Division of Agricultural Sciences and Natural Resources – FY 2004 Research Abstracts

AGRICULTURAL ECONOMICS

Improving the Efficiency of Markets and Institutions

The goal of this project is to increase the use of marketing tools, which can help producers increase income or reduce risk; to increase the efficiency of the marketing system in terms of providing incentives for producers to produce what consumers want; and to determine the efficiency of public institutions such as public schools and public data collection. (2170)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma State Regents for Higher Education, Oklahoma State University Foundation
PI: Wade Brorsen

Agricultural Water Management Technologies, Institutions, and Policies Affecting Economic Viability and Environmental Quality

This project will evaluate the farm-level economic and environmental implications of alternative resource-conserving irrigation technology and water management systems. (2257)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Arthur Stoecker

Costs, Returns, Feasibilities, and Risks of Producing Cucurbit Crops in Oklahoma

This project determines for Oklahoma researchers and farmers the economic and financial feasibility of cucurbits (watermelon, cantaloupe, muskmelon, squash, cucumber, and pumpkin) under alternative production strategies. Specific objectives are first to identify economically viable and sustainable production practices and enterprise budgets for cucurbits in Oklahoma similar to those developed for other crops. These production practices and budgets will reflect a whole farm approach including other crops involved in the rotations. The budgets will estimate land, capital, equipment, and labor physical input requirements and associated costs for cucurbit crops under Oklahoma conditions for a variety of production strategies, including meeting organic certification requirements. The second objective is to determine the potential financial and economic feasibility that cucurbit crops have for providing a main or supplemental source of income for Oklahoma farmers. Estimates of the variability in economic returns will be determined as well as point estimates of average returns. (2348)
Sponsors: Oklahoma Agricultural Experiment Station, Wes Watkins Agricultural Research and Extension Center, Texas A&M University
PI: Merritt Taylor

Products Processing and Distribution Industries

The overall objective of this project is to analyze ways to develop and enhance the value-added food and agricultural products industries in Oklahoma. Specific objectives include examining factors affecting the location and/or relocation of agribusiness of Oklahoma. More specifically, identify factors that have led to an industry's presence, expansion, and/or decline in the state. Another objective of the project is to assess the market potential for new and/or niche value-added food and agricultural products that may

present opportunities for Oklahoma's production agriculture. These assessments are a crucial component of the strategic planning process that will help ensure the success of small/niche agribusiness firms (Phillips and Peterson, 1999). A final objective is to identify and evaluate the opportunities for and feasibility of value-added activities for Oklahoma's primary agricultural commodities (i.e. livestock, wheat, poultry, corn, and milo) and alternative crops (e.g. guar, eastern red cedar, high-antioxidant horticultural crops, etc.), including assessments of business and market risks. To achieve the objectives, research projects are proposed for testing the several hypotheses. Hypotheses associated with factors affecting agribusiness processing activities and distribution center location decisions include: 1) Policymakers and community leaders do not fully understand the many factors that play a role in the location, relocation, expansion, and/or statewide exit of value-added processing/distribution centers; 2) Given the diversity of Oklahoma's production agriculture and the increasingly innovative industrial uses for co-products from production agriculture, unexplored market opportunities exist for technology-generated derivatives from Oklahoma agriculture; 3) Opportunities exist for producer coalitions to generate additional income from their raw agricultural production through the development of producer-owned processing operations in Oklahoma. (2349)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Food and Agricultural Products Center, Oklahoma Wheat Commission, University of Arkansas
PI: Rodney Holcomb

Determination of the Factors that Influence Changes in U.S. Land Use Patterns
Generally the objectives fall into three broad research areas including the estimation of the land use trends and productivity, the factors responsible for these trends, and new land use projections. This project will identify the general trends (patterns) in the U.S. land use changes and estimate the effect of changes in U.S. agricultural policy (e.g. commodity programs, conservation and environmental programs, credit, etc.) on land use changes. For a selected set of counties in several USDA regions, the project will identify the amount and location of land that has a potential to convert from one major land use to another based upon physical characteristics. The project will also identify the socioeconomic characteristics that may encourage or discourage the conversion of land with the physical potential for conversion and will examine the potential for expansion of the results from B-2 to all areas of the United States. The project will develop new or modify existing models to predict the location of specific land use changes and will predict location-specific land use changes under alternative economic and policy scenarios. Finally, the project will estimate the impact of these predicted land use changes on prices, incomes, and local economic activity. (2361)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Michael Dicks

Competitiveness, Value-Added, and Risk in the Oklahoma Grain and Oil Seed Industry
This project will identify new and emerging value-added markets for grains and oilseeds. The project will also analyze the responsiveness of these markets (e.g. to own price, price of complements, price of substitutes, income, transportation costs, and exchange rates). Finally, the project will analyze the competitiveness and risk management of grains and oilseeds in new uses under alternative supply and demand scenarios. (2362)
Sponsor: Oklahoma Agricultural Experiment Station

PI: Robert Oehrtman

Economic Analysis of Management Strategies to Use Livestock and Poultry Waste in Oklahoma
The overall objective is to decide optimal sizes and types of livestock and poultry production and waste management systems that meet environmental constraints for water and air quality in Oklahoma. Specifically, for representative livestock and poultry producers, the research would evaluate the effect of air and/or water quality constraints on the: 1) cost of production, 2) most cost effective modifications to existing facilities to meet increased environmental constraints, 3) implications of new research findings on cost and management of animal waste, 4) optimal type and size of waste management system, 5) optimal type and size of poultry or livestock production facility, and 6) sustainability of crop and livestock production systems in selected locations in Oklahoma. (2363)
Sponsors: Oklahoma Agricultural Experiment Station, North Carolina State University
PI: Arthur Stoecker

Economic Diversification and Community Development Options/Models for Rural Oklahoma
The overall objective of the proposal is to analyze alternative development strategies for rural Oklahoma communities to aid in diversifying and strengthening the local economy. Specific objectives include: 1) developing a community simulation model and procedures to analyze impacts of change in the local economies of rural Oklahoma communities, and 2) Assessing trends and forces shaping retail/small business performance in rural or small communities for Oklahoma. (2364)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma State University Foundation, Oklahoma State Regents for Higher Education
PI: Michael Woods

Economic Analysis of Alternative Agricultural Production Systems for Oklahoma
The overall objective of this project will be to evaluate the economic consequences of agricultural production alternatives for Oklahoma. Impacts of alternative practices and systems on expected net returns, variability of returns, and input requirements will be investigated. 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, with respect to expected net return, production and financial risk, and rate of return on resources, of alternative production systems compared to existing ones, and 2) determine environmental trade-offs between alternative and contemporary production systems. (2403)
Sponsors: Oklahoma Agricultural Experiment Station, USDA
PI: Francis Epplin

The Evolution of Institutions and Coordination in Agricultural Production and Marketing Systems
The specific objectives of this project are to: 1) create a revised paradigm that integrates cultural change, values and norms, psychology, value differentiation and complementarities into a comprehensive theory of institutional change in agricultural markets; 2) determine how producers experienced with various contracting, identity preservation, alliances, and

value-based pricing systems evaluated the costs and benefits of participating in those systems; 3) evaluate the characteristics, attitudes, and beliefs of producers that are most likely to participate or not participate in alternative coordination systems; 4) determine whether rural elevator managers and directors could adopt value-based pricing and identity preservation storage and shipment strategies that would provide higher prices for specific types of food and feed grains and better serve the needs of grain processors; 5) identify and describe the characteristics of strategic alliances in agricultural industries; 6) estimate the costs, benefits, and net benefits of existing strategic alliances in beef and wheat; 7) determine whether beef processors would adopt value-based pricing that provides rewards for producers in strategic alliances for supplying higher quality products and allow the processors to better serve developing branded product, institutional, and restaurant markets. (2404)
Sponsors: Oklahoma Agricultural Experiment Station, USDA Rural Business Cooperative Service
PIs: Dan Tilley, Clement Ward, Phil Kenkel

Imperfect Markets in Rural Economic Development
The general objective of the proposal is to evaluate the effects of selected imperfect markets on rural economic development in Oklahoma. Specific studies are identified in the next section on procedures. However, study objectives include: 1) the effects of imperfect competition in the timber processing industry on raw material prices, forest land rents, regional income and employment, and regional household welfare; 2) determining under- or over-investment in rural transport infrastructure and research and development in food processing as public goods; 3) assessing the effects of externalities on natural resource projects and the impacts on rural economic development; and (4) addressing issues of market interdependencies, data and parameter estimations in general equilibrium modeling, and methods of formulating and evaluating policies for correcting effects of imperfect markets. (2405)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma State Regents for Higher Education
PI: Dean Schreiner

Changes in Ag Input and Output Markets as a Result of Scientific Developments in and Regulation of Biotech
This project analyzes the effects of biotechnology developments on farm costs, returns, competitive positions, and spatial location of production and marketing institutions. The project describes federal and international policy developments in the biotechnology sector and determines how those policies affect the market for U.S. agricultural products. It also determine the market shares, size and number of firms, types of alliances, product mix, number of patents of firms in the farm supply sector, and the effects of proposed mergers and alliances on industry concentration. The project determines the impacts of business conduct, including tying arrangements, contract prohibitions, aggressive patent enforcement, and other practices on structure and performance in the agricultural input supply sector. (2406)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Marcia Tilley

Systems for Controlling Air Pollutant Emissions and Indoor Environments of

Poultry, Swine, and Dairy Facilities
This project develops and improves sustainable systems to reduce air pollution emissions from poultry, swine, and dairy buildings and improves indoor air quality. (2419)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Arthur Stoecker

Resource and Environmental Economics of Animal Production and Land Use
The objectives of this research program are twofold: 1) to address natural resource and environmental issues of relevance to Oklahoma and the nation, and 2) to contribute to the developing theoretical and empirical economic literature on contracting and policy design over natural resource and environmental issues. (2431)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Tracy Boyer

Management and Information Support for Oklahoma Farmers and Ranchers
Determine and report average Oklahoma land values for cropland and pasture by region. Collect and report typical cropland and pasture rental arrangements for Oklahoma. Collect and report normal custom rate charges for fieldwork and planting, haying, harvesting, and livestock management activities. (2432)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Tax Commission
PI: Darrel Kletke

Providing Essential Rural Infrastructure with Emphasis on Health
The overall objective of this research project is to develop economic tools and incorporate them into educational materials and technical assistance programs for rural decision makers as they make decisions relative to structural changes in their community delivery system. More specifically, the objectives are discussed by service. PRIMARY HEALTH CARE: objectives are to develop budgets of primary care health services that enable decision makers to design a financially sound system meeting needs of their population, to further research the importance of the health sector on a rural economy, and to measure the impact of critical access hospitals on health delivery and the community's economy. SOLID WASTE: objectives are to develop budgets that enable decision makers to design a financially sound system and to further investigate rural collection systems, which address illegal dumping problems. EMERGENCY MEDICAL SERVICES (part of Primary Care but problem is such that it needs special attention): objectives are to update budgets such that decision makers can evaluate costs of alternative delivery systems and to study alternative systems to determine if they are cost efficient and medically effective. (2433)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: Gerald Doeksen, Michael Woods

Economics of Oklahoma's Swine Industry, Selecting Swine Production-Waste Management-Marketing Systems and Strategies
The overall objective of this project is to identify resource requirements and management practices associated with economically feasible swine production systems. In addition this project will determine the economic feasibility of increased swine production and processing and the impacts of economic, community, and environmental resources in Oklahoma. The objectives studied are dependent on evolving support and interest. The objectives are: 1) to determine resource requirements, operating costs, and economic

returns for selected swine production systems under alternative management systems and ownership structures; 2) to identify management and human capital, financial, land (crop) base, and other resource characteristics of farms where each swine production system would best fit; 3) to identify and evaluate financial, production, marketing, and personnel management strategies that enable independent and contract swine producers to reach management objectives in an uncertain environment; 4) to delineate the economic conditions under which Oklahoma producers have a comparative advantage in swine production and the conditions necessary for and upper limits of economically feasible swine industry expansion (production and processing) in Oklahoma given a global market for both swine and pork and increased concern for environmental resources; and 5) to identify, update, and evaluate the impact of the swine industry on economic, community, and environmental resources. (2434)
Sponsors: Oklahoma Agricultural Experiment Station, University of Missouri-Colombia
PIs: Bailey Norwood, Derrell Peel, Arthur Stoecker, Michael Woods

Economic Research on Livestock Production, Marketing, and Industry Issues
The overriding objective of this project is to generate information enabling individual producers and groups of producers to make informed marketing-related decisions. Specific objectives fall into three categories: 1) evaluate production-marketing alternatives on the basis of their potential for enhancing producer profitability, 2) determine how to effectively use alternative methods of price discovery and coordination, and 3) assess impacts from consolidation and related issues from alternative market or legislative remedies. (2471)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Clement Ward

Costs, Benefits, and Risks of Integrated Pest Management in Grain Storage 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 to: 1) estimate costs and risks associated with chemical-based and IPM-based pest control strategies in stored grain facilities, and 2) estimate costs and risks associated with chemical-based and IPM-based pest control strategies in food processing facilities. These objectives directly address the priorities in the Division's Strategic Plan (DASNR, 1999). (2489)
Sponsor: Oklahoma Agricultural Experiment Station
PI: 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. Specific objectives include measuring the efficiency gains of coordinating cooperative grain handling, fuel and fertilizer delivery, fertilizer and plant protection application, and other key services over larger geographic areas and develop information and decision support tools to firms considering these arrangements.
A second objective of the project is to determine the factors affecting the success of mergers and other collaborative arrangements among Oklahoma cooperatives during the past ten years and the factors affecting the success of these arrangements. Factors hypothesized to have an impact on merger success include the debt and equity and

profitability characteristics of the cooperative firms, the size of cooperative, similarity in operations and departments and management style. A third objective of the project is to determine the factors impacting the feasibility of value-added processing activities and develop information and decision support tools to help producer groups determine the feasibility and risk of New Generation Cooperatives and other producer-owned value-added efforts. The project's final objective is to investigate the feasibility of common types of shared-service cooperatives in Oklahoma and develop information and decision support tools to assist farmer producer groups, businesses and public agencies evaluate the potential for shared-service cooperatives. (2491)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma State Regents for Higher Education, Oklahoma State University Foundation, USDA/CSREES, Kansas State University
PI: Phil Kenkel

Economics of Supply Chain Management, Traceability, and Commodity Promotion in Food and Agricultural Industries
The overall objective of this project is to provide an economic assessment of supply chain management, traceability, and commodity promotion in food and agricultural industries. Specific objectives include: estimating economic impacts of supply chain management (via contracts, joint ventures, cooperatives, partnerships, and alliances) and traceability on livestock and its related food industries; evaluating economic impacts of various commodity check-off programs; and assessing effects of generic advertising programs in differentiated product markets. (2516)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Chanjin Chung

Impacts of Trade and Domestic Policies on the Competitiveness and Performance of Southern Agriculture
The project objectives are to determine the impacts of changes in domestic policies on the competitiveness of Southern agriculture; to determine the impacts of international institutions and trade agreements on the competitiveness of Southern agriculture, and to determine the impacts of market behavior, performance, and expansion on the competitiveness of Southern agriculture. (2537)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Shida Henneberry

Conservation Reserve Program Haying and Grazing Provision Analysis
The purpose of this proposed research is to develop a procedure that enables the county FSA field agent to develop a management system for haying and grazing management of CRP lands. More specifically, the objectives of this research are to: 1) determine the change in value of the CRP rental rate where limited use is allowed, 2) develop a procedure for measuring the benefits/costs of a CRP acre within a changing landscape, and 3) develop a procedure for developing the limited use management scheme to maximize net returns and environmental benefits. (2541)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Mike Dicks

AGRICULTURAL EDUCATION, COMMUNICATIONS, AND 4-H YOUTH

DEVELOPMENT

Advancing Triangulation Methodology in Agricultural Education Research

The purpose of this descriptive study was to investigate the extent and types of triangulation used in agricultural education research. The degree of triangulation methodology reported in the *Journal of Agricultural Education* (JAE) from 1999 to 2003 (Volume 40, Number 1 through Volume 44, Number 4) was documented according to research design, existence of triangulation, and the type of triangulation used by the researchers. Only 17% of the research articles reported in the JAE from 1999 to 2003 used triangulation methods to increase rigor. Triangulation is necessary in social science research to increase the robustness of findings and to provide a more comprehensive understanding of noumena. Without triangulation, findings cannot confirm that all viewpoints have been considered and results may not be accurately reported. Triangulation increases the validity of research by allowing different perspectives to challenge the consistency of data. When considering the infrequent use of triangulation in agricultural education research today, it is recommended that researchers implement various triangulation practices into their data collection procedures to increase validity and reliability of findings within the discipline. Several types of triangulation methods (between, within, data, investigator, theoretical, and methodological) are offered to advance triangulation methodology in agricultural education research.
PI: Kathleen D. Kelsey

ANIMAL SCIENCE

Effects of Nutrition, Management, and Medical Treatment on the Health and Performance of Newly-Arrived Stressed Stocker Cattle

This study will measure the effects of morbidity in shipping stressed calves on subsequent performance and carcass traits. It will examine effects of season and holding time on body temperatures of normal and sick cattle. It will evaluate efficacy of current and new injectable antibiotics and sulfas used for sick cattle or as mass medications. The study will test the effects of modified management and health practices on health and performance during receiving, grazing, and feedlot phases of production. The study will test the effect of rate of gain during the receiving program on health and subsequent grazing and feedlot performance. It will also examine morbidity and mortality responses to dietary or parenteral adjuncts and will determine the prevalence of zoonotic pathogens carried by shipping stressed calves. (1875)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: Don Gill, D. L. Step

"Net Requirement Systems" for Poultry

This study will develop a net requirement system (NRS) describing broiler energy and oxygen needs and will examine altitude effects on NRS model estimates. The study will also determine growth promoter effects on NRS components, determine NRS feeding value of rations varying in composition, and develop predictive equations to quantify feed NRS values. The study will quantify nutrient savings and equations to quantify feed NRS values and will quantify nutrient savings and carcass uniformity advantages of within-day ration adjustment to meet NRS needs. (2025)
Sponsor: Oklahoma Agricultural Experiment Station

PI: Robert Teeter

Improving Reproduction Efficiency of Cattle
This study will evaluate the effect of season on behavioral estrus and will determine the time of ovulation relative to the onset of estrus. The study will also determine the influence of body condition score at calving and postpartum nutrient intake on behavioral estrus, ovarian function, and reproductive performance at the first postpartum estrus in spring calving beef cows. It will also evaluate time of fall calving on cow and calf performance. (2331)
Sponsors: Oklahoma Agricultural Experiment Station and, Pharmacia and Upjohn
PIs: Bob Wettemann, David Lalman

Detection, Characterization, and Inhibition of Foodborne Pathogenic and Spoilage Microorganisms
This study will detect, isolate, quantify, and characterize pathogenic microorganisms in food and food processing environments. The study will also develop novel molecular approaches for genetic analysis and diagnostic detection of foodborne pathogens, including fluoresence-based PCR detection. The study will reduce the incidence, survival, and/or proliferation of pathogenic and spoilage microorganisms in food by physical, chemical, or biological control mechanisms. (2355)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Peter Muriana

Evaluation of Degradable Intake Protein Sources for Cattle Consuming Low Quality Forages
This study will determine the yearly changes in ruminal available protein from forages commonly grazed by beef cattle and will develop practical methods for addressing deficiencies in ruminal available protein in grazing situations and the use of different protein sources to overcome these deficiencies. The study will also document the effect of energy and protein supplementation on forage protein utilization and fiber digestion. (2365)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Hebbie T. Purvis, II

National Animal Genome Research Program
This work contributes to the growing body of information on genes of economic importance in swine and their expression pattern. Identification and comparative mapping of these genes will provide many new candidates for QTL detected in genomic scans. (2389)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Udaya DeSilva

Calcium and Phosphorus Requirements and Bioavailability in the Horse
The study determine the dietary Ca and P requirements for maximizing bone growth and mineralization and minimizing developmental orthopedic problems. Study also quantifies the dietary Ca and P requirements of young, growing horses in order to reduce the potential of environmental nutrient pollution and Quantifies Ca and P bioavailability to maximize absorption and mineralization and minimize excessive feeding and subsequent excretion of nutrients. (2435)
Sponsor: Oklahoma Agricultural Experiment Station

PI: Steven Cooper

Enhancing the Value and Consistency of Lesser-Used Beef Muscles
The study aims to evaluate and characterize the traits of the three primary muscles which comprise the beef bottom sirloin. Using professional meat fabricators, "time and motion" information was collected and utilized to estimate the costs associated with innovative fabrication of the chuck and round and to investigate the impact of various palatability improvement procedures (i.e., blade tenderizing, marinating, calcium injection, extended postmortem aging) on bottom sirloin beef cuts differing in U.S. Quality grade. (2436)
Sponsor: Oklahoma Agricultural Experiment Station
PI: J. Brad Morgan

Meat and Dairy By-Product Protein Recovery and Utilization
The primary objective of this research program is to enhance the value of food processing by-products through recovery and utilization. In the area of meat by-products, a project is being conducted to recover a functional protein concentrate from red meat by-products using protein solubilization. In addition, research is being conducted on the gasification of organic material reclaimed from pork wastewater in order to create an alternate source of energy for the processing plant. In the area of dairy by-products, research is being conducted to enhance the ability of transglutaminase enzymes to increase the yield of cheese by reducing the amount of proteins lost to the whey (acid or sweet whey). We are also investigating the effectiveness of gravity filtration technology utilizing paper waste as the filter media to recover organic material from food processing wastewater. Lower organic loads would reduce municipal wastewater treatment costs for the food processor while the organic loaded paper could potentially be used as a feed supplement for ruminants. (2437)
Sponsors: Stanley Gilliland, Danielle Bellmer, J. Chance Brooks, Halldor Sigfusson, Paul Weckler, Tim Bowser, K. N. Patil, Dan Wyatt, Jeff Luttrell, Oklahoma Agricultural Experiment Station
PI: Christina A. Mireles DeWitt

Impact of Nutrition on Metabolism, Performance, Carcass Merit, and Nutrient Balance by Feedlot Cattle
The study will 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. The study will also determine the effect of limit feeding on adaptation to a high-grain diet and 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: Clinton R. Krehbiel

Increasing Profitability of the Wheat/Stocker Cattle Enterprise
This study aims to develop supplementation programs for delivery of new technologies that will decrease production risks of growing cattle on wheat pasture and increase profitability of the enterprise; characterize the physiological bases for differences in finishing performance of feeder cattle off wheat pasture; determine the effects of wheat breeding

practices, varietal improvement, and cultural and management practices on productivity of the wheat/stocker cattle enterprise; determine the economic consequences of alternative strategies for managing cropland suitable for dual-purpose winter wheat production; determine current production and marketing practices being used by wheat-stocker cattle producers in Oklahoma; determine persistence, yield, and nutritive value of selected cool-season perennial forage grasses as complementary forages to wheat pasture; and characterize rumen degradable and undegradable protein fractions of wheat forage and cool-season perennial grasses. (2457)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: Gerald W. Horn, Gene Krenzer, Frances Epplin, Brett Carver

Alternative Beef Cow/Calf Nutritional Management Systems to Improve Beef Production Efficiency and Carcass Traits.
When considering beef production costs from conception through the finishing phase, the largest single costs are investment costs in land for the cowherd and purchased feed and harvested forage costs. One purpose of this experiment is to explore the use of nontraditional, unprocessed feed resources to reduce purchased and harvested feed costs. A second purpose is to explore management systems that have the potential to minimize inputs while optimizing animal performance and beef product quality. (2464)
Sponsor: Oklahoma Agricultural Experiment Station
PI: David Lalman

Gene Expression in the Peri-Implantation Porcine Conceptus and Endometrium.
Early embryonic loss contributes to reduced reproductive efficiency in pigs. Regulation of early embryo development in the pig is largely unknown. The purpose of this study is to identify genes expressed in porcine conceptuses during peri-implantation development. This project examines uterine genes involved with maintenance of pregnancy in the pig. (2465)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Rod Geisert

Lactobacilli as Probiotics, Biopreservatives, and Producers of Nutraceuticals
Research selects cultures of lactobacilli that will produce conjugated linoleic acid and also will develop improved methods of producing the cultures of lactobacilli that will be more effective in exerting control of food borne pathogens on refrigerated foods. Results should result in the ability to develop cultured foods, such as yogurt, having elevated levels of CLA. The research also will develop methods to produce cultures of selected lactobacilli that can be used to control food borne pathogens on refrigerated foods such as meat. (2485)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Stanley Gilliland

Analysis of Gene Expression during Adipogenesis in Cattle
Intramuscular fat deposition (marbling) is considered highly desirable in cattle industry, whereas subcutaneous fat deposition is considered undesirable. The purpose of this study is to understand the genetic regulation of adepogenesis in cattle. (2486)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Udaya DeSilva

Role of the Inter-Alpha-Typsin Inhibitor Family and Kallikren-Kinnogen-Kinin System in Establishment and Maintenance of Pregnancy
Discovery of plasma kallikrein and HMW-Kininogen gene expression by the endometrium indicates that kinins can play a major role in the development and survival of porcine embryos. Development of possible methods to enhance kinin production during pregnancy may improve litter size in the pig. Understanding the role of estrogen in pregnancy loss in the pig will help establish therapies to inhibit the effects of environmental estrogens on embryonic mortality in the pig. (2495)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: Rod Geisert, Udaya DeSilva

Genetic and Functional Analysis of Antimicrobial Peptides in Food Animals.
The indiscriminate use of antibiotics for growth promotion and disease prevention in the food animal industry has been accompanied by contamination of food products and the environment with unwanted drug residues and rapid emergence of antibiotic-resistant microorganisms. The purpose of this study is to identify efficacious antimicrobial peptides that can be used as alternative non-antibiotic means to prevent and control various infectious diseases and to enhance pre-harvest food safety in the food animal industry. (2507)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: Guolong Zhang, Stanley Gilliland

Dietary Manipulation to Reduce Nutrient Excretion from Swine.
Excess excretion of nitrogen and phosphorus from swine facilities has the potential to effect water and air quality. This project examines the effects of dietary manipulation on nitrogen and phosphorus excretion. Development of dietary regimens that decrease nitrogen and phosphorus excretion limits the potential for water and air pollution. (2508)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Scott Carter

Insulin-Like Growth Factor Binding Proteins and Their Proteases: Role in Ovarian Follicular Development 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. The goal of this research is to understand the role of the insulin-like growth factor binding proteins and their proteases in follicular development in cattle. (2510)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Leon Spicer

Evaluation of Breed Type of Lamb on Utilization of Wheat Pasture
When young lambs are first placed on winter wheat pasture, weight gains are negative to the first 2 to 3 weeks. This project examines the impact of breed type on the weight changes that occur when lambs are first placed on winter wheat pasture. (2514)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: Gerald Horn, Bill Phillips, M. Brown

Beef Cattle Production Systems in the Southern Great Plains.
Pre-weaning management environment, animal genetics, and their interactions have a dramatic impact on productivity and profitability of beef cattle production systems. The purpose of this project is to identify and document the impact of breed type, predicted genetic potential, pre-weaning livestock management, and post-weaning livestock management on stocker and feeder cattle performance. (2515)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: David Lalman, M. Brown

BIOCHEMISTRY AND MOLECULAR BIOLOGY

Metabolism of the Vitamins A
This project will synthesize and evaluate the biological activity of analogs (heteroarotinoids) of vitamin A relative to cellular growth and differentiation and as chemopreventative and chemotherapeutic agents for various types of cancers. This should result in compounds with higher activity and lower toxicity than natural retinoids and provide additional insight into structure-activity relationships. (1250)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Eldon C. Nelson

Coupled Enzyme Kinetic Mechanisms and Their Metabolic Consequences
We are studying the kinetic, association, and structural properties of dehydrogenase enzymes. The major objective this year is to elucidate the mechanism for NADH transfer between donor and acceptor pairs of dehydrogenases. In the classical mechanism, the acceptor enzyme can utilize only free NADH (i.e., NADH that is not bound to the donor enzyme). However, a possible alternative is channeled NADH, whereby NADH is transferred directly from donor enzyme to the acceptor enzyme without release of NADH into the bulk medium. The criterion for channeling from the channeling test is R = experimental reaction velocity/velocity predicted assuming the classical mechanism only. We have found that the enzymes tested (glyceraldehye-3-phosphate dehydrogenase, lactate dehydrogenase, alcohol dehydrogenase, alpha glycerol-3-phosphate dehydrogenase) do not channel NADH in contrast to previous appearances. The previous appearances resulted from: 1) side reactions that are present at the very high enzyme concentrations used, and 2) a light-scattering artifact, unavoidably interfering with the 340nm-signal in presence of high protein concentration. The most likely results, when artifacts are avoided, are R values not significantly higher than 1 or 2 (i.e., no channeling within probable experimental errors). (1393)
Sponsor: National Science Foundation, Oklahoma Agricultural Experiment Station
PI: H. Olin Spivey

The Biochemical Basis for Resistance of Cotton to Pathogens and Pests
Defense chemicals contribute to the pathogen and pest resistance of cotton, but make its seed toxic to nonruminants. Suppression of the biosynthetic pathway to these chemicals specifically in seeds may detoxify the seed while maintaining overall plant resistance. Genes in this pathway and others that are active during bacterial blight resistance are being sought. (1504)
Sponsors: National Science Foundation, Cotton Incorporated, USDA/ARS Southern Crops Research Laboratory, Oklahoma Agricultural Experiment Station

PIs: Margaret Essenberg, Margaret Pierce

Interactions of Bacterial Pathogens and Animal Hosts
Factors affecting survival of *Brucella abortus* in macrophages and other cells will be investigated by studying effects on survival in macrophages of loss of specific genes involved in carbohydrate, purine, pyrimidine, and amino acid metabolism. The mechanisms and signals that control the expression of these genes will also be studied. (1565)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma State Regents for Higher Education
PI: Richard Essenberg

Virus Evolution
We test hypotheses about how viruses spread and decline and how new viruses emerge. To achieve this, we analyze the evolution of viral sequences integrated in chromosomes; optimize conditions for detecting multiple viruses in one assay and design and manage probes for such assays; characterize plant viruses by nucleotide sequences; and explore the functions of conserved viral nucleotide sequences. (1789)
Sponsors: Oklahoma Agricultural Experiment Station, USDA-ARS, National Science Foundation, OSU Foundation, IBIS Therapeutics
PI: 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 cytochrome bc1 complex. The structural information obtained has been further confirmed by the study of the site-directed mutagenesis, fast kinetic measurement of electron transfer between the two neighboring components, and other biophysical methods. (1819)
Sponsors: National Institutes of Health, American Heart Association, Dupont Company, Sarkey's Foundation, Oklahoma Agricultural Experiment Station, Oklahoma State Regents for Higher Education
PIs: Chang-An Yu, Linda Yu

Role of Heat Shock Protein 90 in Regulating Protein Kinases
This study will determine the mechanism by which heat shock protein (hsp) 90 and its co-chaperones mediate the maturation of protein kinases. It will also determine whether maturational process can serve as a pharmacological target and whether the maturational pathways for protein folding of these kinases overlap pathways regulation. Identification of novel co-chaperone partners and client proteins will also be made. (1975)
Sponsors: American Heart Association, Oklahoma Agricultural Experiment Station
PI: Robert Matts

The Structure of Pectins from Cotton Cell Walls
This study will include a complete structural analysis of the rhamnogalacturonan region of cotton cell wall pectin. The study will determine how the various subsections of pectins associate with each other and will characterize crosslinks between pectin and xyloglucan. The study will also characterize crosslinks between pectin and the cell wall protein

extensin. (2099)
Sponsors: U.S. Department of Energy, Oklahoma Agricultural Experiment Station
PI: Andrew Mort

Improving the Industrial Uses of Oklahoma Wheat
The long-term goal of this research is to understand the basic properties of gliadin (high and low molecular weight glutenin subunits that form the wheat gluten and are directly related to the performance of wheat flour in yeasted baked products). Specific goals include the understanding of the performance of gliadin (high and low molecular weight glutenin subunits in different products), characterization of the interaction of specific groups or subunits with carbohydrates, and the possible correlation of proteins synthesized during the grain filling period to the synthesis of prolamins in wheat. (2351)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Patricia Rayas-Duarte

Photosynthetic Electron Transfer Complexes
The overall objective of this research is to elucidate the role of the supernumeral subunit, subunit IV (Mr = 14,384), in the cytochrome bc_1 complex from a photosynthetic bacterium *Rhodobacter sphaeroides*. The specific aims of this project are: 1) to identify amino acid residues of subunit IV involved in interaction with the three-subunit core complex; 2) to identify amino acid residues of cytochrome *b* involved in interaction with subunit IV; 3) to investigate the effect of subunit IV on the protein conformation and thermostability of the cytochrome bc_1 complex by circular dichroism and differential scanning calorimetry; 4) to investigate the protein:lipid interactions in three- and four-subunit complexes; 5) to examine the Q sequestering role of subunit IV using synthetic Q-derivatives; 6) to explore the possible association of supernumeral subunit function with extra segments in the bacterial core subunits; and 7) to compare the 3-D structures of three- and four-subunit bc_1 complexes. (2372)
Sponsors: Oklahoma Agricultural Experiment Station, National Sciences Foundation
PI: Linda Yu

Structure and Function of Exchangeable Apolipoproteins
Exchangeable apolipoproteins are essential structural and functional components of lipoproteins. The stability of the lipoprotein particles, the activity of lipolytic enzymes and lipid transfer proteins, and the binding of the lipoprotein to receptors are among the processes regulated, to a great extent, by the properties of the apolipoproteins, which bind to the lipoprotein lipid surfaces as well as to cell membranes. Apolipoproteins modulate all those processes, and consequently the homeostasis of the lipid metabolism, by means of their lipid binding activity, rate, and extent of binding, and their structure in the lipid-bound state. The long-term goals of this project are the identification and characterization of the functional domains of the insect apolipophorin-III and human apolipoprotein A-I (apoA-I) as well as studying the structure of these proteins in the lipoprotein bound state. (2398)
Sponsors: Oklahoma Agricultural Experiment Station, National Institutes of Health
PI: Jose Soulages

Building on the Scaffold Model: Septin Structure and Function in Saccharomyces cerevisiae

The long-range objective is to expand our basic knowledge of the mechanisms by which cells grow and divide and how these processes are regulated. This proposal expands our studies on the function of the septin proteins, a conserved family of nucleotide-binding, filament-forming proteins. Septins function in a variety of processes, including cytokinesis and cell-cycle progression. Our working model for septin function, the Scaffold Model, proposes that the septins function by acting as a scaffold, or template, to direct the localization of numerous other proteins to specific subcellular locations. Once localized, these septin-associated proteins then function directly in various processes. We propose to study septin structure and function and the regulation of septin localization and organization. The immediate goals of this project are to investigate septin structure and function, the regulation of septin localization and organization, and to identify and characterize novel septin-interacting proteins. Aim 1 will investigate how septins interact with each other, and how these interactions promote septin localization and filament assembly. Aim 2 will characterize the role of the Gin4p and Cla4p kinases in septin function. Aim 3 will identify and characterize novel septin-interacting proteins. During the past year we have made significant progress in Aim 1, and are now beginning to investigate direct septin-septin physical interactions using *in vitro* and *in vivo* approaches. In Aim 2, we have begun a gin4ê synthetic-lethal screen, and have identified several potentially interesting candidate genes involved in Gin4p function. In Aim 3, we have identified and begun the characterization of Bni5p, a novel septin-interacting protein. (2410)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Mark S. Longtine

Light Regulated Translation and mRNA Stability in Plants
The ability to recognize and respond to extracellular cues is essential for all living organisms. In plants, one of the most important cues is light, which regulates growth and development through transcriptional and post-transcriptional regulation of nuclear and chloroplast gene expression. One of the best examples of post-transcriptional regulation of a nuclear-encoded mRNA is that of the pea *Fed-1* gene, which encodes the chloroplast ferredoxin protein. *Fed-1* is regulated by light at the levels of mRNA stability and translation. For *Fed-1*, light-regulated mRNA stability and translation appear to be conferred by two separate elements. The first element, necessary for destabilization of the mRNA in the dark, is within a region of the *Fed-1* 5' UTR that contains a (CATT)4 repeat. The (CATT)4 repeat and the surrounding region will be mutated to delineate the mRNA instability element, to test if the function of the instability element is position dependent, and to determine if the element is sufficient to destabilize non-light-regulated mRNAs. To identify proteins involved in regulated *Fed-1* mRNA degradation, the instability element will be used in UV-crosslinking assays. The translational control element will be delimited by mutagenesis and, once characterized, the element will be added to non-light regulated mRNAs to determine the minimal sequence sufficient to repress translation in response to darkness. To determine if the translational control element is an mRNA localization sequence, *Fed-1* mRNAs that are wild-type or mutant for translational regulation by light will be localized using a GFP system adapted to plants. (2427)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Marie Petracek

Structural Studies of Midline-1 by Nuclear Magnetic Resonance Spectroscopy
We are currently studying the zinc-binding binding domains from a protein, Midline-1, that is

implicated in almost two-dozen genetic syndromes. We are using nuclear magnetic resonance (NMR) spectroscopy to determine the solution three-dimensional structure of the Ring Finger and B-box domains bound to zinc. We are also using mass spectroscopy and UV-Vis spectroscopy to determine the metal binding properties of these protein domains. These domains interact with a number of proteins that are critical to many cellular processes, including cell death. We intend to investigate these interactions as well using NMR spectroscopy. (2527)
Sponsors: Oklahoma Center for the Advancement of Science and Technology, Oklahoma Agricultural Experiment Station
PI: Michael Massiah

Oxidative Stress Signaling in Plants
Ozone, the most abundant air pollutant, poses a serious threat to crops and forest ecosystems. We are analyzing the molecular basis of oxidative stress induced by ozone using the tools of functional genomics in two model plant systems—Arabidopsis thaliana and Medicago truncatula. Identification of key redox-regulated genes from this research will facilitate the production of crop plants with improved tolerance to multiple stresses. (2528)
Sponsors: National Science Foundation-EPSCoR, Oklahoma Agricultural Experiment Station
PI: Ramamurthy Mahalingam

BIOSYSTEMS AND AGRICULTURAL ENGINEERING

Design of Experimental Equipment
This research study will provide a ready mechanism for preliminary investigation of problems not covered by existing projects, provide the vehicle for inter-departmental cooperation, and will be the means by which prototype machines can be designed, constructed, and tested. (1414)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Ronald L. Elliott

Color Machine Vision for Food Quality Inspection
This project will develop and demonstrate the application of color machine vision and video image processing to the evaluation of food product quality. The project will also develop machine vision software for full-color detection and interpretation of food quality attributes and will develop lighting and optical techniques for optimum image acquisition. Project will also determine quality evaluation performance by statistical comparison with accepted quality standards. (1973)
Sponsors: Oklahoma Agricultural Experiment Station, OSU Food Technology Center Research Initiative Program
PI: Glenn Kranzler

Monitoring and Modeling Evapotranspiration and Soil Moisture: Applications of the Oklahoma Mesonet
Project will calibrate and validate automated soil moisture measurements made at Oklahoma Mesonet sites and will assess the applicability of various data source and methods for quantifying evapotranspiration rates at Mesonet sites. Project will also

characterize soil moisture and evapotranspiration over heterogeneous land areas by applying appropriate models and ground-based and remotely-sensed spatial data. Project will determine the degree to which differences in evapotranspiration and soil moisture can explain temporal and spatial variability in winter wheat yields and will develop probabilistic estimates of evapotranspiration and irrigation water requirements for various Oklahoma crops, as a function of climate/weather, soil characteristics, and planting date. Project will integrate in-situ monitoring and physically-based modeling in a statewide, near-real-time procedure for assessing the severity and spatial extent of drought conditions. (2448)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Ronald L. Elliott

Development of Real-Time Sensor-Based Variable Rate Applicators and Systems for Wheat and Other Crops
Goals of the project are to: 1) design and construct field scale, integral-lighting, high resolution, optical sensor/variable applicators for N fertilizer application at 1-m^2 resolution, spot spraying weeds, and variably apply other pesticides on wheat, selected vegetables, and turf; 2) work with manufacturers to commercialize sensors and systems; 3) develop and verify in-season optical sensor-based algorithms to predict potential wheat yields and N fertilizer application rates that account for climate and agronomic factors affecting yield potential; and 4) determine the agronomic and economic cost/benefits of the high resolution, integral lighting system compared to other optical sensor-based systems. (2453)
Sponsor: Oklahoma Agricultural Experiment Station
PI: John Solie

Exploitation of Micro-Electronics Technology to Enhance Profitability and Minimize Environmental Impacts in Agricultural Systems
Project will investigate the viability of very low-cost distributed network technology for use in agricultural applications and will initiate a systematic survey of micro-electronics technology focused on identifying technologies that may be exploited for application in agricultural systems. (2468)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Marvin Stone

Determination of Operational Parameters for a Full-Scale Anaerobic Sequencing Batch Reactor (ASBR) Used to Treat Swine Waste
Project will characterize solids and liquids fractions of raw waste and will determine laboratory scale ASBR operational parameters for optimum gas production and sludge settlability. Project will also determine optimum operating cycle to reach target operating parameters while minimizing overall cycle time for the lab scale ASBR and will optimize operational parameters of full-scale ASBR using data gathered from laboratory scale studies. Finally, project will determine operational parameters under different temperature conditions and will integrate the ASBR technology into agricultural systems using a mathematical model. (2469)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Jerald Lalman

Improved Methods for Evaluating Textural and Rheological Properties of Foods

The goal of the project is to develop methods for optimizing measurement of rheological properties of semi-solid foods and to quantify effects of loading normal force on rheological measurement of the same. Further goals are to investigate other potential sources of error during rheological measurement, to characterize food texture for development of new products, to develop improved methods for evaluating textural properties of food products, and to quantify relationship between texture analysis parameters and composition for various high fat and high protein foods, specifically meat products. (2473)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Danielle Bellmer

Weather-Related Research and Modeling for Decision Support in Agriculture and Natural Resources
Study will conduct weather-related research, improve existing weather-based models and products, and develop new ones. The study will also incorporate numerical weather forecast output into existing weather-based models and develop other forecast products. The study will implement the models and products operationally on the Oklahoma Mesonet and will provide for the effective dissemination of weather-related information to agricultural and natural resources clientele, and educate them with respect to its availability and usefulness. (2477)
Sponsor: Oklahoma Agricultural Experiment Station
PI: J. D. Carlson

Development and Evaluation of TMDL Planning and Assessment Tools and Processes
Study will develop, improve, and evaluate watershed models and other approaches for TMDL development and implementation and will assess potential/likely economic benefits and costs and equity issues associated with TMDL implementation at the watershed and individual landowner scale. Project will also assess the potential ecological benefits/ implications of TMDL implementation at watershed level. (2479)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Daniel Storm

Linking Regional Scale Hydrologic/Water Quality Models with Biodiversity Models for Environmental Decision Making
The goal of this project is to develop a first generation tool that regional watershed land use managers can use to improve decision making concerning land use change and ecosystem impact. The project will also modify and integrate existing models so that simulations can be made of aquatic ecosystem structure and function changes resulting from stressors created by changing land use, develop an integrated hydrology/water quality/ geomorphology model that evaluates the impact of land use and land use change, and select and modify an aquatic ecosystem model that uses output from the integrated hydrology/water-quality/geomorphology model to predict impact to the ecosystem. (2531)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Daniel Storm

Hydrologic Influences to Dryland Wheat Yield in Oklahoma
This project will test the hypothesis, “Wheat grain and forage yields are impacted by the specific hydrologic conditions of initial soil moisture and season precipitation, and not by

annual or seasonal totals." The focus will be on the development, testing, and proof of improved models and methods to predict dryland wheat yield. (2532)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Glenn Brown

Development and Optimization of Direct Steam Heating Techniques for Pumpable Food and Agricultural Products
Project will optimize the direct steam heating process for pumpable food and agricultural products. Other goals will be to understand and develop a rationale for sizing and specifying steam heaters; to predict and reduce steam heater instability; to estimate the impact of process disturbances on steam heater performance, control, and stability; to determine the effect of process piping geometry and orientation on steam heater stability; and to examine steam heating effects on products that contain particles. (2538).
Sponsor: Oklahoma Agricultural Experiment Station
PI: Timothy Bowser

ENTOMOLOGY AND PLANT PATHOLOGY

Insect Survey and Detection
Project will assist farmers and others to more adequately protect their crops from insect attack, will assure more prompt detection of newly introduced insect pests, and will lead to the development of a workable insect pest forecasting service. Project will also aid manufacturers and suppliers of insecticides and control equipment to determine areas of urgent need and in case of necessity, provide a countrywide skeleton structure to be expanded as needed, which will combat any attempts at biological warfare. (0914)
Sponsors: USDA, Oklahoma Agricultural Experiment Station
PI: Don Arnold

Interactions among Insects and Plants in the Alfalfa Community
The goal of this project is to describe life systems of key insect pests and beneficial species in alfalfa. The role of these species as determinants of productivity and stand longevity of alfalfa is assessed. Influence of management practices including host resistance, grazing, and use of insecticides on insect populations and alfalfa productivity is determined. Comprehensive economic thresholds for key insect pests are developed. (1527)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: Richard Berberet, Jack Dillwith, John Caddel

Development of Improved Methods for Evaluating Reaction of Peanut to Soilborne Fungal Pathogens
Project will develop methods to identify and quantify resistance in peanut to Sclerotinia minor and Sclerotium rolfsii and will assist breeders to develop disease-resistant cultivars. The project will also identify peanut culture conditions that contribute to lowering pathogen populations in soil. (1661)
Sponsors: Oklahoma Peanut Commission, Oklahoma State Department of Agriculture, and Oklahoma Agricultural Experiment Station
PIs: Hassan Melouk, Ken Jackson, Mark Payton

Bionomics and Control of Ticks with Emphasis on Application of Geographic Information System Technology to this Pest Complex in Oklahoma
The project will document the biology, behavior, and ecology of *Ixodes scapularis* immature life stages on reptile hosts in the field and laboratory and will determine the attachment, engorgement, and molting success (%) on five lizard species and selected snake species. The project will also: 1) determine immune responses of lizards to tick parasitism and measure blood loss in lizards due to tick parasitism; 2) continue to evaluate medicated-bait methodology for control efficacy against ticks on mammals; and 3) develop a program using Geographic Information System (GIS) Technology to manage demographic data on ticks, their hosts, and diseases they transmit in order to predict tick-borne disease risk in Oklahoma. (1706)
Sponsors: Oklahoma Agricultural Experiment Station, Departments of Zoology, Animal Science, Geography, Plant and Soil Science, College of Veterinary Medicine
PI: Bob Barker

Development of Disease-Resistant Wheat and Studies of Selected Wheat Diseases
Development of improved winter wheat varieties and germplasm is facilitated by screening breeder lines for disease resistance and developing germplasm resistant to diseases that limit wheat production, including wheat leaf rust and wheat soilborne mosaic virus (WSBMV). Effective sources of resistance for these diseases have been identified in wheat from several countries and states and incorporated into winter wheat backgrounds, which are then advanced to breeding programs for evaluation of agronomic traits by breeders. Additionally, field and lab studies involving the aphid/barley yellow dwarf virus complex are conducted to formulate control recommendations for this insect/disease complex with the ultimate objective of incorporating genetic resistance to the aphid:BYDV complex into improved wheats. (1871)
Sponsors: Oklahoma Agriculture Experiment Station, Oklahoma Wheat Research Foundation
PIs: Robert M. Hunger, Brett F. Carver, Kris Giles, Jeanmarie Verchot, Tom Royer, Art Klatt

Biochemical Basis for Insect-Plant Interactions and Host Plant Resistance
Utilize proteomics and metabolomics to characterize the interaction of aphids with susceptible and resistant plants. Studies focus on proteins and metabolites in both plants and aphids. The systems studies include the greenbug and bird-cherry oat aphid on wheat and the spotted alfalfa aphid and pea aphid on alfalfa. (2001)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma State Regents for Higher Education, USDA-ARS laboratory Stillwater.
PIs: Jack Dillwith, Richard Berberet

Virulence Factors in Phytopathogenic Bacteria
A genetic approach that encompasses both host and pathogen will be used to define the role of coronatine (COR) in the pathogenesis of edible *Brassica* spp. and tomato. The specific objectives are to: 1) characterize the COR genes in *Pseudomonas syringae* pv. *tomato* DC3000; 2) investigate the role of COR, coronafacic acid (CFA), and coronamic

acid (CMA) in the pathogenesis of *Brassica* and tomato; 3) utilize functional genomics and DC3000 mutants to investigate the role of COR, CFA, and CMA on host responses; and 4) analyze the effect of COR, CFA, and CMA on plant cell biology. (2009)
Sponsors: National Science Foundation, Oklahoma Agricultural Experiment Station, and Oklahoma Center for the Advancement of Science and Technology
PI: Carol Bender

Managing Arthropod Pests on Vegetable Crops in the South Central U.S.
Project will evaluate alternative insecticides for use in IPM programs on watermelon and leafy greens crops and develop a databases sufficient to serve as support for registration and use on the crops. The project will also develop alternative management methods to replace the use of insecticides in watermelon and leafy greens crop production, determine action thresholds for insect pests on processing greens crops destined for varying markets, develop insecticide application systems that increase efficacy of botanically derived insecticides, and determine dose:response relations for botanical insecticides. (2040)
Sponsors: Oklahoma Cooperative Extension Service, USDA-IR4, CSREES
PI: Jonathan Edelson

Pathogen-Host Interactions of Phytopathogenic Mollicutes in Selected Plant and Insect Host Systems.
Project investigates the molecular basis of pathogenicity, insect transmissibility, and other ecological niche adaptations of the phytopathogenic mollicutes. The project also investigates Serratia marcescens, the bacterium causing yellow vine disease of cucurbits, with emphasis on transmission factors and the molecular determinants responsible for the unusual niche-versatility of this species. The project will continue to address Oklahoma-related problems involving (or potentially involving) phytopathogenic prokaryotes, including mollicutes, as appropriate. (2052)
Sponsors: Oklahoma Agricultural Experiment Station, USDA
PI: Jacqueline Fletcher

National Agricultural Program to Clear Pest Control Agents for Minor Uses
This program works with growers, food processors, and university research and extension personnel in obtaining pest management agents on minor use crops. Pest management needs are identified and management tools are listed for inclusion in the IR-4 program. In the past few years, over 20 new pest management tools have been accepted by the EPA for managing pests on minor use crops. (2074)
Sponsors: USDA-CSREES, Oklahoma State Department of Agriculture, Food & Forestry, Oklahoma Agricultural Experiment Station
PI: Jim T Criswell

Biology, Epidemiology, and Integrated Management of Peanut and Vegetable Crop Diseases
The goals of this project are to conduct basic studies on the biology and epidemiology of peanut and vegetable crop diseases, to identify and evaluate sources of genetic resistance to important peanut and vegetable crop diseases, and to develop integrated management

programs for peanut and vegetable crop diseases that utilize cultural practices, efficient spray programs, and genetic resistance. (2159)
Sponsors: Oklahoma Agricultural Experiment Station, CSREES/So Region IPM, Vegetable processing and seed industries, University of Arkansas
PI: John Damicone

Centralized Tick Rearing
Study will maintain existing tick colonies in sufficient quantities and quality to provide specimens for research and will be prepared to start new colonies of tick species or other arthropods of medical or veterinary importance that may be needed for medical-veterinary research at Oklahoma State University. The study will also determine the optimum temperatures, relative humidity, and photoperiod for rearing each stage of the blacklegged tick, *Ixodes scapularis* and will evaluate artificial tick feeding techniques for mass rearing several tick species. (2172)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Russ Wright

Anatomy of Host and Vector in Wheat Soilborne Mosaic Virus Disease
The study will document the entire life cycle *in vivo* of Polymyxa graminis, the vector of soilborne wheat mosaic virus (WSBMV), in roots of wheat and will determine the extent of chemical nature and effects on host physiology of the degeneration of leaf epicuticular waxes associated with WSBMV infection. (2227)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Larry Littlefield

Squash Powdery Mildew-Effects of Polyculture
The study will characterize combined effects of: 1) density of plants, and 2) the proportion of each of the constituent crops species on the productivity of a bi-culture of summer squash and cucumber. The study will also characterize the effects of the proportion of each of the constituent crop species on the increase of squash powdery mildew in a bi-culture summer squash and cucumber. (2274)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Jim Duthie

Control of Zoosporic Pathogens of Nursery Crops in Recycling Irrigation Systems
This project will determine if repeated emergence is prevalent among waterborne *Phytophthora* spp. that are commonly found in recycling irrigation systems used for ornamental nursery production. The project will also evaluate the ability of zoospores of *Phytophthora* spp. that are produced by repeated emergence from cysts to produce disease as compared with zoospores produced by the most common method (i.e., within sporangia). Finally, the project will investigate the lateral and vertical distribution of motile and encysted zoospores of *Phytophthora* spp. in model systems imitating water flow conditions in capture and retention basins of nursery recycling irrigation systems. (2319)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Sharon von Broembsen

Pest Management of Wheat Insect Pests

This project will document the relationship between aphid infestation level and wheat forage yields and quality; examine the relationship among aphids, host plants, and natural enemy biology; validate the presence-absence method of classifying cereal aphid parasitism and predicting population suppression in winter wheat fields; and document the ecology of aphidophagous natural enemies in simple and diverse wheat agro-ecosystems. (2334)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Kris Giles

Mechanisms of Antagonism of Yeasts that Suppress Fungal Decays of Stored Fruits
Yeasts have potential for the biological control of fungal decays of fruits in post-harvest storage. An understanding is needed of why some yeast strains are effective bio-control agents, whereas others are not. Mechanisms of antagonism used by yeasts against fruit decay fungi will be sought. The contribution of these mechanisms to the overall bio-control efficacy of yeasts that are effective or ineffective against fungal decays of fruit will be evaluated. Knowledge of mechanisms will be organized into a set of rules for predicting the potential success of a yeast strain for bio-control. (2370)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Allen Filonow

Mechanisms Controlling the Spread of Soilborne Wheat Mosaic Virus in Hard Red Winter Wheat
This study will investigate virus-host interactions required to facilitate movement of soilborne wheat mosaic virus (SBWMV) in wheat plants. These studies will provide insight into the requirements for host susceptibility to SBWMV infection and may lead to novel strategies to control virus infection in the field. The studies will also investigate genetically controlled resistance in wheat plants to SBWMV. At least one cultivar is resistant to SBWMV and uses a defense mechanism that blocks virus movement. Studies will investigate how the wheat host can naturally combat the spread of virus infection and characterize genetic mechanisms that are agronomically useful. (2371)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Jeanmarie Verchot

Biology, Ecology, and Integrated Management of Turfgrass Diseases Caused by Fungi and Nematodes and Insect Pests
Objectives are to describe the biology and ecology of turfgrass pests in Oklahoma and develop integrated management strategies for these pests. The study will also evaluate the diversity of turfgrass pests and describe specifically the interaction between fungi and turfgrass and host tissues. (2420)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: Nathan Walker, T. Royer, S. Marek, D. Martin

Development of Pest Management Strategies for Forage Alfalfa Persistence
Objectives are to elucidate mechanisms by which biotic agents interact with abiotic factors to limit stand persistence of forage alfalfa; to enhance alfalfa persistence through improved plant resistance to key pests by conventional breeding and genetic engineering approaches; to identify and enhance biological and cultural control measures that reduce pest populations and improve forage alfalfa persistence; and to integrate control measures

with decision-making guidelines for adoption by specific states/regions. (2421)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Richard Berberet

Improved Pecan Insect and Mite Pest Management Systems
Objectives are to improve monitoring and chemical control techniques for hickory shuckworm, pecan nutcasebearer, pecan weevil, and brown stink bug and transfer this technology to large grower groups by making the techniques less expensive and more accessible. Study will also develop biointensive insect pest management for pecan through crop profiling, habitat diversification, host plant resistance, and biological control. (2424)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Phillip Mulder

Molecular Aspects of Insect Immunity
The proteolytic activation of prophenoloxidase is an important physiological process involved in several insect defense mechanisms, including cuticle sclerotization, wound healing, melanotic encapsulation of parasites, and generation of cytotoxic molecules. The long-term goal of this project is to understand this activation process in a biochemical model insect Manduca Sexta. Acquired knowledge and molecular probes from this research will be applied to the study and potential manipulation of similar systems in insect vectors of human diseases as well as in agricultural insect pests. (2450)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Haobo Jiang

Biological Control of Arthropod Pests and Weeds
Objectives are to characterize and quantify the impact of indigenous natural enemies on pest and beneficial species. Evaluation of indigenous natural enemy efficacy is a key component of biological control programs. The hypothesis is that to be effacious natural enemies must have significant individual or additive impacts in reducing pest populations. The role of existing natural enemy complexes in reducing pest populations must be explored thoroughly. Studies will measure host/prey suppression by natural enemies in selected commodities and assess the impact of existing natural enemies on the efficacy of introduced biological control agents. (2455)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Kris Giles

Analysis of Soilborne Wheat Mosaic Virus Cell-to-Cell and Vascular Transport
Objectives are to prepare an infectious clone of SBWMV containing GFP and then use GFP expression to study the path of virus movement through the plant. Experiments will also be conducted to determine which viral proteins contribute to viral cell-to-cell and vascular transport. Finally experiments will be conducted to culture the fungal vector Polymyxa graminis in wheat roots. This will be essential to study how the fungus transmits the virus. (2470)
Sponsors: USDA, Oklahoma Agricultural Experiment Station
PI: Jeanmarie Verchot-Lubicz

Transmission of Phytopathogenic Bacteria by the Squash Bug: A New Role for Anasa Tristis

Objectives are to determine whether Serratia marcescens is transmitted non-circulatively or circulatively by the squash bug, Anasa tristis. Study will identify strains of S. marcescens, including the strain that causes disease in cucurbits that are pathogenic to A. tristis and will determine if A. trisis transmits S. marcescens collected from other ecological niches. Study will also disrupt transmission by A. tristis by blocking S. marcescens attachment to gut and/or cuticle. (2472)
Sponsors: USDA/NRI, Oklahoma Agricultural Experiment Station
PIs: Astri Wayadande, Jacqueline Fletcher, Benny Bruton, Sam Pair, Forrest Mitchell

Management of Nematode Pests in Sod Production Systems with Soil Amendments or Fallowing
Objectives are to evaluate soil amendments and soil fallowing on the management of nematodes in commercial sod production and to evaluate the economic costs and benefits of integrated nematode management practices in commercial sod production. (2475)
Sponsors: USDA, Oklahoma Agricultural Experiment Station
PIs: Nathan Walker, Joe Schatzer, Hallin Zhang, Dennis Martin, Gerrit Cuperus

Biology, Ecology, and Pest Management of Wood-Destroying Subterranean Termites
The study objectives are to: 1) elucidate taxonomy, distribution, and biology of indigenous subterranean termites in Oklahoma; 2) investigate resource allocation, brood placement, and care-taking of subterranean termites relative to variation in food resources; 3) determine foraging territories, seasonality, and impact of subterranean termites on grassland plant biomass and carbon sequestration; 4) develop unique methodologies, techniques, and systems; and 5) evaluate efficacy of existing, improved, and emerging termite management technologies. (2480)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Bradford Kard

Biology and Management of Postharvest Insect Pests
Study will investigate the ecology and behavior of stored-product insects in order to understand factors affecting population dynamics and key life processes of individuals, and to provide information that can be incorporated into pest management strategies. Study will develop sampling, trapping, and/or monitoring tools that can be used to assess the size and impact of postharvest insect populations and for ultimate use in the decision-making processes of integrated pest management (IPM). The study will also research the chemical ecology of postharvest insects, develop semiochemical-based suppression or management tools, and will determine the efficacy and use patterns for new, reduced-risk and/or natural product residual insecticides as grain protectants or surface treatments used against stored product insects. Finally, the study will investigate methods using new fumigant insecticides, or alternatives to chemical fumigants, for controlling postharvest insect pests, particularly those with potential as alternatives to methyl bromide. (2518)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Thomas W. Phillips

Control and Etiology of Anthracnose on Euonymus
Sensitivity *in vitro*, by two isolates of Colletotrichum gloeosporioides, the causal organism

for anthracnose to the fungicide Benlate, indicted that both isolates were similar and that they did not represent two different strains of the fungus. Growth of this fungus was not inhibited by copper fungicides. Therefore, copper fungicides will be one of the ingredients used to develop a semi-selective medium to isolate C. gloeosporioides from soils and plant materials. Development of a semi-selective medium will allow us to follow the disease cycle of this pathogen. (2522)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Kenneth E. Conway

Improvement and Field Validation of an Attract-and-Kill Bait Station for the Indianmeal Moth
Research will develop and improve the attractiveness of a bait station used for trapping and suppression of Indianmeal moth (IMM) females. Studies will validate its attractiveness in a wide range of food facilities that are considered at high risk for IMM infestations. A patent application has been filed for the female attractant developed in this work. We intend to disseminate general information related to integrated pest management of stored-product moths with particular emphasis on the prospects of using detailed monitoring programs for early detection and decision-based insect pest control. (2523)
Sponsors: Oklahoma Agricultural Experiment Station, USDA/CSREES, Texas A&M University; Kansas State University
PI: Thomas W. Phillips

Alternatives to Organophosphates as Stored Grain Protectants
This project will evaluate reduced risk replacement insecticides for grain and/or food-handling applications and non-chemical management tactics. Experiments were established to test treatments of stored wheat with diatomaceous earth (DE), a food-safe natural desiccant insecticide. The insect growth regulator (IGR) methoprene is being tested in other bin studies alone and in combination with ambient air cooling. Surface treatments with an IGR, hydroprene, and a pyrethroid, cyfluthrin, are being conducted in pilot scale warehouses. (2525)
Sponsors: Oklahoma Agricultural Experiment Station, USDA/CSREES
PI: Thomas W. Phillips

Pheromone-Based Suppression of Stored-Product Moths Using Attracticides
This project will determine the utility and efficacy of a pheromone-based attracticide for a group of closely related moth species that are pests of stored products. The study will also optimize the attracticide formulation and validate its effectiveness for suppressing the Indianmeal moth in commercial settings; will determine if the same or a modified attracticide formulation can effectively attract and kill males of almond moth and Mediterranean flour moth; and will conduct simulated warehouse studies to determine if almond moths and Mediterranean flour moths can be controlled with attracticides. (2526)
Sponsors: Oklahoma Agricultural Experiment Station, Suterra LLC, IPM Technologies, Inc.
PI: Thomas W. Phillips

Functional Genomics of Plant Pathogenic Fungi
This study will identify and investigate the molecular mechanisms of fungi infecting the model plant, Medicago truncatula, and economically important crops. The study will also develop new functional genomic tools and libraries to elucidate the molecular mechanisms of phytopathogenic fungi affecting Oklahoma agriculture, in general. (2536)
Sponsors: Oklahoma Agricultural Experiment Station, NSF-EPSCoR, Noble Foundation
PI: Stephen M. Marek

Role of Wound Surface Chemistry in the Fungal Invasion of Fruit Wounds and the Decay of Apples and Pears
Fungal pathogens that cause decay of apples, pears, and other fruits limit the economic value of these fruits to fruit growers, distributors, and retailers. In particular, these pathogens are continuing problems in postharvest storage. This project examines the relationship of wound surface chemistry to the adhesion of Botrytis cinerea and Penicillium expansum conidia in wounds, and the decay of apple (cv. Golden Delicious) and pear (cv. Barlett) fruits. The chemical and physical properties of wound surfaces as they age will be determined. (2545)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Alexander Filonow

Cultural Practices for Management of Pod Decay of Snap Bean
An increasing constraint to snap bean production across a four-state region is pod decay. Several water molds, including Pythium aphanidermatum, P. ultimum, and a heterothallic spp. have been identified as casual agents in the disease complex. This research will evaluate cultural modifications to current snap bean production practices in order to disrupt pathogen dispersal using an ecological approach. (2555)
Sponsors: Oklahoma Agricultural Experiment Station, USDA/SRIPM
PIs: J. Damicone, J. Edelson, L. Brandenberger

Vacuum for Postharvest Disinfestation of Durable and Fresh Commodities
Vacuum reduces all the atmospheric gases and imposes a low oxygen atmosphere that is insecticidal. Experiments with vacuum will determine the treatment parameters of pressure, exposure time, and temperature required to control the cowpea weevil infesting postharvest cowpeas. The study will investigate the feasibility of vacuum for killing wood boring beetles, especially cerambycid beetles that are surrogate models for quarantine pests such as the Asian long-horned beetle and will develop methods to utilize vacuum cocoons (flexible PVC chambers) to treat cases of perishable fresh commodities with minimal damage. Finally, the study will research the possibility of combining low doses of natural volatile toxicants with vacuum to enhance or improve mortality of certain postharvest pests. (2556)
Sponsors: Oklahoma Agricultural Experiment Station, USDA/CSREES, Fort Valley State University
PI: Thomas W. Phillips

FORESTRY

Development of Improved High-Value Hardwoods for Oklahoma
Study will establish additional progeny/provenance tests; develop regeneration and management techniques appropriate for these species in Oklahoma; assist the State Division of Forestry in developing improved, synthetic varieties of these species; and conduct molecular genetic studies of drought tolerance, survivability, and other traits of interest/value. The study will also provide pedigreed materials for other studies. (1664)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Charles Tauer

Effects of Forest Management Practices on Water Resources, Riparian, and Aquatic Ecosystems in Oklahoma
This study plan addresses a broad list of interrelated topics including evaluation of the effects of forest management practices on water quantity and quality on existing small and new large watersheds, cumulative effects, forest road erosion, best management practice effectiveness, and the application of GIS and GPS to the development of models for evaluating different management strategies to better protect water resources. (1695)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma State Regents for Higher Education, Weyerhaeuser Southern Forestry Research, USDA Forest Service Southern Forestry Research Station
PI: Don Turton

Silvicultural Practices Applicable to Multi-Storied, Uneven-Aged Pine and Pine Hardwood Mixtures in Oklahoma
Study will develop efficient, effective methods of regenerating pine-hardwood mixtures and uneven-aged pine stands utilizing low-cost artificial and natural methods. Study will also develop intermediate cultural treatments applicable to natural pine and mixed pine-hardwood stands to increase productivity and meet management objectives. Finally, the study will evaluate the effects of silvicultural practices on long-term site productivity. (1879)
Sponsors: Oklahoma Agricultural Experiment Station, USDA Forest Service
PIs: Robert Wittwer, Tom Hennessey, and Tom Lynch

Genetics and Improvement of Conifers in Oklahoma
Study will characterize the AMP gene recently discovered from loblolly pine and will examine genome organization and gene structure and function in loblolly pine and shortleaf pine. The study will also examine population variation in loblolly and shortleaf pine, and putative and known hybrids, using isozyme, chloroplast DNA, mitochondrial DNA, and genomic DNA markers. Finally, the study will determine natural and potential gene flow between them and will continue existing studies. (1886)
Sponsors: Oklahoma Agricultural Experiment Station, USDA Forest Service, Oklahoma State Regents for Higher Education
PI: Charles Tauer

Methods for Monitoring and Predicting the States of Forest Stands
Goals of the stud include the development and testing of improved methods for monitoring current states of forests, methods that use forestry data to estimate parameters of forest resources, growth models to predict future states of forests important in Oklahoma, and

management practices important in eastern Oklahoma. (1887)
Sponsors: Oklahoma Agricultural Experiment Station, USDA Forest Service Ouachita National Forest, USDA Forest Service Cimarron National Grasslands
PI: Tom Lynch

Improvement of Quality Forest Tree Seedlings for Regeneration of Oklahoma Forests
Study will develop improved seed treatments to enhance germination vigor and increase efficiency of nursery production of seedlings, develop improved seedling storage and handling techniques to maintain seedling quality and insure survival and rapid growth after transplanting to the field, determine root and shoot traits critical to growth and survival of seedlings under drought stress, develop techniques to precondition seedlings in the nursery to have the capacity for high performance when transplanted to the field, and develop selection criteria to genetically improve seedling traits for high performance under drought. (1979)
Sponsor: Oklahoma Agricultural Experiment Station, ODAFF State Forest Regeneration Center
PI: Steve Hallgren

Investigation of Ecophysiological Processes Determining Productivity of Loblolly Pines
The study will investigate differences in photosynthate production and distribution in response to moisture and nutrient availability and among sources and families of loblolly pine. (2120)
Sponsors: Oklahoma Agricultural Experiment Station, USDA Forest Service, Weyerhaeuser Company, Mead Westvaco Corporation
PI: Tom Hennessey

Timber Management under the Ecosystem Management Model
Study will develop and understand methods of forest management for public and private lands that establish and maintain sustainable forest enterprises. Quantitative descriptions of growth and yield processes at the tree, stand, forest, and ecosystem levels will be developed. Financial and econometric analyses of stand and forest level management practices and alternatives will be done. (2206)
Sponsors: Oklahoma Agricultural Experiment Station, USDA Forest Service, Temple-Inland Forest Products Corp.
PI: Gordon Holley

Responses of Wildlife Populations and Communities to Land Management in South-Central U.S. Forests
Study will determine effects of vegetation management in the Cross Timbers and other south-central U.S. forests on bird and mammal communities. The study will also develop and test habitat models that predict landscape responses by animals to the effects of land management practices. (2236)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma Department of Wildlife Conservation, OSU Department of Zoology
PI: Fred Guthery

The Role of Inventory as a Capital Stock in the Evaluation of Forestland Woodland Management
The study will incorporate estimates of the value of the inventory as a capital stock in the evaluation of management alternatives for forest and woodland ecosystems. These evaluations are intended to compare alternatives on the basis of efficiency criteria as well as consideration of impacts and their distribution. (2273)
Sponsor: Oklahoma Agricultural Experiment Station
PI: David Lewis

The Interrelations among Landscape Management, Climate, and Bird Populations
The goals of this study are to develop a bobwhite prediction model, test hypotheses on quail declines, use simulation modeling to study spatial arrangements of habitat objects, and examine weather and quail demography. (2368)
Sponsors: Oklahoma Agricultural Experiment Station, Noble Foundation, Oklahoma Department of Wildlife Conservation, various private landowners, OSU Department of Zoology, OSU Department of Plant and Soil Sciences, Oklahoma State Regents for Higher Education
PI: Fred Guthery

Value-Added Wood Composite Manufacture from Under-Utilized Species in Oklahoma
Study will develop data to understand the properties of experimental particle board panels from whole-tree furnish of various low quality hardwoods and softwoods in Oklahoma. The 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: Salim Hiziroglu

HORTICULTURE AND LANDSCAPE ARCHITECTURE

Fruit Tree and Grape Investigations
Study will evaluate new peach and grape cultivars for use in Oklahoma as well as best management cultural practices for fruit in Oklahoma. (1433)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Dean McCraw

Vegetable Breeding Material Evaluation and Alternative Crop Development
Study will evaluate advanced lines and cultivars of vegetables in comparison with established cultivars for production, quality, and energy use efficiency. The study will also evaluate the production and economic potential for non-traditional vegetable crops in Oklahoma and will determine what weeds and diseases could potentially limit production of selected vegetables and evaluate various control techniques and strategies. (1441)
Sponsors: Oklahoma Agricultural Experiment Station
PIs: Lynn Brandenberger, Brian Kahn, James Shrefler, John Damicone

Studies of Alternate Bearing in Pecan

Studies will evaluate new pecan rootstocks and cultivars for use in Oklahoma and will evaluate selected N application rates, timing, and ground cover management for pecan to reduce alternate bearing and develop best management practices for pecan. (1689)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Pecan Growers' Association
PI: Michael W. Smith

Plant Resistance to Abiotic Stress
Study will characterize freeze tolerance of bermudagrass to identify cultivars suitable for the transition zone between warm and cool season grasses, will screen experimental bermudagrass germplasm to select for superior freeze tolerance, will identify factors contributing to freeze tolerance, and will determine the role of the chemical and physical environment in susceptibility of proteins to denaturation and aggregation at high temperatures. (2002)
Sponsors: Oklahoma Agricultural Experiment Station, U.S. Golf Association
PIs: Jeff Anderson, Charles Taliaferro, Dennis Martin

Improved Vegetable Crop Development through Sustainable Cultural Practices
Study will develop more environmentally benign pest control strategies for Oklahoma vegetable crops and investigate systems emphasizing soil conservation, including use of cover crops and strip tillage. (2026)
Sponsors: Oklahoma Agricultural Experiment Station
PIs: Brian Kahn, Ken Conway, John Damicone

Cultural Management, Seed Germination, and Stand Establishment of Vegetables in Oklahoma
Study will determine long term changes to a soil when poultry litter is used continuously as a fertilizer, determine impediments to certified organic vegetable production in Oklahoma, compare vegetable cultivars for resistance to such impediments, develop techniques of managing soil and plant nutrient requirements for production of certified organic vegetables in Oklahoma, and develop techniques for lessening the effect of wind erosion and the effects of wind damage on cucurbit crops. (2087)
Sponsors: Oklahoma Agricultural Experiment Station, USDA-CSREES
PI: Warren Roberts

Development of Integrated Resource Management Systems for Turfgrass Culture in Oklahoma
'Riviera' (tested as OKS 95-1) and 'Yukon' (tested as OKS 91-11) seeded bermudagrasses (Cynodon dactylon) have provided high turf quality, improved spring dead spot resistance, and enhanced cold-hardiness for transition zone and subtropical climate zone environments. Questions arose concerning the ability to produce commercially viable sod from seed of these grasses although selection for sod production characteristics were not the initial goal in development of these seed generated varieties. Yukon was seeded at 36.7, 48.8, 61.0 kg pure live seed / ha (0.75, 1.0 and 1.25 lbs pls/ 1,000 sq. ft.) in July 2003. Riviera was established in a separate study at the same time with seeding rates of 24.4, 36.7, and 48.8 kg pure live seed / ha (0.5, 0.75 and 1.0 lbs pls/1,000 sq. ft.). Sod was grown under regular irrigation, 244 kg N /ha yr (5 lbs N/ 1,000 sq. ft. yr), with P and K

optimized as per soil test indices, and sod mowed regularly at 3.8 cm (1.5 in). Sod was harvested in July 2004 and rated for commercial quality on a 1 – 5 scale where 3 = minimum acceptable commercial quality and 5 = outstanding quality. Sod shear strength was measured at the time of harvest using an electrically operated linear actuator interfaced to a pressure transducer/processor that recorded peak shear force. Sod was harvested to an approximate 1.8 cm (0.7 inch) depth using a commercial walk-behind sod cutter with a 30.5 cm (12 inch) wide cutter bar. Yukon sod was unable to be effectively handled for testing in the shear device. Seeding rate did not statistically affect Yukon sod quality or sod shear strength. Yukon in this trial was unable to provide commercially viable sod strength for harvest, handling, and transport. Riviera provided mean quality and acceptable sod shear strength, indicating that it could meet minimum sod production characteristics but was not outstanding in its sod production characteristics. Sod production of Riviera without netting by licensed commercial producers using only Foundation Class seed is possible. Production of both varieties by seed or vegetative stock is protected against unauthorized propagation by "U.S. Plant Variety Patent Applied For" status. Sod productions results should be valuable in selecting seeded bermudagrasses that also have the capacity to be produced as sod for special marketing purposes. (2222)
Sponsors: Oklahoma Dept. of Transportation, United States Golf Association, Oklahoma Golf Course Superintendents Association, National Turfgrass Evaluation Program, Oklahoma Turfgrass Research Foundation, Oklahoma Agricultural Experiment Station, Oklahoma Cooperative Extension Service, Oklahoma State Regents for Higher Education
PIs: Dennis Martin, Charles Taliaferro, Jeff Anderson, Greg Bell

Production, Establishment, and Maintenance of Ornamental Plants in Oklahoma
Study will evaluate woody ornamental plants and ornamental grasses for their response to low moisture conditions and identify potential physiological and morphological mechanisms that may contribute to drought resistance. Study will also determine cultural practices that may be used in economical production and maintenance of quality landscape plants; determine optimum combinations of controlled release and liquid fertilization that allow for production of high quality plants with minimal fertilizer inputs and runoff contamination; and identify cultural and chemical methods of controlling anthracnose on *Euonymus fortunei*. (2324)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Janet Cole

Postharvest Preservation and Processing Systems for New and Conventional Horticultural Commodities
Study will develop postharvest handling and quality analysis procedures necessary for integrated sage and oregano production/harvesting/processing systems as a new Oklahoma antioxidant/antimicrobial production industry. The study will also investigate capsaicinoid metabolism in pungent/high capsaicin pepper selections and will evaluate processing steps for lycopene production, as a secondary marketing option for watermelons. (2325)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Niels Maness

Management Procedures that Enhance the Partnership between Turfgrass and the Environment
Study will investigate the use of optical sensors for evaluation of turfgrass quality and moisture status. The study will also evaluate the performance of optical-based variable rate spray techniques for potential in turfgrass management; determine methods that reduce nutrient and pesticide runoff from golf course fairways and other turf areas; and work in cooperation with Mississippi State University, University of Maryland, and University of Minnesota researchers to develop and/or revise pesticide runoff models for effective use in turf. (2392)
Sponsors: Oklahoma Agricultural Experiment Station, United States Golf Association, Oklahoma Turfgrass Research Foundation, Toro Center for Advanced Turf Technology
PIs: Greg Bell, Dennis Martin, John Solie, Marvin Stone, Michael Kizer, Hailin Zhang, Mark Payton, Joseph Massey, Kevin Armbrust,, Mark Carrol, Pamela Ric, Brian Horgan

Postharvest Quality and Safety in Fresh-Cut Vegetables and Fruit
Technologies to produce lycopene from watermelon are under development. A lycopene rich fraction can be obtained from macerated red fleshed watermelon by removal of cellular material via filtration and precipitation of lycopene from the filtrate. Measures to eliminate sugar from the lycopene have been developed. Investigations are focusing on measures to enhance lycopene yield in the filtrate, which presently is about 35 to 40 percent of the total lycopene. Investigations have also been initiated to assess enhancement of lycopene yield from the de-sugared filter cake. (2423)
Sponsors: Oklahoma Agricultural Experiment Station, Watermelon Promotion Board
PIs: Niels Maness, William McGlynn, Danni Bellmer

Evaluation and Marketing of Ornamental Plants in the State of Oklahoma
Study will develop a consumer-targeted marketing program for Oklahoma Prove, will coordinate the selection of Oklahoma Proven plants through industry surveys and plant evaluations, and will direct the consumer to superior plants for Oklahoma, thereby creating more environmentally friendly landscapes, and increased sales for Oklahoma green industries. (2441)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Cooperative Extension Service, Oklahoma Department of Agriculture, Oklahoma Nursery and Landscape Association, Oklahoma Greenhouse Growers Association, Oklahoma Botanical Garden and Arboretum, Oklahoma Gas and Electric, Urban and Community Forestry Council
PI: Lou Anella

Harvesting, Processing, and Storage of Horticultural and Alternate Commodities
The study will evaluate means to enhance total capsaicinoid production of peppers, and to increase capsaicin as the major produced capsaicinoid in peppers. Ammonium thiosulfate has been utilized to remove early flowers with the intent of unifying later flowering and increasing the capsaicinoid content of later set fruit. Selection for the high capsaicin trait is underway, and plants with the high capsaicin trait are being utilized to cross with plants with the high capsaicinoid trait to produce a line which has both desirable traits. Metabolic mechanisms for capsaicinoid-specific metabolism are under investigation, with emphasis

towards potential fatty acid regulation as the acyl substituent of capsaicinoid molecules. (2481)
Sponsors: USDA, CSREES, SS Farms
PIs: Niels Maness, Paul Weckler, John Solie, Marvin Stone

Postharvest Handling, Storage, and Processing of Horticultural and Alternate Commodities
An NDVI camera system for spinach chlorophyll concentration and pecan tree nutritional status/crop load determinations was utilized to evaluate the feasibility of multi-pixel NDVI measurement for individual-plant nutrient status. An x-ray imaging system for non-destructive pecan quality evaluation was developed and image analysis systems are under development to investigate x-ray imaging as a pecan grading technique. Development of an aqueous procedure for watermelon lycopene concentration determination is also underway. (2502)
Sponsors: Oklahoma Agricultural Experiment Station USDA, CSREES, Penny Perkins-Veazie
PIs: Niels Maness, Paul Weckler, John Solie, Marvin Stone

Floral Crop Enhancement with Silicon, Novel Plant Growth Regulators and Application Techniques, and Introduction of Native Species
Study evaluates Silicon supplementation (sources, rates, and application techniques) for floral crop enhancement of stem strength and diameter, postharvest life, and disease resistance. Study will also establish optimum plant growth regulators, rates, and application techniques that contribute to production of quality floriculture plants. Finally, the study will evaluate native flowering crops for introduction to commercial floriculture trade by screening for germination, adaptability to greenhouse production, responsiveness to plant growth regulators, and nutritional requirements. (2534)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Todd Cavins

Preservation, Handling, and Processing of Horticultural and Alternate Commodities
Study will determine the effects of horticultural practices and harvesting procedures on product quality before and after harvest and will investigate critical biological processes related to fresh and minimally processed horticultural product deterioration and nutraceutical content during postharvest handling. The study will also develop and evaluate new and redesigned harvesting, handling, processing, and storage technologies for horticultural products and will evaluate technologies for extending the shelf life, enhancing the concentration of active ingredients, and/or improving marketability of horticultural products. (2542)
Sponsors: Oklahoma Agricultural Experiment Station, USDA-CSREES
PIs: Niels Maness, Paul Weckler, John Solie

HUMAN ENVIRONMENTAL SCIENCES

Enhancing Health and Safety through Personal Protective Equipment
Oklahoma provided thermal and evaporative resistance data on selected NC-170 test

materials for use in objective 1 of the project (i.e., the development of a statistical model to be used for selection of protective clothing materials). A fit analysis of two prototype garments was undertaken in collaboration with Cornell University using a 3-D body scanner.
Sponsor: Oklahoma Agricultural Experiment Station
PI: Donna Branson

Tourism Shopping: Do Retailing Strategies Fit Consumers' Expectations?
The purposes of the study are to expand understanding of retailing strategies employed by the tourism industry in Oklahoma and consumer expectations for travel and shopping in Oklahoma and to make recommendations to the Oklahoma souvenir and service industry to better approach their target markets. The project includes both qualitative and quantitative studies.
Sponsor: Oklahoma Agricultural Experiment Station
PI: Hong Yu

Effects of Metabolic Stress and Trace Mineral Interactions
Methods of inducing oxidative stress by trace mineral depletion are being evaluated. Restriction of dietary minerals during pregnancy was used as a technique for producing young rats with low stores of targeted trace elements. In one experiment, dams were randomly assigned to a 2 x 2 factorial design with selenium and iodine as factors. Young male and female pups were randomly selected from each dam and continued on the same experimental diet fed to the dam. Male pups were consistently more selenium depleted than females. In males, selenium depletion significantly reduced growth rate, bone mineral content, and density of tibia and vertebra. Selenium depletion also significantly reduced bone volume/total volume (BV/TV) and trabecular number, and increased trabecular space in vertebra.
Sponsor: Oklahoma Agricultural Experiment Station
PI: Barbara J. Stoecker

Impacts of Food Choices and Nutritional Status of Americans
The goal of this project is to better understand factors influencing food choices and nutritional status. The project conducted a study with young women to determine if nutrition education and/or cereal intake will increase folate intake and biomarkers of folate status.
Sponsor: Oklahoma Agricultural Experiment Station
PI: Gail Gates

Interactions between Micronutrients and Their Influence on Immune Function
Both zinc and vitamin E are important for optimal immunity. This project will determine if supplemental zinc and vitamin E act together to affect macrophage function. Results thus far suggest that zinc and vitamin E do interact to affect the growth of the cells and tumor necrosis factor-alpha production in response to stimulation with E. coli endotoxin. Interleukin-10, PGE2, zinc, and vitamin E concentrations of the macrophages are also being assessed. This project will help better define the role of zinc and vitamin E in macrophage function during an infection.

Sponsor: Oklahoma Agricultural Experiment Station
PI: Elizabeth Droke

Meat Analogs Made From Texturized Vegetable Materials
The aim of this project is the development of meat analogs that may reduce the risk of cardiovascular disease. Physical tests (including texture profile) and chemical analyses (fat and flavor profiles using GC-MS) have been carried out on texturized peanut prepared by extrusion processing of partially-defatted peanut meal. The texturized peanut has meat-like properties, but lacks compounds that may impart off-flavors. Potential commercial applications for it are being investigated.
Sponsor: Oklahoma Agricultural Experiment Station
PI: Margaret J. Hinds

Mineral Interactions in Optimal Health
Previously collected and cleaned fifth lumbar vertebrae from rats randomized to treatment [young mature (YM), ovariectomized (OVX), or sham-operated (SHAM)] and diet (6, 12, 35 or 150 ppm Fe) were scanned for micro-architecture (Micro-CT 40, SCANCO MEDICAL AG, Zurich, Switzerland) and strength analyses were performed. YM rats fed 6 ppm Fe for 15 weeks had significantly lower bone volume/total volume (BV/TV) and trabecular number (Tb_No) than YM rats fed either 35 or 150 ppm Fe. The measure of rod- or plate-like trabecular structure (SMI) and tracebular space (Tb.Sp) was significantly greater in the YM 6 ppm group than in either the 35 or 150 ppm groups. In the sham-operated and ovariectomized animals fed for 27 weeks, effects of diet were found for force, stiffness, and Von. Mises stresses. Effects of ovariectomy were also found for stiffness. In architectural characteristics, ovariectomy also affected SMI and connectivity density.
Sponsor: Oklahoma Agricultural Experiment Station
PI: Andrea Arquitt

PLANT AND SOIL SCIENCES

Evaluating Cotton Varieties for Oklahoma Producers
Study will determine the relative performance of commercially available cotton varieties when grown in replicated experiments under Oklahoma environmental conditions and make that information available to cotton producers in the state. Study will also study genotype by environment interactions relative to the major factors of cotton production in the state and region. Secondary objectives are to provide information to cotton research and extension personnel and to provide data to cotton breeders that would help them release varieties better adapted to Oklahoma. (0714)

Sponsor: Oklahoma Agricultural Experiment Station
PIs: Laval Verhalen, Rocky Thacker, J. C. Banks, Melanie Bayles

Management and Interference of Weeds in Cultivated Agronomic Row Crops and Pastures
Study will 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. Study will also determine the relationship of specific weed species with cultivated agronomic row-crops as well as pastures, will assess the biology and ecology of

weeds, and will define the weed-crop threshold protection level a crop needs to produce optimum, high quality yields. Finally, the study will 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: Cotton, Inc., Monsanto, Dow AgroSciences, BASF, Syngenta, Valent, Oklahoma Agricultural Experiment Station
PIs: Don Murray, Craig Talley

Pasture, Range, and Turfgrass Breeding
Study will develop new grass cultivars bred for improvements in selected yield, quality, adaptation, and other performance features. Cultivars will be bred for pasture, turf, and bioenergy feedstock uses. Study will collect, evaluate, and enhance germplasm of select grass species and will elucidate reproductive behavior, genetic variation, and breeding improvement potential in selected grass species. Finally, the study will develop and test new plant breeding models that incorporate molecular techniques. (1361)
Sponsors: U.S. Golf Association, CSREES, Oklahoma Agricultural Experiment Station
PI: Charles Taliaferro

Wheat Breeding
New, improved pureline cultivars are developed in this research project through field-based, winter wheat breeding procedures, supplemented by contemporary DNA selectable marker and transformation techniques. The principal aim is to develop and release marketable bread-wheat cultivars for commercial production in Oklahoma and surrounding states in the southern Great Plains. Special emphasis is placed on adaptation to dual-purpose and grain-only management systems, acid soils, drought stress, high test weight, resistance to several foliar diseases, and functional quality relevant to the hard red winter and hard white market classes. Other traits are combined with these to the greatest extent possible, including winterhardiness, straw strength, shatter resistance, optimal maturity, and resistance to greenbugs, oat-birdcherry aphid, and Russian wheat aphid. Proprietary research is conducted on incorporating genes conferring herbicide resistance. Two hard red winter wheat varieties were forwarded by this program and released by the Oklahoma Agricultural Experiment Station in 2004 under the names, Endurance and Deliver. These varieties fill significant voids in variety choices currently available to wheat producers in the southern Great Plains. Three additional varieties are targeted for release in 2005. Finally, fundamental research is conducted on breeding methodology and on quantitatively inherited traits of direct importance to the breeding program. (1426)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Wheat Research Foundation, USDA-ARS
PIs: Brett Carver, Bob Hunger, Art Klatt, Tom Peeper, Arron Guenzi, Dave Porter, Patricia Rayas, Jeanmarie Verchot, Bjorn Martin, Jeff Edwards

Integrated Weed Control Programs for Small Grains
Project will develop chemical weed control technology for use in small grains that is more effective, reliable, and/or economical than that presently available. Project will investigate the influence of cultural practices and grazing on weed infestations and their control and will develop integrated weed management programs for major weeds in wheat. (1644)
Sponsors: Washington State University, Oklahoma Wheat Commission, Oklahoma Wheat Research Foundation, USDA Southern Region Sustainable Agriculture Research and

Education Program, Rohm and Haas, FMC Corporation, Oklahoma Agricultural Experiment Station
PIs: Tom Peeper, Gene Krenzer, John Solie, Francis Epplin

Soybean Improvement
Soybean performance nurseries were planted at seven locations in 2003. Nurseries planted included both early and full-season. Soybean cultivars and breeding lines evaluated represented maturity groups III through VI. Grower acceptance and utilization of herbicide resistant cultivars contributed to a continued large increase in the number and proportion of cultivars in tests that were herbicide resistant. One Oklahoma line, OK926524, was identified as being high-yielding with good varietal potential. This line is maturity group VI, and entered into testing again in 2004. One Oklahoma line, OK986108, in the maturity group V test, was identified as being high-yielding with good performance in the North and East test locations of the state. This line was entered into test again in 2004. A nematode nursery was established at the Eastern Research Station near Haskell. (1653)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Soybean Board
PIs: Neal Foster, Kenton Dashiell, John Caddel

Alfalfa Breeding and Management
Project will identify and enhance germplasm with resistance to important alfalfa pests and to grazing. Project will also evaluate cultivators and strains for forage yield, persistence during grazing, and pest resistance. Finally, the project will evaluate Oklahoma alfalfa production practices that economically impact yield, forage quality, and persistence and will develop integrated management systems to minimize production losses and optimize forage yield. (1685)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: John Caddel, Richard Berberet

Rangeland Brush Management and Prescribed Fire
Project will determine long-term economic and ecological influence of vegetation change and vegetation management practices in upland oak-hickory forests and tallgrass prairies of central North America. It will also evaluate, with cooperating scientists, ecosystem responses associated with brush management, and the causes and ecological implications of vegetation change. The project will develop vegetation management strategies using prescribed fire. (1822)
Sponsors: Oklahoma Agricultural Experiment Station, Department of Zoology, Oklahoma Cooperative Fish and Wildlife Research Unit, U.S. Environmental Protection Agency, The Nature Conservancy
PIs: David Engle, Mark Gregory, Hebbie Purvis, David M. Leslie, Jr., Eric Hellgren

Soil-Forming Processes in Oklahoma
Project evaluates the effects of erosion and deposition on soils formed at sites occupied by prehistoric people, measures long-term stream and river incision rates for soil-landscapes in western Oklahoma using volcanic ash deposits, and characterizes soil lithologic discontinuities by using trace and heavy element soil profile distributions. Project also characterizes 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:** Brian Carter

Cellular and Molecular Biology in Wheat Germplasm Enhancement
A systematic characterization is ongoing to define transcription profiles between the interactions of wheat roots of the cultivar Jagger and 1 take-all Gaeumannomyces graminis var. tritici, 2 Rhizoctonia solani, and 3 Pythium arrhenomanes. These three species represent a complex of soilborne pathogens (i.e., the root-rots that are endemic to all wheat producing regions in the Great Plains and much of the world). A cDNA microarray representing genes differentially expressed during early stages of infection was created and used to characterize host transcription profiles during root surface colonization, epidermis penetration, and cortex colonization. 150 genes were differentially expressed during the wheat G. graminis interaction. 105 genes were differentially expressed during the infection by P. arrhenomanes into wheat roots. Surprisingly, there was little overlap between the gene expression profiles for these two pathogens with the same host genotype. These results provide targets for future functional analyses and engineering for plant resistance to these diseases. (1996)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Wheat Research Foundation, National Science Foundation
PI: Arron Guenzi

Effects of Nitrogen Enrichment on Nitrogen and Carbon Cycling and Vegetation Dynamics in Old Fields
Study will assess the influence of nitrogen addition and exclusion of primary consumers (small mammals) on aboveground and belowground primary productivity, nitrogen flux, carbon storage, and plant community composition in a naturally revegetated old field. The study will model ecosystem response to anthropogenic nitrogen enrichment and will investigate the ecological influences and causes of increases in an exotic and invasive C3 grass, Festuca arundinacea. (2044)
Sponsors: Oklahoma Agricultural Experiment Station, Department of Zoology, Oklahoma Cooperative Fish and Wildlife Research Unit, U.S. Environmental Protection Agency
PIs: David Engle, David M. Leslie, Jr., Eric Hellgren

Mechanisms Conferring Water-Use Efficiency to Crops
No environmental factor limits crop yields more than the availability of water. Yet, genetic variation in drought resistance exists and could be taken advantage of in the development of crops for the future. The proposed project targets the physiological and molecular basis of drought resistance and its major component, water-use efficiency (WUE) in C-3 crops from a variety of directions. (2115)
Sponsor: Oklahoma Agricultural Experiment Station
PI: Bjorn Martin

Heavy Metal and Trace Element Chemistry in Soils: Chemical Speciation and Bioavailability
This study will determine the ability of chemical speciation methods that measure heavy metal bioavailability, estimate ecotoxicity of contaminated soil, determine the effect of soil chemical properties on chemical speciation and heavy metal bioavailability in contaminated soil, determine the ability of soil chemical properties to define ecotoxicity categories in development of Ecological Soil Screening Levels, and determine the ability of diammonium

phosphate to reduce bioavailable chemical species of heavy metal contaminants in soil. The effectiveness of DAP to reduce heavy metal bioavailability will be compared with other treatments being investigated by the scientific community and USEPA (i.e., biosolids, alkaline materials). Research will include optimization of cost-effective use of DAP to remediate smelter-contaminated soils in Oklahoma. (2176)
Sponsors: Oklahoma Agricultural Experiment Station, Ohio State University, U.S. Army Chemical Edgewood Chemical Biological Center, U.S. EPA Environmental Response Team, University of Washington
PI: Nick Basta

Improvement of Nitrogen and Phosphorus Fertilization Use and Environmental Safety
Few scientists have focused on improving worldwide nitrogen use efficiency (NUE) for cereal production that regardless of the crop remains at 33%. The unaccounted 67% results in a 20.0 billion dollar world annual loss of N fertilizer. Since 1992, a team effort from agronomy and engineering has struggled to develop an N fertilization system capable of improving upon the 33% NUE barrier. The new system that is now commercially available (Ntech Industries, Ukiah, CA) detects plant N uptake mid-season and determines appropriate N rates based on the yield potential for each four square foot area in agricultural fields. In addition to resulting in increased wheat grain yields at lower N rates, NUE has averaged 55% compared to conventional systems that remain near 30%. Added benefits of this technology include the environmental stewardship of fertilizer nutrients, which have led to surface and groundwater contamination. In 2003, a field scale variable N rate applicator for corn was tested in Iowa, Oklahoma, and Nebraska with equally promising results as that found for winter wheat and spring wheat. This technology has also been transferred to farmers in Argentina, China, India, Mexico, and Ecuador using our online sensor-based N rate calculator (SBNRC) at http://www.soiltesting.okstate.edu/SBNRC/SBNRC.php. This program allows farmers to obtain prescribed topdress N rates for corn, winter wheat, spring wheat, and bermudagrass using handheld sensors that are also commercially available via NTech Industries. The variable N rate applicator for corn was also tested in Iowa in 2004 and that delivered increased NUE. Also, plant P needs (applied with foliar N) are currently being investigated, whereby our work suggests that 1/10 the amount of P applied to the plant can deliver the same yields as much higher rates of soil applied P on moderately P deficient sites. Lastly, the use of CVs combined with NDVI readings on-the-go to adjust fertilizer N rates (CVs indirectly estimate plant stands) has resulted in improved NUEs and increased grain yields. (2192)
Sponsor: Agricultural Experiment Station
PI: Bill Raun

Cultural Solutions to Cotton Production Problems in Oklahoma
Study will improve experimental methodologies for detecting treatment differences in cotton field experiments; determine optimum planting dates (or time intervals) for irrigated and dryland cotton production; increase cotton's competitiveness with diseases, insects, and weeds; optimize inputs such as seeding rates; and minimize the effects of cold, drought, weathering, etc. on the plant. (2225)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: Laval Verhalen, Melanie Bayles

Agroecosystem Approach to Pasture Production
Study will identify improved management practices for a farm-scale sustainable grass/ legume forage system for year-round cow-calf operations in eastern Oklahoma. Study will document plant species composition and distribution during the grazing season, describe soils and correlate soil factors with productiveness of legumes and grasses, and will evaluate yield and persistence of legumes as affected by applied phosphorous in acid soils. (2230)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: John Caddel, Daren Redfearn, Hailin Zhang

Chemistry and Bioavailability of Waste Constituents in Soils
Study will characterize trace element chemistry in soil and waste to predict plant uptake and movement of trace elements in soils. Study will also characterize trace element chemistry in contaminated soils and evaluate the effects of remediation on trace element chemistry, bioavailability, and mobility. (2233)
Sponsors: Oklahoma Agricultural Experiment Station, Environmental Protection Agency
PI: Nick Basta

Environmentally Sound Management of Animal Waste in the Southern Great Plains
Study will incorporate animal waste into the N budget for selected production systems of the Southern plains, monitor soil nutrient levels from repeated applications of animal waste resources, evaluate high P loading rates from animal waste and potential environmental concerns, and evaluate near-infrared spectroscopy as an analytical tool to decrease the time frame for analysis of animal waste resources. (2281)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: Jeff Hattey

Microbial Activities of Environmental and Agricultural Importance
The main goal is to reveal microbial activities that are important to agricultural production and environmental protection. Given the fact that microbiological and biochemical reactions in soils dictate transformation of soil amendments such as animal waste and soil contaminants, it is essential to understand microbiological and biochemical reactions in soils for development of enviromentally sound animal waste management strategies that minimize negative environmental impact and preserve soil and water quality. We continue to focus on evaluating the impact of animal manures on microbial populations and activities of enzymes involved in phosphorus and nitrogen transformations in soil, characterizing microbial community in different agroecosystems, and investigating the impact of human activities such as heavy metal contamination on ecosystem health. In collaboration with scientists across the campus, country, and continents, multidisciplinary research teams are established to address fundamental questions, bridge research and application to promote the use of beneficial microorganisms in agricultural production, provide bioremediation of contaminated soil and water, and protect ecosystem health. (2394)
Sponsors: Oklahoma Agricultural Experiment Station, University of Georgia, University of California-Riverside, Savannah River Ecology Laboratory (Dept. of Energy), Hungarian Academy of Science, Debrecen University in Hungary
PIs: Shiping Deng, Jeff Hattey, Bill Raun

Multiple Objective Decision Support Systems for Managing Natural Resources and

Protecting Groundwater
The objectives of this project are to: 1) determine the sensitivity of the decisions of interest to simplifications in decision-support systems and to uncertainty and natural variability in input parameters of those systems, 2) develop effective methods of conveying this sensitivity and uncertainty to end-users, and 3) incorporate additional processes and new understanding into current and new decision-support systems. In the past 12 months we have created a decision-support system for managing the application of swine effluent based on the deterministic model for predicting ammonia volatilization from surface applied swine effluent developed and tested in the past two years. The decision-support system incorporates simplified weather input parameters that are generally available to farmers and decision-makers. The selection of the final required parameters was based on detailed sensitivity analysis of the deterministic model. Errors introduced by the simplified weather were less than 5% of the total ammonia volatilized during the first seven days after application in 85% of the scenarios tested. Due to extensive computing time, the decision-support system incorporates solutions for many combinations of input parameters and uses linear interpolation to provide the user with results for their specified inputs. The interpolation errors are generally less than 5% also. (2401)
Sponsor: Agricultural Experiment Station
PI: David Nofziger

Increasing Genetic Diversity for the Winter Wheat Breeding Program at Oklahoma State University
Wheat production in Oklahoma is complicated by numerous yield-limiting biotic and abiotic factors. The winter wheat breeding program at OSU has developed and released adapted varieties for Oklahoma for more than 50 years. However, in recent years, little progress has been made in resolving some of the biotic and abiotic factors that limit productivity. Dr. Brett Carver indicated in the Project Outline for OAES Hatch Project 1867 that average wheat yields in Oklahoma increased only 12% in the period 1970-1992. Varieties released by Texas (formerly) and Kansas (currently) are dominating the wheat area in Oklahoma. Higher yielding, well adapted varieties with better resistance to the principal diseases and better tolerance to the abiotic stresses are urgently required by Oklahoma farmers in order to increase productivity and total production, and to improve their overall economic situation. Genetic diversity is the “raw material” for plant improvement (genetic gains) and its proper utilization can provide protection against genetic vulnerability caused by biotic and abiotic stresses (Beuningen and Busch, 1997; Cox, 1991). Genetic variability in the OSU winter wheat breeding program has been limited. Efforts have been initiated to introduce genetically divergent germplasm with high yield potential, proven resistance to the common diseases, and enhanced tolerance to the most prevalent abiotic stresses into the breeding program. These characters will be incorporated into winter wheat cultivars adapted to the production environments in Oklahoma. With widespread adoption by farmers, productivity will be increased and income levels will rise. More importantly, the incorporation of these traits will lead to greater production stability as a result of the enhanced disease resistance and improved tolerance to soil and environmental stresses. (2407)
Sponsors: USDA/ARS, Plant Science and Water Conservation Research Laboratory, CIMMYT, Mexico, Turkey/CIMMYT/ICARDA Wheat Program, Improvement Association Ankara, Turkey, Oklahoma Wheat Research Foundation, Oklahoma Crop Improvement Association

PIs: Arthur Klatt, Brett Carver, Robert Hunger, David R. Porter, Jeanmarie Verchot

Mapping Wheat Genes for Tolerance to Abiotic Stress
Abiotic stresses such as aluminum (A1) toxicity in acid soils severely limit productivity and yield stability of wheat (Triticum aestivum) in the southern Great Plains. Breeding cultivars with resistance to adverse environmental factors can greatly improve crop productivity. In breeding programs, the genetic improvement of adaptation to acid soil is addressed through conventional approaches, which involve selection for related traits and yield under stress conditions and its stability over locations and years. Because many populations have to be evaluated in several locations under uniform field-stress environments, such selection programs are expensive and slow in attaining progress. Molecular markers should allow breeders to track genetic loci controlling stress tolerance without having to measure the phenotype, thus reducing the need for extensive field testing over time and environments. Two populations of recombinant inbred lines has been developed from Atlas 66/Chisholm and Atlas 66/Century and used for mapping of QTL for Al tolerance. One major QTL on chromosome 4DL was identified from Atlas 66 and its near-isogenic lines, which explained about 50% of phenotypic variation. Several closely linked markers have been identified and have potential to be used in marker-assisted breeding to improve Al tolerence of wheat in the southern Great Plains. (2425)
Sponsors: Oklahoma Agricultural Experiment Station and USDA-ARS-NPA-GMPRC-Plant Science and Entomology Research Unit
PIs: Guihua Bai, Brett Carver

Cotton Harvest Aid Evaluations in Oklahoma Production Systems
The goal of this study will be to determine the effect of plant and environmental conditions on performance of standard and newly developed harvest aid materials and to utilize this information to develop effective and profitable harvest aid management systems for both irrigated and dryland cotton production systems in Oklahoma. Field experiments will be established in multiple areas to determine the effectiveness of commercially available harvest aid materials and promising new chemicals in developmental stages prior to product introduction. Preliminary evaluation will be completed on small replicated plots and the more promising products will be evaluated in larger scale replicated plots to determine efficacy and economic implications, which include cotton fiber quality. Evaluations taken on both small plot and large plot experiments will include percent open bolls at application; percent defoliation at 3,7,14 days after application; percent open bolls at 3,7, 14 days after application; percent decissation at 3,7,14 days after application; and percent lower and upper re-growth at 14 and 21 days following application. In addition, lint yield, percent lint, and HVI fiber properties will be evaluated for each treatment. Oklahoma boll weevil eradication program will provide new opportunities to utilize a harvest aid program to condition the crop for an earlier and higher quality harvest. Since yields will be higher, increased costs can be justified. Data generated from this research project should help Oklahoma cotton producers make logical decisions on the most economical product or combination of products to use under specific conditions and on their timing of application. (2439)
Sponsor: Agricultural Experiment Station, Oklahoma State University
PIs: J.C. Banks, Don Murray, L. Verhalen, K. Anderson, S. Osborne

Soil Microbial Taxonomic and Functional Diversity as Affected by Land Use and

Management
The main objective was to determine relationships among microbial taxonomic and functional diversity, contaminant bioavailability, and remediation rates for different organic-contaminated soils. Contamination of nitroaromatic compounds in the environment is of concern. Following characterization of long-term nitroaromatic contaminated soils and obtaining isolates exhibiting nitroaromatic-degrading capability, we tentatively identified and characterized some of the microbial isolates using a combination of gram stain, morphology, biooxidation tests, and hydrolysis tests along with 16S rDNA sequences. Results suggested that one isolate is a Sinorhizobium, one belongs to Streptomyces, one is a Pseudomonas, one appears to be an actinomycete, and two isolates are from the same genus, Bacillus. There are two isolates that remain unidentified. Studies were also conducted to assess the impact of surfactants, including SDS, Steol CA-230, Tween 20, Tween 60, and Tween 80, on growth of three bacteria isolates. In general, nonionic surfactants, including Tween 20, Tween 60, and Tween 80, had little effect, while anionic surfactants, SDS and Steol CA-230, generally inhibited growth of the bacteria tested. Results obtained from this study suggested that caution should be exercised in the use of surfactants to facilitate bioremediation because surfactants might inhibit, promote, or remain neutral to bacterial growth depending on the type and concentrations used. (2460)
Sponsor: Agricultural Experiment Station
PI: Shiping Deng

Enhancement of Nutritional and Economic Value of Oils and Oilseeds through Innovative Processing
The main objective of this project is to enhance the nutritional and economic value of oils and oilseeds through innovative processing. Supercritical fluid extraction and fractionation, pressurized solvent extraction, and enzyme-aided aqueous oilseed extraction techniques will be utilized to increase the concentration of lipophilic bioactive compounds in the oilseed-based edible oils. Supercritical carbon dioxide, supercritical carbon dioxide-ethanol mixtures, pressurized water, ethanol, isopropanol, and alcohol mixtures will be examined as alternative solvents to conventional hexane extraction in an effort to reduce the impact of oilseed processing on the environment. Wheat germ, corn fiber, soybean, cottonseed, pecan, and peanut will be utilized as starting material for the processing research. This program will also utilize biotechnology to develop high purity value-added vegetable oil based products. Biocatalytic production of conjugated linoleic acid and biosurfactants such as fatty acid esters of polyols will be examined. Reaction kinetics, bioreactor types, and downstream processing of the bioconversion products will be investigated. Plant breeding and genetic modifications may result in unintentional changes in the composition of nutritional compounds naturally present in the plants. This project will examine the unintentional changes in the phytosterol, tocopherol, tocotrienol, and phospholipids content of modified crops, which have economic impact in the state of Oklahoma. (2476)
Sponsor: Agricultural Experiment Station
PI: Nurhan Dunford

Animal Waste Management in Semiarid Agroecosystems
Project will develop sustainable, environmentally safe and ecologically sound principles and practices for beneficial animal waste management. Project will also determine best management practices to maximize nutrient utilization from land application, monitor air quality and odor losses to the environment, and will develop technology transfer systems

available to research and extension personnel, producers, and general public. (2484)
Sponsors: Agricultural Experiment Station, Oklahoma State University, USDA
PIs: Jeff Hattey, Shiping Deng, M. Kiser, Scott Carter, Arthur Stoecker

Peanut Breeding and Management
The high costs of production, increasing concerns regarding chemicals and the environment, and the short shelf life of many peanut products are major concerns of the peanut industry. This project will help solve these problems by developing peanut varieties with resistance to drought, diseases and insects and with longer storage time. These improved varieties will require less production inputs such as water, fungicides, and insecticides and this will result in significant savings in time and resources for the producers, as well as protecting the environment. (2487)
Sponsors: Agricultural Experiment Station, Oklahoma Peanut Commission
PIs: Kent Dashiell, Nurhan Dunford, Niels Maness, John Damicone, Ken Jackson, Phillip Mulder, P. D Blankship, T. H Sanders, Hassan Melouk, K. D Chenault, M. D. Burow

Development of Bio-Control Strategies to Fungal Diseases in Bermudagrass and Wheat
Fungal Diseases are major detrimental factors afflicting the growth of wheat and bermuda turfgrasses in Oklahoma and throughout the world. To combat these diseases, producers use fungicides, but only when they are economical and effective. An important alternative to organic pesticide use is the development of bio-control strategies utilizing micro biota with significant antagonism against specific fungal pathogens. In this project we have isolated over a hundred microorganisms with significant antifungal activity. We focus on a subset of microorganisms known as endophytes, which live naturally in plant tissues. Our initial objectives are to enhance the bio-control activity by improving the colonization ability and antifungal activity of these specific endophytes. Our approach ranges from *in vitro* laboratory screenings, biochemical and molecular characterization of isolates, to field studies at the OSU Plant Pathology farm to determine overall efficacy in a natural setting. The overall objective of this project is to select for and engineer the plant-microbe system in such a way that will increase the control of fungal diseases in two of Oklahoma's most important plant cultural systems. (2488)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: Michael P. Anderson, Charles Taliferro, Randy Lewis, Bob Hunger
Nathan Walker.

Heterogeneity on Rangelands: Effects on Biodeversity and Productivity
Our overall goal is to evaluate the conceptual patch fire and grazing model proposed by Fuhlendorf and Engle (2001) and determine the importance of heterogeneity on structure and function of rangelands across several spatial and temporal scales. In evaluating this goal we will address the following objectives: 1) evaluate the spatial and temporal heterogeneity of botanical composition and diversity, and habitat structure across several hierarchical scales in response to grazing-X-fire interactions within tall and mixed grass prairies, 2) determine the response of the grassland bird community to changes in rangeland resource heterogeneity across several spatial and temporal scales caused by grazing-X-fire interactions within tall and mixed grass prairies, and 3) monitor livestock behavior, diet, and performance in response to heterogeneous and homogeneous environments where patch level heterogeneity is enhanced by the application of fire to

grassland patches within an unburned matrix.(2496)
Sponsor: Oklahoma Agricultural Experiment Station
PIs: Sam Fuhlendorf, David Engle, C. Davis, David Leslie

Comprehensive Animal Waste Systems for Semiarid Ecosystems
Swine effluent will be land applied by selected N rates to no-till corn-wheat and sorghum-wheat rotations to determine agronomic rates under irrigated corn. Work will continue to evaluate subsurface irrigation as a method to apply swine effluent to irrigated cropping systems. Measurements of biomass production, nutrient uptake, nutrient changes in the soil profile, description of the microbial community, and gas losses will be taken. To determine ammonia volatilization following swine effluent application forages, buffalograss plots will be established and ammonia will be measured using passive flux samplers. Additional work will be conducted to determine the effect of diet management on ammonia emissions from swine. This will be conducted in environmental chambers equipped to collect air samples from the isolated unit. A spreadsheet program will be developed to allow producers to make informed management decisions regarding their nutrient supplies. (2509)
Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma State University
PIs: Jeff Hattey, Scott Carter, Shiping Deng, Art Stoecker, Mike Kizer

Optimizing Management Practices for Establishment and Performance of Cool-Season Perennial Grass Forages
Study will evaluate the effect of soil temperature (planting date) on establishment of cool-season perennial forage species, compare minimum tillage and conventional tillage seedbed practices on establishment of cool-season perennial forages and will determine if late-spring defoliation adversely affects stand establishment and performance the year following establishment. (2520)
Sponsors: Oklahoma Agricultural Experiment Station, USDA-ARS Grazinglands Research Laboratory, El Reno, OK
PI: Charles Taliaferro

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 (Fuhlendorf and Engle 2001, Briske et al. 2003). Understanding spatial and temporal variability inherent within ecosystems or associated with variable patterns of disturbance can be critical in describing and managing the structure and function of ecosystems. In fact, 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 (Christensen 1997, Ostfeld et al. 1997, Wiens 1997). 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: Sam Fuhlendorf

WES WATKINS AGRICULTURAL RESEARCH AND EXTENSION CENTER

Interaction of Multiple Biotic and Abiotic Factors on Cucurbit Crop Productivity
This study will measure the effect of squash bug feeding on watermelon plant growth and fruit production, evaluate the use of polyculture techniques for managing plant diseases in cucurbit crops, and will measure the relationship between watermelon foliage and fruit. The study will also determine effect of fruit pruning and time of fruit set on total plant fruit yield, determine the interactions among irrigation, insect infestation, and plant disease and effects on watermelon plant growth and fruit production, and will determine economics of best management practices for optimum return using alternative production strategies. (2440)
Sponsors: Oklahoma Agricultural Experiment Station, USDA-CSREES, Oklahoma Vegetable Association
PI: Jonathan V. Edelson

Developing Production Strategies for Cucurbit Crops in S. Central U.S.
The goal of this project is to determine the impact that multiple and interacting factors have on cucurbit crop production. Specific objectives are: 1) determine temporal and spatial distribution of squash bug on watermelon in the south central U.S. and develop valid scouting methods; 2) determine efficiency of insecticides for controlling squash bug and the effect of squash bug abundance on plant growth and fruit production; 3) increase knowledge of selected factors that influence the efficiency of the design of field experiments on watermelon; 4) evaluate a) optimal size and shape of field plots and, b) optimal rates of replication; 5) determine interactions between temperature and moisture for germination of cucurbit seeds; 6) determine the effect of planting date on watermelon establishment and survival; 7) determine mechanical and/or chemical treatments to enhance germination of cucurbit seeds; 8) determine effects and interaction among cultural practices of soil-borne diseases on watermelon seedlings at different temperatures, and methods for lessening the impact of such diseases; 9) determine costs of sampling research experiments comparing traditional/conventional techniques versus scouting protocol techniques that provide statistically valid forecasting data, and 10) determine best management practices for optimum economic return using the most technically efficient production strategies. (2462)
Sponsors: Oklahoma Agricultural Experiment Station, USDA-CSREES, Oklahoma Cooperative Extension Service
PI: Merritt J. Taylor

On-Farm Development of Alternatives Insect and Disease Management for Cucurbit
This project involves evaluation of management systems for two critical pest categories that affect watermelon production: foliar diseases (anthracnose) and insects (squash bug and cucumber beetle). Trials were conducted in 2001 at five sites representing distinct cucurbit production areas of the state. Trials were conducted in 2002 at four sites continuing the previous year's data collection. For the insect studies, an untreated plot was compared to two alternative management strategies. Fields were scouted weekly to assess pest populations. Squash bug was found at all sites and tended to be more abundant in eastern areas. Preliminary data analysis indicated that squash bugs were more abundant on squash than watermelon and that watermelon had fewer squash bugs when squash was planted at the edges of the field. One foliar disease management trial was conducted in 2001. The trial was designed to compare fungicides and their application timing for the control of anthracnose of watermelon. Moderate infestation levels of

anthracnose and cercospora were evident in the latter part of the crop cycle. All treatments provided significant control as compared to an untreated check. (2417)
Sponsors: Oklahoma Agricultural Experiment Station, USDA-CSREES, Oklahoma Vegetable Association
PI: Merritt J. Taylor