivity of embryonic lizards to soil contaminants, 2) evaluate the effects of malaria parasites on the sensitivity of adult lizards to environmental contaminants, and 3) evaluate the effects of prescribed fire on the community structure of reptiles in grassland and xeric forest habitat. (2807)

Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Cooperative Fish and Wildlife Research Unit, US Army Center for Health Promotion and Preventive Medicine, US Army Engineer Research and Development Center
PI/PD: Larry Talent

Understanding Plant-soil Microbial Processes to Enhance Soil Carbon Sequestration in Bioenergy Feedstock Production
The Energy Independence and Security Act of 2007 mandates increased reliance on biofuels to reduce our dependency on foreign oil. It has been suggested that prairie grasses can provide a sustainable, low-input biofuel feedstock, while at the same time sequestering large amounts of soil carbon (C). We have studied the importance of mycorrhizas to prairie ecosystems, as well as their contribution to belowground C storage for over 25 years. We wish to apply this ecological knowledge towards the development of sustainable practices for biofuel feedstock production. (2808)
Sponsors: Oklahoma Agricultural Experiment Station, USDA AFRI
PI/PDs: Gail Wilson
Plant and Soil Sciences: Yanqi Wu
Argonne National Laboratory: R. Michael Miller
Northern Arizona University: Nancy C. Johnson

Prioritizing Targets for Avian Conservation in Dynamic Oklahoma Landscapes
Native bird populations have responded to declines in once abundant grassland species and increases of eastern forest species in the Cross Timbers. Conservation efforts focused on high priority species can be an efficient use of resources, but we need better information on distribution and abundance of multiple avian species in dynamic landscapes to determine what those priorities should be. We lack basic information on the quality of these habitat conditions for native birds. It is important to establish baseline understanding of how species respond to the unique habitat conditions in the Cross Timbers as those are forecasted to be increasingly variable over the next several decades. Native birds surveys will be conducted in Cross Timbers land cover types. The goal is to better inform the prioritization process with respect to native birds of the Southern Plains. (2809)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Cooperative Fish and Wildlife Research Unit
PI/PD: Timothy O'Connell

Measuring and Modeling the Flow Paths, Travel Distances, and Delivery of Sediment from Forest and rural Unpaved Roads to Streams in Oklahoma
Roads are considered to be the greatest long-term source of sediment from forest management activities. This project focuses on the measurement and modeling of sediment delivery to streams from forest and other unpaved roads found in forest lands in Oklahoma and neighboring regions. This study will assist forest and water resource managers to make better judgments about the true effects of forest roads on water quality and the effectiveness of Best Management Practices. (2814)
Sponsors: Oklahoma Agricultural Experiment Station, USDA Forest Service Southern Forest Experiment Station and Ouachita National Forest, Weyerhaeuser Company
PI/PD: Donald J. Turton

PLANT AND SOIL SCIENCES

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
Grasses employed in pasture, range, and turf plantings are economically, environmentally, and societally important. 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 the OAES for biofuel feedstock and forage production in February, 2008. Two new turf bermudagrass clonal selections had outstanding performance in multiple locations of the National Turfgrass Evaluation Program Bermudagrass Test. The two turf bermudagrass clones, OKC 1119 and OKC 1134 were released by the Oklahoma Agricultural Experiment Station in July 2010. OKC 1119 is officially named Latitude 36 while OKC 1134 has a name of NorthBridge. The two new turf cultivars have been licensed for commercial production since 2011. As of writing the report, there are nine sod producers who have obtained licenses to produce sod for the two turf bermudagrasses in the US. (1361)
Sponsors: Oklahoma Agricultural Experiment Station, U.S. Golf Association, USDA, Oklahoma Turf Research Foundation, Oklahoma Bioenergy Center, Sun Grant Initiative, NSF EPSCoR
PI/PD: Yanqi Wu

Wheat Breeding
Pureline winter wheat cultivars are developed in this project through field-based selection procedures supplemented by accelerated breeding tools in the form of molecular markers and doubled haploids. 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 the past two crop years 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. Most cultivars developed by this project are products of the **Graze**n**Grain** breeding system, which combines mass selection methodology with target selection in early-planted, grazed production systems. Duster, another product of this breeding system, was the third leading variety in the 2010-2011 crop season, a ranking likely to increase in future years. Since its release in 2006, we have substantiated essential qualities of rapid stand establishment, non-precocious winter dormancy release, and above-average recovery from grazing. Its acid-soil tolerance, Hessian fly resistance, and foliar disease resistance lends added versatility for widespread production in the southern Plains. Leaf rust resistance in Duster is conferred by the unique gene combination of Lr3, Lr11, Lr34, plus one additional unnamed gene. Two HRW cultivars were released by OSU in 2011, Garrison and Ruby Lee. Garrison will provide an alternative to Endurance with similar maturity but improved disease resistance, yield potential, and baking quality. Ruby Lee will be targeted for production under intensive management for maximum economic returns on producer investments. It also provides a unique combination of early maturity and elevated cold hardiness. (1426)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Wheat Research Foundation, USDA-ARS, USDA-NIFA
PI/PDs: Brett Carver, Liuling Yan, Jeff Edwards, Art Klatt, Joe Armstrong, Gopal Kakani, Chad Penn
Entomology and Plant Pathology: Bob Hunger, Kris Giles, Tom Royer
Biochemistry and Molecular Biology: Patricia Rayas

Soybean Variety Testing and Improvement
Soybean variety test were conducted at several location during the 2011 growing season. Early season cultivars were planted at 4 different locations throughout Oklahoma, while full season tests were conducted at 9 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.oilseeds.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
The Greenseeker NDVI sensor invented at Oklahoma State University is now the benchmark equipment used for biomass determination in the world. More recently, OSU worked to develop the Optical Pocket Sensor (also NDVI) that has since been extended in China, India, Mexico, Nepal, Brazil, and various locations in the USA. 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 29 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. Farmers in the Yaqui Valley, Ciudad Obregon, Mexico how have many years of experience, increased revenue exceeding $40.00 per acre using the Greenseeker nitrogen fertilization approach. Our list of on-line algorithms now include versions that can be accessed by phone, and one that is generalized whereby it also works for different crops. 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)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Bill Raun

E**nvironmentally 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: Shiping Deng

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
Natural Resources and Ecology Management: Sam Fuhlendorf
Horticulture and Landscape Architecture: Jeff Anderson

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 and researchers in the Southern Region. Plant germplasm distribution data received from S-9 indicate that 529 plant accessions maintained at the Plant Genetic Resources Conservation Unit at Griffin, GA were distributed to organizations or individuals in Oklahoma the last year. The

accessions were distributed in 13 requests. The requested plant germplasm in 2011 included sorghum (*Sorghum bicolor* and *S. intrans*) (465 accessions), sweet potato (*Ipomoea batatas*) (11 accessions), Zoysiagrass (*Zoysia* sp.) (46 accessions), Lablab legume (*Lablab purpureus*) (1 accession), switchgrass (*Panicum virgatum*) (2 accessions), and African bermudagrass (*Cynodon transvaalensis*) (4 accessions). Receivers of the plant accessions represent researchers of Oklahoma State University, USDA-ARS laboratories, local companies and individual Oklahomans. (2547)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Yanqi Wu

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 and accounts for more than 60% of the 2.6 million hectares of wheat planted in Oklahoma annually. This unique system requires different management practices and cultivar characteristics than a standard grain-only system and necessitates a research initiative that gives proper attention to both systems. The primary emphasis of this project is to develop improved management practices and recommendations for grain-only and dual-purpose wheat producers in the region. Research efforts in this project include evaluation of the suitability of currently released wheat cultivars and experimental lines for production in Oklahoma under both grain-only and dual-purpose systems. Information and findings will be distributed to stakeholders via extension meetings, website, mass media, and direct mailing through a weekly periodical insert in mid-July. Progress towards goals and objectives will be determined according to the number and quality of improved cultivars released to the public and acreage reports detailing adoption of improved cultivars. (2581)
Sponsors: Oklahoma Agricultural Experiment Station, Department of Plant and Soil Sciences, Oklahoma Wheat Commission, USDA-CSREES
PI/PD: Jeff Edwards

Development of Molecular Markers for the Developmental Phase Transition and Their Application in Breeding of Winter Wheat
Using RIL#23 from the population of recombinant inbred lines (RILs) generated from the locally adapted cultivars, Jagger x 2174 to cross with the parental line 2174, we have created a backcross population that showed that segregation for vernalization requirement duration was controlled by a major gene. We mapped this gene on the long arm of chromosome 5A, in a region including the recessive *vrn-A1* gene in winter wheat. The *VRN1* was cloned based on variation in vernalization requirement between spring wheat and winter wheat; therefore, it is anticipated that the recessive *vrn-A1* gene controlling quantitative vernalization requirement duration has a different mechanism from the dominant *Vrn-A1* gene controlling spring growth habit without vernalization requiremnt. We are approaching to the gene responsible for vernalization requirement duration in winter wheat. (2616)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Liuling Yan

Characterization and Identification of Productivity Associated Rhizobacteria in Wheat
The rhizosphere is the portion of the soil plant interface under the influence of the plant, composed of millions of distinguishable microorganisms, sustained by plant produced photosynthate and critical for maintenance of plant productivity. Up until now due to the

enormous biological complexity resident in the rhizosphere we have yet been able to characterize those elements directly connected to the productivity. In collaboration with Joshua Habiger (Statistic) we developed and published a novel and powerful approach to identify those organisms most linked to plant productivity (*Applied and Environmental Microbiology 78: 4434-4446*). In so doing we identified 42 positively and 39 negatively associated bacteria. From this research it appears that shoot productivity mechanisms associated with rhizosphere most likely reflect the balance between growth promoting and deleterious rhizobacteria. Overall community rhizobacteria diversity was nonlinearly related to productivity tightly modeling a cubic equation. The nonlinear response may reflect the balance between exudates stimulated growth and plant selectivity mechanisms within the plant microbe interaction. This study, for the first time, identifies the rhizobacteria that make up the productive and the unproductive rhizobacteriome. (2626)
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 several crop rotations were established. This past year activities have included analyzing data from grain sorghum, corn, and sunflower. 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 several extension meetings in western Oklahoma. (2628)
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 and characterized for investigation in regard to their ability to sorb nutrients (phosphorus and nitrogen). This includes drinking water treatment residuals, slag from steel production, fly-ash, and waste gypsum. We have constructed a phosphorus removal structure designed to filter phosphorus out of runoff from areas with excessive soil phosphorus levels. The structure is constructed such that the by-products (P sorbing materials; PSMs) are contained and runoff water is channeled through them to achieve a desired retention time. After the materials are spent and no longer remove phosphorus, they can be removed from the structure and replaced with fresh materials. Several structures have been constructed in drainage ditches on the Eastern Shore of Maryland, and one urban structure has been constructed in Stillwater, OK in a residential neighborhood. (2658)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Chad Penn

Genetic Relationship Between Dormancy and Temperature in Winter Wheat
In the previous study, we found that high temperature germination sensitivity was genetically controlled by a major QTL (*Qhtgs.osu-3A*) on the short arm of chromosome 3A in the winter wheat populations of recombinant inbred lines (RILs) generated from the locally adapted cultivars, Jagger x 2174. The effect of *Qhtgs.osu-3A* on seed germination was eliminated when the seed was treated with low temperature consistent when the seed was treated with room temperature. We have found that the gene *MFT*, a gene that was reported to control seed germination in spring wheat, was located on the peak of *Qhtgs.osu-3A*. We are sequencing the

MFT gene to find allelic variation associate with temperature germination sensitivity in winter wheat. (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. We 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 (CRP), and land under winter wheat cultivation. During 2009 and 2010, two samplings were conducted each year with one in the spring and one in summer. For switchgrass plants in the native range and CRP sites we obtained data on protein, chlorophyll, and reducing power. Plant biomass production and diversity were determined for the overall plant communities. Preliminary data indicate that chronic plant stress parameters were affected more by season than by ecosystem management. For soil samples, we evaluated chemical, biochemical, and microbiological properties, including pH, organic carbon content, microbial biomass carbon, multiple enzyme activities, water-stable aggregation, and composition and structure of the soil microbial community using fatty acid methyl ester analysis. Roots isolated from soils were evaluated for arbuscular mycorrhizal intra-radical colonization. Preliminary data suggest that after six years of conservation, the soil ecosystems under CRP are not significantly different from their actively farmed counterparts. Grazing activities stimulated plant growth and enhanced soil microbial activities, which led to strengthen ecosystem health and function. Data obtained support our long-term goal to provide integrated scientific data and strategies to promote restoration of degraded ecosystems and enhance the sustainable integrity of rangelands. (2701)
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
The great drought of 2011 devastated both dryland and considerable irrigated cotton in southwestern Oklahoma. About 80 percent of the state's 415,000 planted acres failed. In spite of the loss of a large majority of applied research trials due to extreme drought in 2011, we were able to complete several harvest aid projects. These projects were divided into two groups. Two of the projects were demonstrations which were strategically placed in high traffic areas in surviving subsurface drip irrigated cotton fields in far southwestern Oklahoma. The treatments applied within each of these demonstrations represented the most effective options available to Oklahoma cotton growers based on the crop condition at time of application. Producers were allowed to personally evaluate the effectiveness of these treatments and to utilize these demonstrations to help make the best decisions for their operations. Both of these demonstrations received considerable traffic from both western Oklahoma and the far eastern

Texas panhandle areas. A harvest aid/harvesting field day was held, and over 50 clientele attended the meeting. In addition to the two demonstrations, two replicated applied research trials were also established. These trials evaluated the effectiveness of currently available treatments compared to a product with potential for future harvest aid labeling in Oklahoma. Data from this work supported the labeling of a new harvest aid product for Oklahoma in 2012. As with any new harvest aid option, it will take additional time to determine the best fit. Results from these replicated trials were published in our "2011 Extension Cotton Project Annual Report" and were also presented at the Beltwide Cotton Conference in Orlando, FL in January, 2012. Copies of the annual report were provided to producers, Extension and industry personnel, and it was posted on our Website. Similar projects are planned for multiple locations in 2012. (2722)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Randy Boman

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. Soil moisture is often a limiting factor for plant growth, but little is known regarding soil moisture dynamics under current and potential cropping systems in Oklahoma. This project is expanding the knowledge base on soil water dynamics under annual and perennial crops, as well as rangeland, in Oklahoma. In the past year, we have continued field measurements of soil water dynamics to 2-m depth under forage sorghum, mixed grasses, and switchgrass, potential bioenergy feedstocks. We have continued monitoring soil water dynamics under rangeland and wheat, soybean, grain sorghum, and sunflower. We have also created a plant-available water monitoring system based on the Oklahoma Mesonet. These efforts are resulting in new understanding about soil water dynamics in Oklahoma agroecosystems and will ultimately contribute to identification of improved land management practices. (2735)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Tyson Ochsner

Bioenergy Crop Production: Toward Realizing Yield Potential
Diversified bioenergy crop production is the key to enhance sustainability and biomass supply to bioenergy industry in the State of Oklahoma. The diversified crop production will also enable improve economic status and farm sustainability of small farmers in Oklahoma. Agronomic adaptation of diverse bioenergy crops (lignocellulosic, sugar, and oilseed crops) and their best management practices are being evaluated using field research stations across Oklahoma by conducting replicated, multi-location, small plot tests. Morphological and physiological traits for improved tolerance to water and nitrogen were identified in switchgrass. In collaboration with OSU switchgrass breeding program, new and improved germplasm is being evaluated for agronomic and physiological traits for improved potential yields and geographic variation across Oklahoma. Research is continuing with other bioenergy crops using field, green house and controlled environment studies. Biomass production potential of the CRP acres (~1M) in Oklahoma is being evaluated through a Regional Feedstock Partnership program. Identified traits for abiotic stresses are being analyzed and verified through tissue culture, proteomic and other techniques and integrated into the appropriate breeding programs in Oklahoma. Collaborations were initiated with national (USDA-ARS - Energy Cane and Camelina) and

international (ICRISAT- Sorghum) organizations to improve bioenergy crops profile in Oklahoma. Research is being initiated in collaboration with WIT to improve drought and temperature tolerance in Wheat. Several in-state and multi-state teams are being developed to address regional feedstock production issues through SunGrant and Industry collaboration. 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 are utilized to assess the rate of soil carbon sequestration under soil conservation management practices. The first two approaches utilize farmer-cooperator fields. The first approach compares fields under conservation management to conventionally tilled fields. This quick assessment of carbon sequestration potential suggests that after conversion no-till soils sequester 0.5 Mton C_2O acre^{-1} yr^{-1} with a 90% confidence interval of ±0.7 Mton CO_2 acre^{-1} yr^{-1}. The second approach of long-term monitoring on farmer-cooperator fields under conservation management will improve this estimate. The third approach involves 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

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. This project consists of multistate research cooperation to advance understanding of mass and energy transport in the vadose zone. At Oklahoma State University, we are using a combination of direct measurements and pedotransfer function modeling to determine the soil water retention characteristics as a function of depth at the sites of 116 automated weather stations comprising the Oklahoma

Mesonet. The water retention curves will be used, together with existing Mesonet sensors and spatial scaling theory, to generate real-time maps of soil profile water storage and plant available water for the state of Oklahoma. (2771)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Tyson Ochsner

Leaf lamina Development: Understanding the Genetic Network of Biomass Accumulation
Photosynthetic carbon assimilation, which directly or indirectly supports all terrestrial life on earth, almost exclusively occurs in leaves. The size, shape and arrangement of leaves on a plant determine its photosynthetic and transpiration efficiency, and the fitness of the plant to a given environment. We have recently cloned the *Medicago* WOX gene *STENOFOLIA* (*STF*) and shown that *STF/LAM1* is necessary and sufficient for leaf blade outgrowth and vascular patterning in widely diverged dicot species *Medicago truncatula* and *Nicotiana sylvestris*. Unlike most leaf axial polarity factors, *STF* is expressed at the adaxial-abaxial junction of the middle mesophyll and leaf margins, and regulates blade outgrowth by promoting cell proliferation. Using the classical bladeless *lam1* mutant of *Nicotiana sylvestris* as a genetic tool, we examined the function of the *Medicago truncatula WOX* gene, *STENOFOLIA* (*STF*), in controlling leaf blade outgrowth. Introduction of mutations into the WUS-box of STF (STFm1) significantly reduced its ability to complement the *lam1* mutant. Fusion of an exogenous repressor domain to STFm1 restores complementation while fusion of an exogenous activator domain to STFm1 enhances the narrow leaf phenotype. These results indicate that transcriptional repressor activity mediated by the WUS-box of STF acts to promote blade outgrowth. With the exception of *WOX7*, the WUS-box is conserved in the modern clade *WOX* genes, but not found in members of the intermediate or ancient clades. Consistent with this, all members of the modern clade, except *WOX7*, can complement the *lam1* mutant when expressed using the *STF* promoter, but members of the intermediate and ancient clades cannot. Furthermore, we found that fusion of either the WUS-box or an exogenous repressor domain to WOX7 or to members of intermediate and ancient WOX clades results in a gain-of-function ability to complement *lam1* blade outgrowth. These results suggest that modern clade *WOX* genes are evolved by acquisition of the WUS-box to provide transcriptional repression activity for promoting cell proliferation. Current experiments are focused on identifying the downstream targets and interaction partners of STF using EMSA and Y2H techniques, respectively, to better understand the mechanism by which STF orchestrates its developmental and metabolic functions. The outcomes of this research will enlighten our understanding of the mechanism of vegetative biomass accumulation in plants which will facilitate our ability to improve biomass feedstock in energy crops. (2782)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Million Tadege

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 (FAPC) 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 fifteen (15) years of service to Oklahoma, the FAPC has assisted more than 1,000 Oklahoma businesses with more than 3,000 projects resulting in impacts of more than $2 billion in annual sales revenue and more than 8,500 jobs. Additionally, the FAPC has incubated and contributed significantly to 60 successful start-up

businesses resulting in more than 300 employees working in more than 35 communities across Oklahoma, resulting in more than $10 million in annual sales revenue. Core strengths of the FAPC include food safety and food microbiology, horticultural products and processing, grain products and processing, meat and poultry products and processing, oilseed products and processing, food sensory technology, food process engineering, wood products and processing, food processing economics, quality manufacturing and management, business and marketing of food products, and media and communications delivery of information on the food industry. The FAPC has continued to significantly contribute to the economic growth and well-being of every geographic quadrant of the State of Oklahoma. (2501)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: J. Roy Escoubas

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 was completed on the economic impacts of a hypothetical cellulosic ethanol production facility proposed for Oklahoma. The study resulted in a thesis, two presented papers at professional meetings, and a forthcoming peer-reviewed publication. Regional food processors were surveyed to determine the potential economic impacts of proposed sodium reduction policies on their operations. This information resulted in a completed thesis, two presentations at industry conferences, and a forthcoming presentation at the 2012 Food Distribution Research Society conference. A study was also undertaken to examine the geographically diverse impacts on agriculture associated with U.S. dietary changes to meet the 2010 Dietary Guidelines for Americans. To date, the results have been partially included in a peer-reviewed journal article, and detailed results of the study were presented at the 2012 Agricultural and Applied Economics Association 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 the detection, isolation, and characterization of pathogenic and spoilage microorganisms in food and food processing environments. The purpose is to reduce the incidence, survival , and/or proliferation of pathogenic or spoilage microorganisms in food by using physical, chemical, or biological control mechanisms It further involves approaches for genetic analysis and rapid diagnostic detection of foodborne pathogens or their toxins. (2642)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Peter Muriana

Improving Industrial Uses of Cereal Grains
We investigated the effects of the surface active additive diacetyl tartaric acid ester of monoglycerides DATEM on isolated gluten to estimate the effect on protein-protein interactions by a creep-recovery test. Creep-recovery parameters were compared to empirical rheological methods used as indicators of quality in their discriminatory abilities of explaining the variance. Changes in gluten viscoelasticity, dough mixing, fermentation and baking properties were evaluated. DATEM increased the time constant of gluten recovery and loaf volume at 0.3 and 0.6% while 1% decreased both. The effect of DATEM on dough properties was better captured in the fermentation properties with a major effect on volume of CO_2 lost. Evidence of increased time constant and decreased recoverable strain of gluten plus decreased volume of CO_2 lost in

dough suggest that DATEM favors a more entangled network in which polymer chains move slower resembling larger average molecular mass compared to the control. The combination of flour protein, mixing breakdown time and selected fermentation properties were the best predictors of loaf volume (R^2 = 0.814). The next step is the elucidation of the effect of DATEM on other flour components. (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/PD: 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 antigens. Such genetically engineered vaccines could provide greatly improved immunity against Shipping Fever. (2752)
Sponsors: Oklahoma Agricultural Experiment Station, USDA CSREES, Agriculture and Food Initiative Competitive Grant
PI/PDs: Anthony W. Confer, Sahlu Ayalew

Characterization of Tick Genes Involved in the Tick Developmental Cycle and Transmission of the Cattle Pathogen, *Anaplasma marginale.*
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: Oklahoma Agricultural Experiment Station
PI/PDs: Katherine M. Kocan, José de la Fuente, Edmour F. Blouin

Nuclear Receptor Gene Expression in the Bovine Preimplantation Embryo Produced in Vitro
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

Pathogenesis, Diagnosis, Treatment, Prevention and Control of Livestock Diseases
This project covers agricultural and biomedical research funded by sources other than USDA that contributes to total research capacity of the OSU Center for Veterinary Health Sciences (CVHS). We are developing strategic alliances with partner institutions and the private sector and growing the supporting infrastructure. Consequently, publications are presented as evidence of progress and productivity. Expenditures for these non-USDA projects came from Federal, State and private funding sources, including biological and pharmaceutical corporations. (2061)
Sponsor: Oklahoma Agricultural Experiment Station
PI/PD: Jerry Malayer

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 ePI/PDdemiology. 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 diffentiation of vaccine strains from field strains in vaccinated animals. The prevalence of PI/PD animals in Oklahoma beef herds will be determined using immunehisto-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

PI/PDs: Robert W. Fulton, Anthony W. Confer. 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