

**House Committee on Agriculture**  
*Farm Bill Audit*

**1. Program Name**

Agricultural Research Service (ARS)

**2. Subprograms/Department Initiatives**

**Animal Production and Protection**

The mission of the ARS Animal Production and Protection (APP) national programs is to provide the scientific information and tools to help support the U.S. food animal industries to continue to compete successfully in worldwide trade, provide the supply of nutritional animal products required by the Nation, and contribute toward global food security. APP accomplishes this mission by research to maximize production efficiency and animal health through scientific innovation and the discovery and development of new technologies focused on national priorities. Strategic public-private partnerships are established to achieve our mission, including support of government action and regulatory agencies responsible for trade, biodefense, and global food security. Emphasis will be given to genetic improvements of traits related to production and production efficiencies and germplasm conservation; understanding the mechanisms of disease resistance, and the development of tools to prevent, control, or eradicate diseases that threaten our food supply and public health; and identifying and developing sustainable systems for production of high quality meat, fish, milk, and eggs that also ensure animal health and well-being. The portion of the program that produces new solutions to the many veterinary problems created by arthropod pests and vectors will be leveraged to solve related problems affecting human health and the well-being of American citizens.

**APP Statistics:**

**Total Projects: 108**

**Total Locations: 37**

**Total Scientists: 295**

The *Food Animal Production* program conducts research to furnish scientific information about biotechnologies and management practices that ensure an abundant supply of competitively priced animal products. The mission of the Food Animal Production Program is to: safeguard and utilize animal genetic resources, associated genetic and genomic databases, and bioinformatic tools; develop a basic understanding of the physiology of livestock and poultry; and develop information, tools, and technologies that can be used to improve animal production systems, all to ensure an abundant, safe, and inexpensive supply of animal products produced in a healthy, competitive, and sustainable animal agriculture sector of the U.S. economy.

U.S. systems of agricultural animal management and production face formidable challenges. One of the most exacting challenges is successful adaptation to the accelerating demands of society that impact animal productivity and product quality. The demands placed on the national

system of food animal production by a rapidly changing world can only be met by technologies that optimally harness the inherent genetic potential of animal and plant germplasm in concert with certified industry and food marketing practices. Production systems that successfully identify, preserve, and harness that genetic potential will maximize profits, secure supply, increase market competitiveness, sustain small and mid-sized producers, and maintain genetic diversity and consumer confidence.

This National Program addresses high-priority national needs for:

- Understanding, Improving, and Effectively Using Animal Genetic and Genomic Resources
- Enhancing Animal Adaptation, Well-Being and Efficiency in Diverse Production Systems
- Measuring and Enhancing Product Quality

**Total Projects: 32**

**Total Locations: 17**

**Total Scientists: 91**

The *Animal Health* program aims to deliver scientific information and tools to detect, control, and eradicate animal diseases of high national priority. The goal of the program is to protect and ensure the safety of the Nation's agriculture and food supply through improved disease detection, prevention, control, and treatment. Basic and applied research approaches will be applied to solve animal health problems of high national priority. Emphasis will be given to methods and procedures to control animal diseases through the discovery and development of diagnostics, biotherapeutics, animal genomics applications, disease management systems, animal disease models and farm biosecurity measures.

Achieving results in veterinary medical research, which provide useful information for problem-solving, often demands an integrated approach in which the experimental design may range from knowledge development at the molecular level to clinical trials that will lead to the development of countermeasures for preventing and controlling a disease outbreak in the field. This national program provides the means for the integration of research. Major initiatives draw upon relevant expertise within the national program, coordinating and integrating that expertise to develop a specific useful application of the knowledge. Research projects also attract federal, university, industry and international partners. Because a significant number of projects in the animal health research portfolio focuses on the discovery of novel technologies, intellectual property strategies will be addressed in project plans to facilitate technology transfers and the investment by the private sector in the development of these technologies.

This National Program addresses high-priority national needs for:

- Biodefense research
- Animal genomics and immunology
- Zoonotic, respiratory, reproductive, neonatal, enteric and parasitic diseases

- Transmissible spongiform encephalopathies

**Total Projects: 40**

**Total Locations: 11**

**Total Scientists: 103**

The *Veterinary, Medical and Urban Entomology* program develops more effective means to prevent or suppress insects, ticks and mites that affect animal and human well being. The program aims to eliminate losses to animal production and products caused by arthropod borne diseases and arthropod induced trauma; to reduce the risk to humans from arthropod borne zoonotic diseases; to enhance the safety of animal products and the quality of life for humans; and to increase the value and competitiveness of United States agriculture.

More detailed behavioral studies of certain activities (*e.g.*, blood sucking) will result in the association of chemical and other stimuli with these behaviors. A new understanding will also present the possibility of entirely new tools being developed to alter arthropod behavior in such a way that their damage is prevented. Beyond the research needed to understand the nature of these behaviors, bioassays that accurately measure them will be necessary to find out what chemical or physical factors affect them. Before integrating bioassays into an evaluation scheme, they should be validated independently to be sure that they are measuring what is intended. Electrophysiology is another essential part of development, representing a range of activities and measurements. Among the organizational products required for maximum impact are a standard vocabulary for influences on hematophagous arthropods and a standard concept of how to develop useful products.

This National Program addresses high-priority national needs for:

- Medical Entomology for the Public and Military
- Veterinary Entomology of Livestock and Poultry
- Pests that Damage Structures
- Fire Ants, other Invasive Ants, and Household Pests

**Total Projects: 13**

**Total Locations: 7**

**Total Scientists: 49**

The vision for the *Aquaculture* program is to support a thriving domestic industry based on improved genetic stocks and scientific information on biotechnologies and management practices to ensure a high quality, safe supply of healthful seafood and aquatic products.

The U.S. aquaculture industries face formidable challenges. The demand for seafood is increasing worldwide, yet the ability for U.S. aquaculture producers to meet that demand requires development of technologies to reduce the cost of production while maintaining and improving product quality. Producers, processors and breeders are in need of systems that successfully identify, promote, and harness the aquatic animal improvements to maximize

profits, secure supply, reduce environmental impacts, increase market competitiveness, sustain small and mid-sized scale producers, and earn consumer confidence. Research in the disciplines of genetics, nutrition, health, and physiology will support the biological improvement of animals, while ecology, engineering and economics will support the improvement of systems and help to ensure sustainability. Our research components strive to develop and ensure an abundant, safe, and affordable supply of seafood products for the 300 million U.S. consumers produced in a healthy, competitive, and sustainable aquaculture sector, a sector supported by over 4,300 aquaculture farmers that produced in excess of \$1 billion dollars worth of goods in 2005 (National Agricultural Statistics Service (NASS), 2005 Census of Aquaculture).

This National Program addresses high-priority national needs for:

- Understanding, Improving, and Effectively Using Animal Genetic and Genomic Resources
- Enhancing Animal Performance, Well-being and Efficiency in Diverse Production Systems
- Defining Nutrient Requirements, Nutrient Composition of Feedstuffs and Expanding Alternative Ingredients
- Improving Health and Welfare of Aquatic Animals
- Improving Production Systems, Developing New Products and Enhancing Product Quality

**Total Projects: 23**

**Total Locations: 11**

**Total Scientists: 52**

### **Crop Production and Protection**

Crop Production and Protection (CPP) National Programs deliver science-based information, genetic resources, and technologies for increased crop productivity and quality, protection from plant diseases and pests, and economically and environmentally sustainable methods of crop production that meet consumers' demands for a ready supply of high quality, safe, affordable and nutritious food, the public's desire to protect the environment, and the global community's needs for food security.

**CPP Statistics:**

**Total Projects: 379**

**Total Locations: 78**

**Total Scientists: 816**

The *Plant Genetic Resources, Genomics, and Genetic Improvement* program provides research that addresses national priorities of genetic resource conservation, genomics and genetic improvement. This program harnesses the inherent genetic potential of plants. This research develops, and effectively applies new knowledge of crop genes, genomes, and the control and expression of genes, to accelerate increases in productivity and improves the quality of crops; realized via traditional and novel plant breeding methods.

Genetic resources are the foundation of our agricultural future. ARS crop genebanks contain the sources of resistance to biotic and abiotic stresses and new genes to improve the quantity and quality of crops. To ensure that these genes are available for research and breeding, ARS continues to acquire and conserve crop genetic resources, develop more effective screening methods for identifying superior traits, characterize the genetic profiles of genebank holdings, ensure that genetic resources are distributed where and when they are needed, and safeguard these collections and their associated information for future generations.

New crop genetic improvement methods are incorporating advances in genome sequencing and analysis, molecular genetics, computational biology, and metabolic engineering. New crop breeding theories and strategies are being developed that more effectively capture the intrinsic genetic potential of germplasm—especially to improve key agronomic and horticultural traits—resulting in crops tailored for consumer and producer needs.

This National Program addresses high-priority national needs for:

- Plant and Microbial Genetic Resource Management
- Crop Informatics, Genomics, and Genetic Analyses
- Genetic Improvement of Crops
- Plant Biological and Molecular Processes

**Total Projects: 179**

**Total Locations: 55**

**Total Scientists: 360**

The *Plant Diseases* program delivers research to develop and improve ways to reduce crop losses caused by plant diseases. The program focuses on developing effective disease control strategies that are not environmentally harmful, do not threaten the safety of consumers, and are compatible with sustainable and profitable crop production.

Plant diseases – spread by viruses, viroids, bacteria, phytoplasmas, fungi, nematodes or other methods – cause billions of dollars in economic losses each year to agriculture, landscape, and forest settings in the United States. These diseases reduce yields, lower product quality or shelf-life, decrease aesthetic or nutritional value, and, sometimes, contaminate food and feed with toxic compounds. Control of plant diseases is essential for providing an adequate supply of food, feed, fiber and aesthetics. Yet, growers spend millions of dollars each year only to partially control the pathogens that attack their crops and other plants. Reducing these losses has long been a high priority for agriculture and for the Agricultural Research Service (ARS). Besides the obvious monetary benefits to producers and processors, successful plant health protection is important for maintaining and increasing food supplies with minimal increases in land under cultivation. Additionally, the knowledge and management of plant diseases of quarantine significance are vital, not only for protecting our domestic crops from foreign disease, but also for maintaining and expanding export markets for plants and plant products.

This National Program addresses high-priority national needs for:

- Disease diagnosis: Detection, identification and characterization of plant pathogens
- Biology, ecology, epidemiology, and spread of plant pathogens and their relationships
- Plant disease resistance
- Biological and cultural strategies for sustainable disease management

**Total Projects: 69**

**Total Locations: 29**

**Total Scientists: 141**

The *Crop Protection and Quarantine* program provides fundamental and applied research to develop improved strategies for the cost-effective management and control of native and invasive insect, mite, and weed pests, while minimizing impacts on the environment and human health. The rationale for this National Program is that the development and implementation of improved management and control strategies will contribute to maintaining the competitiveness and vitality of agriculture in America.

Insects, mites, and weeds have a considerable impact on our Nation's food and fiber crops, affecting domestic supply and exports with economic losses estimated to be in the tens of billions of dollars. This program also provides research contributing to greater productivity in traditional and organic agricultural and horticultural systems by improving and developing new, innovative control strategies, by improving existing control methods and by alerting growers and producers to problems so informed decisions regarding mitigation can be accomplished at the earliest possible time.

This National Program addresses high-priority national needs for:

- Systematics and Identification (of invasive insects, mites and weeds as a threat)
- Protection of Agricultural and Horticultural Crops
- Protection of Natural Ecosystems
- Protection of Post-Harvest Commodities and Quarantine

**Total Projects: 92**

**Total Locations: 39**

**Total Scientists: 211**

The *Crop Production* program's research develops economically and environmentally sound technologies that improve the production efficiency, quality, health and value of America's crops.

Contemporary U.S. crop enterprises for annual, perennial, and greenhouse crop production are complex and depend on access to and successful integration of highly diverse components, such as a steady stream of superior crop varieties, new strategies for mitigation of crop losses from biotic and abiotic stresses, and mechanization and automation of undesirable or labor intensive

activities. This program is developing successful new production systems to sustain or increase crop yield and quality by focusing on 1) productive and profitable crop management strategies for new and traditional crops that conserve natural resources; 2) efficient and effective integrated management strategies for multiple pests; 3) mechanization of management activities to address labor constraints; and 4) improved crop management models and decision aids.

Pollination is a critical element in agriculture as well, because honey bees pollinate more than 130 crops in the United States and add \$15 billion in crop value annually. Declining honeybee populations and honey production due to Colony Collapse Disorder (CCD) require special attention. CCD has now increased honey bee mortality to more than 30 percent. This program provides research to improve honey bee and non-apis bee health and well being, better hive management practices for more robust pollination, development of emerging technologies to be used to address current and future challenges of the bee keeping industry, conserving bee biodiversity, and develop pollinators for land restoration.

**Total Projects: 24**

**Total Locations: 17**

**Total Scientists: 71**

This National Program addresses high-priority national needs for:

- Integrated Sustainable Crop Production Systems
- Bees and Pollination

The *Methyl Bromide Alternatives* program provides research to develop alternatives to the agricultural uses of methyl bromide, a widely used fumigant and known ozone depletor. Methyl bromide is a highly efficacious fumigant that has for a number of decades been used on more than 100 crops, in forest and ornamental nurseries, and on wood products to control insects, nematodes, weeds, and pathogens, and thus, has been critical to important segments of U.S. agriculture. The research focuses on strawberry, pepper, tomato, perennial replant, field-grown propagative material, and ornamental and cut flower cropping systems for pre-plant methyl bromide use, and for processing and storage structures, fresh and durable commodities, and quarantine for post-harvest use. The ultimate goal of this National Program is to make available to the U.S. agriculture community environmentally acceptable, practical, economically feasible, and sustainable alternatives to methyl bromide.

The U.S. Department of Agriculture (USDA) has vigorously responded to the methyl bromide challenge. It has brought together agricultural and forestry leaders from private industry, academia, state governments, and the federal government to assess the problem, formulate priorities, and implement research directed at providing solutions to the problems predicted by the methyl bromide phase-out. The Agricultural Research Service (ARS) was assigned the lead in this process and has emphasized the importance of research on alternatives to methyl bromide.

This National Program addresses high-priority national needs for:

- Pre-plant Soil Fumigation Alternatives
- Post-Harvest Alternatives

**Total Projects: 15**

**Total Locations: 10**

**Total Scientists: 33**

### **Natural Resources and Sustainable Agricultural Systems (NRSAS)**

Sustainable agricultural systems produce the agricultural crops and livestock needed by societies; protect the natural resource foundation essential for production, processing, and other uses; and provide economic and social value to producers, processors, consumers, and communities. ARS develops scientific knowledge that enhances quality of life for all Americans by ensuring safe, affordable, and sustainable food, feed, fiber and renewable energy while enhancing natural resources and the environment. ARS research creates profitable agricultural systems that capitalize on the Nation's vast renewable natural resources to preserve the fertility and productivity of soils, provide abundant and high quality water supply and clean air, maintain healthy agricultural and rangeland ecosystems, and offer renewable energy and fuel alternatives that form the basis of U.S. economy and the well being of rural America.

#### **NRSAS Statistics:**

**Total Projects: 171**

**Total Locations: 71**

**Total Scientists: 518**

The *Water Availability and Watershed Management* National Program conducts research that helps provide integrated, effective, and safe water resource management. There is no substitute for fresh water, nor are there replacements for its essential role in maintaining human health, agriculture, industry, and ecosystem integrity. ARS scientists conduct fundamental and applied research on the processes that control water availability and quality and develop new and improved technologies for managing agricultural water resources to help ensure the health and economic growth of the Nation. Results provide the technologies to manage and deliver safe and reliable fresh water supplies to the agricultural, urban, and industrial sectors of society while enhancing the aquatic natural resources of the Nation. Results are a key part of the USDA's Conservation Effects Assessment Project (CEAP), which seeks to determine and improve the effectiveness of Farm Bill conservation practices and programs. Strategic approaches include coordination of ARS' infrastructure of experimental watersheds and rangelands, located in all major production regions of the nation, as a single long-term agroecosystems research network focusing on natural resources that provide the foundation for agriculture, especially water.

This National Program addresses high-priority national needs for:

- Effective Water Management in Agriculture
- Erosion, Sedimentation, and Water Quality Protection
- Improving Conservation Effectiveness
- Improving Watershed Management and Ecosystem Services in Agricultural Landscapes

**Total Projects: 47**

**Total Locations: 30**

**Total Scientists: 151**

The *Climate Change, Soils, and Emissions* National Program conducts research to improve the quality of atmosphere and soil resources, understand how agriculture and climate affect each other, develop strategies to adapt agricultural systems to climate variability, mitigate gaseous and particulate emissions, and convert research results into decision-support capabilities for end-users.

The effects of climate change create challenges to agriculture and offer new opportunities for production, and these are identified and managed through research on crop and livestock responses and resilience to abiotic stresses; changing risks related to pests, pathogens, and weeds; soil, nutrient, and water management; and carbon sequestration. Enhancement of soil productivity is a focus of ARS research and together with crop improvement research, offers promise for meeting future global agricultural demands. Atmospheric emissions from agriculture are under increased scrutiny due to potential negative environmental effects and threats to human and animal welfare. Emissions contribute to tensions between agriculture and residential communities from visibility impairment (haze) and nuisance odors. Strategic, coordinated research projects include the nation-wide Greenhouse gas Reduction through Agricultural Carbon Enhancement network (GRACEnet project); the Renewable Energy Assessment Project (REAP) in collaboration with universities; development of models such as the Soil and Water Assessment Tool (SWAT), which is used worldwide for conservation and land management applications; widely used models for assessing and managing wind and water erosion; and leadership in the Global Research Alliance on Agricultural Greenhouse Gases.

This National Program addresses high-priority national needs for:

- Improvements of Air Quality via Management and Mitigation of Emissions from Agricultural Operations
- Knowledge and Technologies for Reducing Atmospheric Greenhouse Gas Concentrations Through Management of Agricultural Emissions and Carbon Sequestration
- Agriculture to Adapt to Climate Change
- Maintaining and Enhancing Soil Resources

**Total Projects: 38**

**Total Locations: 29**

**Total Scientists: 97**

The ***Bioenergy*** National Program conducts research to develop technologies to enable sustainable commercial production of biofuels by the agricultural sector in ways that enhance our natural resources without disrupting existing food, feed, and fiber markets.

ARS research creates new varieties and hybrids of bioenergy feedstocks with optimal traits; develops new optimal practices and systems that maximize the sustainable yield of high-quality bioenergy feedstocks; develops new, commercially preferred conversion technologies; and optimizes both the production of plant feedstocks and the biorefining of agricultural materials to bioenergy and value-added coproducts. Much of the research is conducted through the USDA Regional Biomass Research Centers, emphasizing development of crops and sustainable production methods that can be regionally successful. Strategic planning tools to identify research, technologies, and organizational actions needed to achieve commercial viability of biofuels are developed in cooperation with other agencies and industry. This research leads to strengthened rural economies, provides knowledge for increased supplies of renewable transportation fuel, enhance energy security, and supports efforts to improve the U.S. balance of trade.

This National Program addresses high-priority national needs for:

- Feedstock Development
- Feedstock Production
- Biorefining

**Total Projects: 14**

**Total Locations: 6**

**Total Scientists: 45**

The ***Agricultural and Industrial Byproducts*** National Program conducts research to effectively and safely manage and use animal wastes and other agricultural and industrial byproducts in ways that maximize their potential benefits, while protecting the environment and human and animal health.

Improvements are needed in animal feeding and management regimens to increase the proportion of dietary nutrients retained in the animal or animal products while decreasing the quantity of dietary nutrients excreted and lost to water, air, and soil. Research tracks the fate and transport of excreted nutrients in the major soil-crop systems common to animal agriculture, providing the foundation for developing Best Management Practices. New application methods improve nutrient use efficiency and incorporate wastes to conserve nitrogen while maintaining adequate crop residue to protect the soil from erosion and runoff. These practices, and their associated nutrient management plans, are developed from sound understanding of the fate and transport of specific nutrients for major soils, hydrologic conditions, and cropping systems. Other research addresses pathogen inactivation and die-off as well as their potential for regrowth

as functions of environmental conditions (e.g., temperature, moisture, etc.) during all stages of waste management. Technologically sound methods are developed for utilizing byproducts that are characterized as beneficial and result in products that are commercially sustainable. This includes blending, composting, and amending byproducts as well as developing land application and management techniques that improve soil, water, and air quality in addition to improved plant growth. Much of the research is done in collaboration with private sector entities, with a strong emphasis on development of useful, safe, commercially desirable products from what would otherwise be considered wastes.

This National Program addresses high-priority national needs for:

- Management, Enhancement, and Utilization of Manure Nutrients and Resources
- Manure Pathogens and Pharmaceutically Active Compounds (PACs)
- Atmospheric Emissions
- Developing Beneficial Uses of Agricultural, Industrial, and Municipal Byproducts

**Total Projects: 17**

**Total Locations: 15**

**Total Scientists: 54**

The *Rangeland, Pasture & Forages* National Program develops and integrates improved management practices, germplasm, and land-use strategies to optimize productivity, economic viability and environmental enhancement in managing vegetation, livestock and natural resources on private and public grass and forage lands.

Grazing lands constitute the largest single land use in the United States. Their environmental and economic sustainability are essential to the nation, yet they are under stresses from many environmental factors and land uses. Research to mitigate these problems and strengthen their value include: enhancing conservation and restoration of ecosystems and agroecosystems through improvements based on the application of ecological principles; improving management of fire, invasive weeds, grazing, climate change and other agents of change; developing grazing-based livestock systems that reduce risk and increase profitability in existing and emerging markets; developing improved grass and forage legume germplasm for livestock, conservation, turf and bioenergy and bioproduct systems; improving the sustainability of turf management; and improving decision-support systems including improving inventory, monitoring, and assessment tools.

This National Program addresses high-priority national needs for:

- Rangeland Management Systems to Improve Economic Viability and Enhance the Environment
- Pasture Management Systems to Improve Economic Viability and Enhance the Environment
- Sustainable Harvested Forage Systems for Livestock, Bioenergy and Bioproducts

- Sustainable Turf Systems

**Total Projects: 35**

**Total Locations: 25**

**Total Scientists: 106**

The *Agricultural System Competitiveness and Sustainability* National Program integrates information and technologies to develop dynamic systems that enhance the productivity, profitability, energy efficiency, and natural resource management of American farms.

The program uses interdisciplinary systems research to develop an understanding of how different kinds of farm enterprises function, and how changing or introducing new technology affect their productivity, profitability, energy efficiency, and natural resource stewardship. Finding the best combinations of practices helps producers achieve their production goals, while enhancing the environmental goods and services derived from agricultural lands. Diverse and dynamic agricultural systems in development can adjust to changing environmental and market conditions to increase the long-term financial viability and competitiveness of farms, enhance natural resource quality, contribute to the vibrancy of rural communities, and increase the food, fiber, and energy security for the Nation and the world.

This National Program addresses high-priority national needs for:

- Agronomic Crop Production Systems
- Specialty Crop Production Systems
- Integrated Whole Farm Production Systems
- Integrated Technology And Information To Increase Customer Problem Solving Capacity

**Total Projects: 20**

**Total Locations: 18**

**Total Scientists: 65**

### **Nutrition, Food Safety and Quality**

The Nutrition, Food Safety and Quality (NFSQ) research area leads and coordinates ARS research and information dissemination to define the role of food and its components in optimizing health for all Americans; develop tests and processes that keep the food supply safe; reduce and control pathogens and toxins in agricultural products; and improve the economic viability and competitiveness of American agriculture by enhancing the quality and utilization of agricultural products for the benefit of producers and consumers.

### **NFSQ Statistics:**

**Total Projects: 226**

**Total Locations: 47**

**Total Scientists: 553**

The ***Human Nutrition*** program provides the science base to undergird U.S. food policy, i.e. the *Dietary Guidelines for Americans*, thus enabling Americans to make nutritious and health-promoting dietary choices. The mission of the Human Nutrition Program is to define the role of food and its components in optimizing health throughout the life cycle for all Americans. Distinctive aspects of this research include an emphasis on a food-based approach to improving health; the core capability to sustain long-term research; the availability of state-of-the-science equipment and facilities for human research across the lifecycle; and the conduct of multidisciplinary research to improve the nutritional value of the American diet and the food supply.

This research is focused on maintaining health and preventing disease through food-based recommendations. This unique USDA research does not duplicate other federal departments. The research emphasizes study of essential nutrients and nonessential health-promoting components in foods, evaluating the nutritional value of diets eaten by people in America, determining how consumption of specific foods or food components can enhance health, and developing strategies to improve food choices and lifestyle factors to promote health in Americans. Increasingly, research focuses on addressing over-consumption and caloric imbalance (obesity related research) with incorporation of cutting-edge genomic and metabolomic technologies. Unique national resources that are part of this Program include the National Nutrient Databank and the “USDA What We Eat in America/NHANES” national food consumption survey. Partnerships with other federal agencies and non-profit and industry groups allow ARS to leverage funds and build upon common goals. Information dissemination programs operated by the National Agricultural Library address general and specific human nutrition issues and audiences and include general Web portals such as [www.nutrition.gov](http://www.nutrition.gov) for the American consumer as well as the targeted Web sites for professionals such as the Food and Nutrition Information Center.

This National Program addresses high-priority national needs for:

- Monitoring Nutrient Composition of the Food Supply and Consumption by Americans
- Strengthening the Scientific Basis for Dietary Guidance for Health Promotion and Disease Prevention
- Developing Strategies for Prevention of Obesity and Related Diseases
- Conducting Research on Life Stage Nutrition and Metabolism

**Total Projects: 89**

**Total Locations: 9**

**Total Scientists: 172**

The ***Food Safety*** program protects food from pathogens, toxins, and chemical contamination during production, processing, and preparation. The safety of the food supply is a highly visible public health issue and a national priority for the Federal government. The continued priority is partly due to the diverse and complex system of production, processing, and distribution of food

in the U.S. and the increasing global distribution. Outbreaks of foodborne illness are seen as a major cause of morbidity and mortality, and economic costs, both nationally and internationally. The full extent of the disease burden is still unknown, even with recent Centers for Disease Control (CDC) estimates. Foodborne illnesses can be caused by microbial pathogens, parasites, viruses and an array of foodborne contaminants such as chemicals or toxins. The cause of every outbreak is still unknown, but persistent outbreaks of major commodity-specific foods that may directly affect public health, regulations, industry, and trade, require our immediate attention.

ARS has developed an integrated approach to food safety, that is, food production is seen as a continuous process from production, through harvesting and processing, to retail and the consumer. Pre- and post-harvest are not separated but considered an integrated production system of safe and quality food. Interventions and controls that are applied to one phase will ultimately affect the other segments of food production and processing. Food safety research has also changed during the past decade, having moved past simple, surveillance/prevalence studies to asking more complex questions. Consequently, researchers are required to think creatively to solve problems, which means considering alternate perspectives, exploiting new opportunities and technologies, and crossing conventional boundaries. Multidisciplinary collaborations, especially between Centers/Institutes, nationally and internationally are an absolute necessity.

ARS provides the intramural infrastructure and expertise to address short and long-term needs in food safety. Because of the infrastructure, ARS is uniquely poised to respond quickly to emerging and critical food safety issues. ARS also collaborates closely with Federal regulatory agencies as well as industry, professional, and international stakeholders to assist in addressing their specific food safety needs.

This National Program addresses high-priority national needs for:

- Food-borne Contaminants
- Microbial Population Systems
- Systems Biology (Pathogenicity and Virulence)
- Technologies for the Detection and Characterization of Microbial Contaminants
- Intervention and Control Strategies to Decrease or Eliminate Pathogens
- Predictive Microbiology and Data Acquisition
- Chemical and Biological Contaminants: Detection Methodology, Toxicology and Toxinology

**Total Projects: 64**

**Total Locations: 14**

**Total Scientists: 180**

The *Quality and Utilization of Agricultural Products* program conducts research to enhance the economic viability and competitiveness of U.S. Agriculture by maintaining the quality of harvested agricultural commodities or otherwise enhancing their marketability, meeting consumer needs, developing environmentally friendly and efficient processing concepts, and

expanding domestic and global market opportunities through the development of value-added food and nonfood technologies and products, except energy and fuels.

Research is being conducted on the development of nonfood, nonfuel biobased products from agricultural commodities and byproducts. Interest in biobased products has increased as consumers and governments have sought more environmentally friendly products that provide alternatives to petroleum and which do not contribute to greenhouse gases. Thus, biobased products can reduce our dependency on petroleum and provide a more sustainable technology for the future. Biobased products that were once too expensive to commercialize may now be affordable. There is some public concern that biobased products could contribute to the rising cost of food in the U.S. This program seeks opportunities to develop biobased products from agricultural feedstocks that do not compete with food, in cooperation with other ARS national programs and partners. ARS also supports quality and processing research on crop fiber, such as cotton, and animal hides, leather and wool. Stakeholders who produce fibers and hides constitute an important segment of our rural economy. These industries are severely impacted by energy and production costs and have lost market share to foreign competition. Technologies that improve fiber quality, reduce the energy consumption of processing equipment, and develop new products are needed to help the fiber industry to compete in a global market.

This National Program addresses high-priority national needs for:

- Methods and Technologies to Enhance Quality & Utilization of Food Crops and Animals
- Methods and Technologies to Enhance Quality & Utilization of Agricultural Fibers
- Non-Food, Non-Fuel Biobased Products and Sustainable Technologies/Processes

**Total Projects: 73**

**Total Locations: 24**

**Total Scientists: 201**

### **ARS International Research Programs**

ARS engages in international collaborations primarily that support its mission but may also conduct research under external funding that falls within its mission and also supports critical U.S. Foreign Policy initiatives. ARS international research collaborations enable an economically vibrant U.S. agricultural system by developing technologies, knowledge and tools that help US producers be more productive, efficient and sustainable. ARS research also support the Foreign Agricultural Service's (FAS) mission by providing key research that helps FAS project crop production estimates in other countries and by engaging in collaborations that underpin food security. The Office of International Research Programs (OIRP) is an ARS Headquarters Office under the Office of National Programs in Beltsville, Maryland. The OIRP maintains a cadre of International Affairs Specialists who: 1) liaise with each National Programs; 2) provide special focus on specific regions of the world; and 3) oversee a portfolio of programs/projects that are important to U.S. foreign policy objectives as well as the agency's objectives.

*This Program is currently focused on three major areas:*

- Global Food Security
- Biosecurity Engagement
- International Partnerships

ARS Operates four Overseas Biological Control Laboratories (OBCLs) that offer the benefits of international projection of mission, training for key personnel, and broadening of potential solutions for invasive species. Having operations overseas forms a 365-day-per-year presence for ARS, something that could never be accomplished by temporary visits and assignments. As a result of that dedication to their missions and host countries, the overseas laboratories have established reputations as reliable partners. The flow of information, training, and agricultural progress go in both directions. The OBCLs are administered out of ARS Headquarters by a Director within the Crop Production and Protection (CPP) mission area of the Office of National Programs. There are four OBCLs:

- The European Biological Control Laboratory in Montpellier, France
- The South American Biological Control Laboratory in Buenos Aires, Argentina
- The Australian Biological Control Laboratory in Brisbane, Australia
- The Sino-American Biological Control Laboratory in Beijing, China

### **ARS Technology Transfer Programs**

USDA broadly defines technology transfer as the adoption of research outcomes for public benefit. Innovations arising from USDA intramural research, such as new or improved technologies, processes, products and services, benefit the nation by increasing productivity, increasing efficiency (keeping costs low) and enhancing global competitiveness for the U.S. agriculture sector. Thus, technology transfer functions are critical to accelerating utility of public R&D investments, creating economic activity, and in job creation and sustainable economic development.

Principal among the formal instruments of technology transfer are Cooperative Research and Development Agreements (CRADAs), patents, and invention licenses for commercialization by the private sector, as well as material transfer agreements and germplasm releases to industry.

To assist USDA in transferring technologies to the private sector, the Agricultural Research Service (ARS) created the Agricultural Technology Innovation Partnership (ATIP) program consisting of 10 economic development organizations across the U.S. serving as “intermediaries” to further enhance the likelihood that research outcomes would be adopted by the private sector for commercialization. ATIP members coordinate regional co-sponsored events with ARS, showcasing available technologies for licensing, and USDA intramural research capabilities available to businesses to assist in solving high priority, mission-related issues connected to the agricultural industries. Additionally, members provide the current or prospective private sector partners of ARS with access to business mentors, entrepreneur schools, seed and venture funds, and the Manufacturing Extension Partnership programs.

The Agricultural Research Service (ARS) has been delegated authority by the Secretary of Agriculture to administer the patent program for ARS, the review of CRADAs and the technology licensing program for all intramural research conducted by USDA.

ARS's Office of Technology Transfer (OTT) is assigned the responsibility for protecting intellectual property (IP), developing strategic partnerships with outside organizations, and performing other activities that effectively transfer ARS research outcomes and technologies to the marketplace. ARS-OTT is centralized in policy and approval procedures, but maintains field offices to provide one-on-one customer service to ARS researchers. To facilitate technology transfer, OTT is organized into five sections that include Administrative/Headquarters, Patents Licensing, Marketing and Technology Transfer Coordinators (TTCs). TTCs are seven highly qualified employees stationed across the United States who are responsible for facilitating the development and transfer of USDA technologies. They serve as liaisons with scientists, ARS managers, university partners, and the private sector.

Technology transfer is accomplished through many mechanisms, such as:

- developing written information for customers and stakeholders, including scientific publications, publications in trade journals, and reports to stakeholders;
- releasing plant germplasm to the public;
- transferring research materials to scientists outside of ARS;
- entering into formal partnership agreements, such as CRADAs, and other cooperative agreements;
- delivering specific research results to regulatory agencies to support their actions;
- licensing IP (patents, Plant Variety Protections Certificates, and biological materials);
- participating in meetings with industry organizations and universities, workshops and field days; and distributing information to the public via the ARS Information Staff, the National Agricultural Library, and other sources.

### **Enhanced Use Lease Authority**

Enhanced Use Lease (EUL) is provided under the authority of section 7409 of the Food, Conservation and Energy Act of 2008, Public Law 110-246 (112 Stat. 1651), commonly referred to as the 2008 Farm Bill. This authority grants the Secretary of the Department of Agricultural (USDA) the authority to establish a pilot program at the Beltsville Agricultural Research Center (BARC) to lease non-excess property to any private or public entities.

Five calls for proposals were issued by ARS on or about December 4, 2010, requiring businesses to set forth a Business and Leasing plan, a Development plan and a Property Management plan.

Within the Development plan, businesses are to identify the collaborative research in-place or a plan of a potential project consistent with the research mission of the USDA. The six calls for proposals were directed to i) use of greenhouse facilities, ii) 10 acres for bio-byproduct production, iii) an under-utilized composting facility. v) Transgenic greenhouse space and vi) large animal transgenic research space, with screened barn, surgery room, lunch room and storage and rest room facilities.

Four proposals were submitted by small businesses. All of which had existing agreements with ARS. Proposals received from Renewable Carbon Management, LLC and EnviRemed were uncannily similar and were directed to a full scale composting business located at BARC. The two proposals were rejected by committee as being deficient in failing to outline a research component directed to the mission of ARS\USDA. Both entities were advised by letter of the deficiencies in their proposals and no reply was received. The existing agreements with these entities have expired.

A Proposal from New Agriculture was received directed to production of plant proteins from tobacco for use in plastics manufacture and as a nutritional supplement. The proposal was unfocused and New Agriculture was invited to tour the facility in which the proposed operation was to be housed and to submit a more focused proposal directed to the specific space to be occupied. New Agriculture failed to follow-up; however a CRADA agreement is still active and is being worked to completion with this entity.

A proposal from Plant Sensory Systems Inc. was received for the purpose of leasing two transgenic greenhouses in building 010 at BARC, for a total of 1859 sq ft for three years. The proposal was directed to growing transgenic corn for purposes of drought and heat tolerance and efficiency of nitrogen use. A lease was successfully negotiated and Plant Sensory Systems occupied space on or about May 1, 2011. Today both soybean and corn are being grown for the stated research purpose. In a direct quote from the company, “we could not live without the space!”

This EUL project supports the USDA priority of responding to climate change and is part of the Climate Change, Soils and Emissions (#212).

### **Buildings and Facilities**

Because ARS operates at over 100 locations both nationally and internationally, a high priority and great degree of focus is placed on the maintenance of the agency's facility assets. The Secretary has received many requests from members of Congress for the Administration to support budget increases to complete pending ARS capital improvement projects. In response, the Administrator of ARS was asked to establish an objective process to guide orderly and timely capital investments for ARS Laboratory facilities focusing on support to priority programs and other long-term requirements of USDA scientific research. The agency is also in the process of completing more than \$176 million in repair and maintenance projects across the country as a

result of funding from the A summary of those assets and a discussion of the agency’s developing capital asset strategy are below.

Land under ARS custody & control:

Leased	10,888
Owned	393,260
<b>Subtotal</b>	404,148
MOU	2,051
<b>TOTAL ACRES</b>	406,199

Buildings owned/leased (Gross Square Feet)

		Number	GSF
Owned Buildings	Existing Operational	3016	13,565,457
	Existing Excess	294	780,498
<b>Subtotal</b>		3310	14,345,955
Leased Buildings		116	495,596
<b>TOTAL</b>		3426	14,841,551

- 105 Domestic Locations; 3 Foreign Locations; & 60 worksites.
- Location/Worksites collocated with Land Grants/Institutes of Higher Learning
  - Land Grant Locations – 60
  - Land Grant Worksites – 14
  - Non Land Grant Locations – 4
  - Non Land Grant Worksites – 1
- Replacement Value \$3.64B

With the issuance of Executive Order (E.O.) 13327, Federal Real Property Asset Management in February 2004, the USDA recognized the need to adopt a more consistent, structured, performance-based, integrated planning process to better enable the Agency to oversee management of its extensive real property portfolio. In October, 2007 USDA issued the Real Property Capital Programming and Investment Process (CPIP). The CPIP was based upon the Office of Management and Budget (OMB) Capital Planning and Investment Control (CPIC) guidance (OMB A-11 Part 7; Planning, Budgeting, and Acquisition of Capital Assets.) An ARS specific CPIP – the ARS Building Block Plan (BBP) - was included as an appendix.

Similar to the USDA Plan, ARS built its process around the OMB CPIC guidance; this allowed ARS to evaluate real property investments based upon risks and returns throughout their lifecycle while ensuring that USDA and ARS' investments are well-conceived, cost-effective, and support strategic mission and business goals.

A key component of the ARS BBP is the use of investment review boards as the decision-making body in matters related to real property – the Boards are called Asset Management Review Boards (AMRB). There are 2 levels of review; the initial process begins at each of the 8 Area offices, these 8 plans are then consolidated and reviewed at the Headquarters level. The AMRB's membership includes representation from throughout the ARS and includes program, finance, budget, planning, and facilities. This membership ensures a balanced approach to investment decisions. The ARS Headquarters AMRB is chaired by the Deputy Administrator, Administrative & Financial Management and is responsible for:

- Reviewing new Capital investments (includes new construction, repair, land purchase, and disposal) using a standard set of criteria to ensure proposed projects that will support the ARS and Department missions and program delivery processes.
- Recommending approving/disapproving all projects over \$1,000,000. (The ARS AMRB assumes projects under \$1,000,000 have been validated by the Area AMRB's).
- Reviewing opportunities to right-size inventories and operations and management costs.
- Ensuring that both the Department's and ARS's criteria and performance goals are considered and implemented when making Agency investment decisions.
- Assuring that the ARS's Real Property program remains in compliance with EO and implementing directives.

As outlined above, once a decision is made on which real property assets warrant attention, there is an OMB process for analyzing capital investments. The process is generic, and it allows for the analysis of various capital investments, not just real property. The guidance provided in the USDA and ARS BBP process follows the basic criteria outlined within the OMB guidance.

Informal discussions with NASA and National Institutes of Health (NIH) staff have indicated that their Capital Investment Process closely follows the OMB guidance. The criteria taken into account include the following:

- Does the investment in a major capital asset support core/priority mission functions that need to be performed by the Federal Government? (How does the project support the Secretaries priorities, Congressional mandates, and the Department's and agency's strategic goals and objectives);
- Is the investment supported by a Life Cycle analysis?
- Does the investment improve the Real Property Performance Measures? (1) Utilization; 2) Condition Index; 3) Mission Dependency; and 4) Annual Operation & Maintenance (O&M) costs.)

The challenge for ARS is in identifying those real property assets that warrant priority attention and investment to ensure core and priority research needs are met. (There will always be a

number of facilities that require immediate attention due to failing building systems and life safety issues; these assets also need to be addressed.) ARS has identified the following tasks as necessary to complete its capital investment strategy.

**Task 1-** Bench mark the ARS BBP against other Government and industry organizations (General Services Administration (GSA), Department of Defense (DOD) activities, NIH, university, pharmaceutical, etc.). Include the decision making process, investment strategies, business systems and automation systems used, and metrics on expenditures for operation, sustainment, and recapitalization of similar assets.

**Task 2-** Identify funding amounts necessary to raise existing facilities to an acceptable condition, sustain facilities at that level, and recapitalize facilities.

**Task 3-** (concurrent with task 2) Implement processes and procedures to improve ARS management of its assets and prioritize investment priorities through a decision matrix that aligns and relates research program priorities and investment requirements with associated infrastructure needs in a systematic way to support a rank-ordered priority plan for identifying, scheduling, and sequencing existing and out-year capital investments needed to address infrastructure improvement requirements on a regular and recurring basis consistent with facility engineering industry norms. The ranking process will consider Congressional directed projects, recent construction, and general facilities that need to be accounted for in ranking priorities. ARS program priorities will relate both to facilities where specific research is conducted and also to facilities where the work could be conducted.

### **3. Brief History**

The Agricultural Research Service was officially founded in 1953 but has precursor agencies that date back as far as 1884 to the Bureaus of Plant and Animal Industry. The importance of agricultural research performed by the government goes back even farther, to the first work done to stem hog cholera outbreaks in 1868. In 1938, Congress appropriated funding to create agricultural research laboratories in Peoria, IL, Wyndmoor, PA, Albany, CA and New Orleans, LA. These locations still exist to this day as major centers of ARS work and concentrations of our science. We are proud of this long history of government commitment to solving agricultural problems that affect every single American in one way or another.

### **4. Purpose/Goals**

ARS conducts research to develop and transfer solutions to agricultural problems of high national priority and provide information access and dissemination to:

- Ensure high-quality, safe food, and other agricultural products;
- Assess the nutritional needs of Americans;
- Sustain a competitive agricultural economy;

- Enhance the natural resource base and the environment, and;
- Provide economic opportunities for rural citizens, communities, and society as a whole.

As part of the Research, Education, and Economics (REE) Mission Area, ARS, like its fellow REE agencies, focuses its research on five priorities:

- Climate change;
- Food safety;
- Children's nutrition and health;
- International food security;
- Bio-Energy.

## **5. Success in Meeting Programmatic Purpose/Goals**

### **Climate Change**

In an ARS study of the impact of global climate change, crops responded positively to future levels of atmospheric carbon dioxide (CO<sub>2</sub>), but soil tillage practices had little effect on this response. This first long-term study comparing tillage practices under high CO<sub>2</sub> levels showed that elevated CO<sub>2</sub> caused soybean and sorghum plants to increase photosynthesis while reducing transpiration, the amount of water the plants release. This resulted in increased water use efficiency, whether the crops were grown with no-till or conventional tillage.

ARS scientists have found that using alternative types of fertilizers can cut back on greenhouse gas emissions, at least in one part of the country, and are examining whether the alternatives offer similar benefits nationwide. Nitrogen fertilizers are often a necessity for ensuring sufficient crop yields, but their use leads to release of nitrous oxide, a major greenhouse gas, into the atmosphere. Fertilizer use is one reason an estimated 78 percent of the nation's nitrous oxide emissions come from agriculture.

Current atmospheric ozone levels are already suppressing soybean yields, according to ARS scientists' studies of the effect of global climate change on crops. The scientists have been working on a project called "SoyFACE"—short for Soybean Free Air Concentration Enrichment—to measure how the projected increases in carbon dioxide (CO<sub>2</sub>) and ozone will affect soybean production. The scientists found that soybean yields increase by about 12 percent at the elevated CO<sub>2</sub> levels predicted for the year 2050 (550 parts per million)—only half of what previous studies estimated. They also found that increased ozone is quite harmful to soybean yields, reducing them by about 20 percent. In addition, current levels of ozone are already suppressing soybean yields by up to 15 percent.

### **Food Safety**

Innovative studies by ARS scientists are providing new information about the impressive array of genes that a major foodborne pathogen, *Escherichia coli* O157:H7, calls into action when attempting to colonize leaves of fresh-cut lettuce. The investigation—the first to provide

extensive details about the biology of E. coli O157:H7 in fresh-cut lettuce—could pave the way to new technologies to improve the safety of bagged salads.

ARS scientists have used a type of high-tech imaging called "hyperspectral imaging" to distinguish the foodborne pathogen *Campylobacter* from other microorganisms as quickly as 24 hours in laboratory tests. *Campylobacter* infections in humans are a major cause of bacterial foodborne illness both in the United States and other countries throughout the world. Normally, isolation and detection for identification of *Campylobacter* from foods like raw chicken can take several days to a week. This "sensing" technology, which was nearly 100 percent accurate with pure cultures of the microorganisms, could be used for early detection of presumptive *Campylobacter* colonies.

Using a cleansing solution to wash eviscerated chicken carcasses is effective in removing bacteria that cause human foodborne diseases, according to an ARS study. The findings provide data that may be useful to poultry producers in designing practical, non-chlorine-based sanitizers. The cleanser, which is composed of lauric acid and potassium hydroxide, could be used to sanitize chicken carcasses during processing prior to chilling. Since other countries do not use chlorine rinses, ARS is looking at alternatives for them and is evaluating the most effective rinses against foodborne pathogens in poultry.

### **Children's Nutrition and Health**

Aspiring moms are often advised to achieve a healthy weight before they become pregnant, and to gain only the recommended amount of weight during their pregnancy, and ARS-funded studies could provide new insights into those recommendations. The studies focus on how influences that occur in the womb—and perhaps during the first few months of life—might affect development of a child's ability to regulate his or her weight later in life. In fact, the child's body-weight-regulating mechanisms might be permanently altered by maternal signals associated with the mother's own overweight, the scientists say, and such maternal programming of the unborn child could increase the risk that the child would become an overweight or obese adult and would have a higher risk of obesity-related afflictions.

Parents of kids age 2 and up can check a handy website every six months to help determine if their children's weight gains or losses are heading in the right direction. ARS-funded scientists developed the easy-to-use, online resource and based it on growth charts issued by the Centers for Disease Control and Prevention. In just a few minutes spent at their computer, parents can easily calculate their child's BMI, or Body Mass Index, and put it into perspective by viewing the youngster's BMI percentile on a helpful graph.

A collaborative study conducted by ARS scientists and Harvard University scientists showed decreased nutritional dietary quality and increased caloric intake among U.S. children on days when they consumed fast food. The authors analyzed existing dietary intake data from 6,212 children and adolescents, aged 4 to 19, from a nationally representative USDA Continuing

Survey of Food Intakes by Individuals, 1994-1996, and the Supplemental Children's Survey, 1998. The findings showed that U.S. children who ate fast food, compared with those who did not, consumed more total calories, more calories per gram of food, more total and saturated fat, more total carbohydrate, more added sugars and more sugar-sweetened beverages, but less milk, fiber, fruit and nonstarchy vegetables.

### **International Food Security**

ARS scientists have solved a longstanding mystery as to why a pathogen that threatens the world's wheat supply can be so adaptable, diverse and virulent. It is because the fungus that causes the wheat disease called stripe rust may use sexual recombination to adapt to resistant varieties of wheat. The scientists showed for the first time that stripe rust, caused by *Puccinia striiformis*, is capable of sexually reproducing on the leaves of an alternate host called barberry, a common ornamental.

An international team of researchers co-led by an ARS scientist has sequenced the genomes of two fungal pathogens—one that threatens global wheat supplies and another that limits production of a tree crop valued as a future source for biofuel. The sequencing of the genetic codes of wheat stem rust pathogen (*Puccinia graminis*) and poplar leaf rust pathogen (*Melampsora larici-populina*) is expected to help researchers develop control strategies to address worldwide threats to wheat fields and tree plantations.

ARS scientists and their colleagues completed a four-year effort to sequence the genome of corn, an achievement expected to speed up development of corn varieties that will help feed the world and meet growing demands for using this important grain crop as a biofuel and animal feed. The results represent the largest and most complex plant genome sequenced to date.

### **Bio-Energy**

ARS scientists have found that barley grain can be used to produce ethanol, and the leftover byproducts—barley straw, hulls, and dried distillers grains—can be used to produce an energy-rich oil called bio-oil. The bio-oil could then be used either for transportation fuels or for producing heat and power needed for the grain-to-ethanol conversion.

ARS scientists have long-term studies underway to examine growing camelina as a bioenergy crop for producing jet fuel for the military and the aviation industry. This research supports the recently signed memorandum of understanding between the U.S. Department of Agriculture (USDA) and the Department of the Navy (DoN) and interests of the Commercial Airlines Alternative Fuels Initiative (CAAFI). Native to Europe, camelina (*Camelina sativa*) is a member of the plant family Brassicaceae and has been grown since ancient times for use as lamp fuel, among other things. The seed's high oil content has made it a promising candidate as a new source for biofuels.

ARS scientists have developed a new tool for deciphering the genetics of a native prairie grass being widely studied for its potential as a biofuel. The genetic map of switchgrass is expected to

speed up the search for genes that will make the perennial plant a more viable source of bioenergy. Interest in using switchgrass as a biofuel has intensified in recent years because it can be burned to produce electricity and, like corn stalks, can be converted to ethanol. It also grows on marginal lands, is adaptable to different regions, and—as a perennial—does not need to be replanted each year, which means lower energy costs and less runoff.

## 6. Annual Budget Authority (FY 2002-FY2011) (\$ in thousands)

### Salaries and Expenses

FY 2002	\$978,865
FY 2003	\$1,048,906
FY 2004	\$1,088,057
FY 2005	\$1,108,129
FY 2006	\$1,130,128
FY 2007	\$1,132,031
FY 2008	\$1,124,992
FY 2009	\$1,143,459
FY 2010	\$1,179,784
FY 2011	\$1,133,230

### Buildings and Facilities

FY 2002	\$216,824
FY 2003	\$228,703
FY 2004	\$63,434
FY 2005	\$186,335
FY 2006	\$149,883
FY 2007	\$0
FY 2008	\$51,752
FY 2009	\$46,752
FY 2010	\$70,873
FY 2011	\$0

**NOTE: In FY 2011, the appropriation rescinded \$230 million in balances from prior appropriations, and there was no funding received under the Buildings and Facilities line.**

## 7. Annual Outlays

Aggregate agency outlays are below. See next page for details by location. (\$ in thousands)

FY 2002	\$928,330
FY 2003	\$1,024,665
FY 2004	\$1,076,374
FY 2005	\$1,107,953
FY 2006	\$1,133,833
FY 2007	\$1,099,270
FY 2008	\$1,135,728
FY 2009	\$1,133,144
FY 2010	\$1,169,025
FY 2011	\$1,115,892

UNITED STATES DEPARTMENT OF AGRICULTURE  
Agricultural Research Service  
FY 2011 Estimated Research Funding by Location

Location	2011 NTL Estimate
<b>ALABAMA, Auburn</b>	
AQUATIC ANIMAL HEALTH RESEARCH	2,302,355
SOIL DYNAMICS RESEARCH	<u>3,604,375</u>
<i>Subtotal, Alabama</i>	<b>5,906,730</b>
<b>ALASKA, Fairbanks</b>	
SUBARCTIC AGRICULTURAL RESEARCH UNIT	<u>5,465,003</u>
<i>Subtotal, Alaska</i>	<b>5,465,003</b>
<b>ARIZONA, Maricopa - U.S. ARID LAND AGRICULTURAL RESEARCH CENTER</b>	
AFLATOXIN REDUCTION	850,435
PEST MANAGEMENT AND BIOCONTROL RESEARCH	2,897,456
PLANT PHYSIOLOGY AND GENETICS RESEARCH	3,026,574
WATER MANAGEMENT AND CONSERVATION RESEARCH	2,950,663
<i>Maricopa Subtotal</i>	<b>9,725,128</b>
<b>ARIZONA, Tucson</b>	
HONEY BEE RESEARCH	

	1,627,276
SOUTHWEST WATERSHED RESEARCH	3,318,636
	<i>Tucson Subtotal</i> <u>4,945,912</u>
	<b><i>Subtotal, Arizona</i> 14,671,040</b>
<b>ARKANSAS, Booneville</b>	
DALE BUMPERS SMALL FARMS RESEARCH CENTER	1,764,605
<b>ARKANSAS, Fayetteville</b>	
POULTRY PRODUCTION AND PRODUCTS SAFETY RESEARCH	1,627,547
<b>ARKANSAS, Little Rock</b>	
ARKANSAS CHILDREN'S NUTRITION CENTER	6,348,600
<b>ARKANSAS, Stuttgart</b>	
DALE BUMPERS NATIONAL RICE RESEARCH CENTER	3,600,124
HARRY K. DUPREE STUTTGART NATIONAL AQUACULTURE RESEARCH CENTER	3,224,860
	<i>Stuttgart Subtotal</i> <u>6,824,984</u>
	<b><i>Subtotal, Arkansas</i> 16,565,736</b>
<b>CALIFORNIA, Albany - PLANT GENE EXPRESSION CENTER</b>	
4,116,816	
<b>CALIFORNIA, Albany - WESTERN REGIONAL RESEARCH CENTER</b>	
BIOPRODUCT CHEMISTRY AND ENGINEERING RESEARCH	3,924,646
CROP IMPROVEMENT/UTILIZATION RESEARCH	4,507,709

EXOTIC AND INVASIVE WEEDS RESEARCH	4,967,546
FOODBORNE CONTAMINANTS RESEARCH	4,246,950
GENOMICS AND GENE DISCOVERY	2,092,410
PLANT MYCOTOXINS RESEARCH	3,007,727
PROCESSED FOODS RESEARCH	3,855,196
PRODUCE SAFETY AND MICROBIOLOGY RESEARCH	5,436,157

*Albany Subtotal* 36,155,157

**CALIFORNIA, Davis**

CROPS PATHOLOGY AND GENETICS RESEARCH	2,763,178
NATIONAL CLONAL GERMPLASM REPOSITORY - TREE FRUIT & NUT CROPS & GRAPES	1,304,663
WESTERN HUMAN NUTRITION RESEARCH CENTER:	
OBESITY AND METABOLISM RESEARCH	3,400,766
IMMUNITY AND DISEASE PREVENTION RESEARCH UNIT	3,485,541

*Davis Subtotal* 10,954,148

**CALIFORNIA, Parlier - SAN JOAQUIN VALLEY AGRICULTURAL  
SCIENCES CENTER**

COMMODITY PROTECTION AND QUALITY RESEARCH	3,358,348
CROP DISEASES, PESTS AND GENETICS PLANT GENETIC RESOURCES CONSERVATION	5,429,823

	625,023
WATER MANAGEMENT RESEARCH	2,363,685
	<i>Parlier Subtotal 11,776,879</i>
<b>CALIFORNIA, Riverside</b>	
U.S. SALINITY LABORATORY	
CONTAMINANT FATE AND TRANSPORT RESEARCH	2,114,961
WATER REUSE AND REMEDIATION RESEARCH	2,316,566
NATIONAL CLONAL GERMPLASM REPOSITORY FOR CITRUS	1,142,398
	<i>Riverside Subtotal 5,573,925</i>
<b>CALIFORNIA, Salinas</b>	
CROP IMPROVEMENT AND PROTECTION RESEARCH	4,907,345
<b>CALIFORNIA, Shafter</b>	
WESTERN INTEGRATED CROPPING SYSTEMS RESEARCH	<u>1,455,204</u>
	<i>Subtotal, California 70,822,658</i>
<b>COLORADO, Akron</b>	
CENTRAL PLAINS RESOURCES MANAGEMENT RESEARCH	2,049,276
<b>COLORADO, Fort Collins</b>	
AGRICULTURAL SYSTEMS RESEARCH	2,132,160
PLANT AND ANIMAL GENETIC RESOURCES PRESERVATION RESEARCH UNIT	4,620,480
SOIL, PLANT AND NUTRIENT RESEARCH	

	2,782,077
SUGARBEET RESEARCH	797,220
WATER MANAGEMENT RESEARCH	1,819,074
	<i>Fort Collins Subtotal</i> <u>12,151,011</u>
	<i>Subtotal, Colorado</i> <b>14,200,287</b>
<b>DELAWARE, Newark</b>	
BENEFICIAL INSECTS INTRODUCTION RESEARCH	<u>2,069,908</u>
	<i>Subtotal, Delaware</i> <b>2,069,908</b>
<b>DISTRICT OF COLUMBIA</b>	
U. S. NATIONAL ARBORETUM:	
EDUCATION UNIT	1,328,736
FLORAL AND NURSERY PLANTS RESEARCH UNIT	6,489,013
GARDENS UNIT	<u>3,594,923</u>
	<i>Subtotal, District of Columbia</i> <b>11,412,672</b>
<b>FLORIDA, Brooksville</b>	
BEEF CATTLE RESEARCH	1,249,875
<b>FLORIDA, Canal Point</b>	
SUGARCANE PRODUCTION RESEARCH	2,888,264
<b>FLORIDA, Fort Lauderdale</b>	

INVASIVE PLANT RESEARCH LABORATORY <b>FLORIDA, Fort Pierce - U.S. HORTICULTURAL RESEARCH LABORATORY</b>	2,552,219
HORTICULTURE AND BREEDING RESEARCH	4,117,253
QUALITY IMPROVEMENT IN CITRUS AND SUBTROPICAL PRODUCTS RESEARCH	2,644,308
SUBTROPICAL INSECTS RESEARCH	2,964,198
SUBTROPICAL PLANT PATHOLOGY RESEARCH	4,543,843
	<i>Fort Pierce Subtotal 14,269,602</i>
<b>FLORIDA, Gainesville - CENTER FOR MEDICAL, AGRICULTURAL AND VETERINARY ENTOMOLOGY</b>	
CHEMISTRY RESEARCH	3,464,716
IMPORTED FIRE ANT AND HOUSEHOLD INSECTS RESEARCH	2,120,122
INSECT BEHAVIOR AND BIOCONTROL RESEARCH UNIT	4,034,501
MOSQUITO AND FLY RESEARCH	2,455,817
	<i>Gainesville Subtotal 12,075,156</i>
<b>FLORIDA, Miami</b>	
SUBTROPICAL HORTICULTURE RESEARCH	<u>4,569,783</u>
	<i>Subtotal, Florida 37,604,899</i>
<b>GEORGIA, Athens</b>	
SOUTHEAST POULTRY RESEARCH LABORATORY:	

ENDEMIC POULTRY VIRAL DISEASES RESEARCH	1,839,675
EXOTIC AND EMERGING AVIAN VIRAL DISEASES RESEARCH	3,908,077
RICHARD B. RUSSELL RESEARCH CENTER: BACTERIAL EPIDEMIOLOGY AND ANTIMICROBIAL RESISTANCE RESEARCH	3,401,577
EGG SAFETY AND QUALITY RESEARCH	2,200,757
POULTRY MICROBIOLOGICAL SAFETY RESEARCH	2,735,627
POULTRY PROCESSING AND SWINE PHYSIOLOGY RESEARCH	1,721,610
QUALITY AND SAFETY ASSESSMENT RESEARCH	3,847,038
TOXICOLOGY AND MYCOTOXIN RESEARCH	2,617,726
SOUTHERN PIEDMONT CONSERVATION RESEARCH	2,659,303
	<i>Athens Subtotal</i> 24,931,390
<b>GEORGIA, Byron</b>	
FRUIT AND NUT RESEARCH	3,650,947
<b>GEORGIA, Dawson</b>	
PEANUT RESEARCH	3,878,854
<b>GEORGIA, Griffin</b>	
PLANT GENETIC RESOURCES CONSERVATION RESEARCH	2,318,940
<b>GEORGIA, Tifton</b>	
CROP GENETICS AND BREEDING RESEARCH	2,205,021

CROP PROTECTION AND MANAGEMENT RESEARCH 4,075,707

SOUTHEAST WATERSHED RESEARCH 3,412,954

*Tifton Subtotal* 9,693,682

*Subtotal, Georgia* 44,473,813

**HAWAII, Hilo - U.S. PACIFIC BASIN AGRICULTURAL RESEARCH CENTER**

TROPICAL CROP AND COMMODITY PROTECTION RESEARCH UNIT 5,961,010

TROPICAL PLANT GENETIC RESOURCES AND DISEASE RESEARCH UNIT 3,583,427

*Subtotal, Hawaii* 9,544,437

**IDAHO, Aberdeen**

SMALL GRAINS AND POTATO GERMPLASM RESEARCH 6,011,779

**IDAHO, Boise**

WATERSHED MANAGEMENT RESEARCH 2,142,620

**IDAHO, Dubois**

RANGE SHEEP PRODUCTION EFFICIENCY RESEARCH 2,149,498

**IDAHO, Kimberly**

NORTHWEST IRRIGATION AND SOILS RESEARCH 3,584,719

*Subtotal, Idaho* 13,888,616

**ILLINOIS, Peoria - NATIONAL CENTER FOR AGRICULTURAL UTILIZATION RESEARCH**

BACTERIAL FOODBORNE PATHOGENS & MYCOLOGY RESEARCH	6,453,938
BIOENERGY RESEARCH	4,215,810
BIO-OILS RESEARCH	4,260,469
CROP BIOPROTECTION RESEARCH	2,876,133
FUNCTIONAL FOODS RESEARCH	4,650,895
PLANT POLYMER RESEARCH	5,032,373
RENEWABLE PRODUCT TECHNOLOGY RESEARCH	4,328,884

*Peoria Subtotal* 31,818,502

**ILLINOIS, Urbana**

GLOBAL CHANGE AND PHOTOSYNTHESIS RESEARCH	2,959,242
SOYBEAN/MAIZE GERMPLASM, PATHOLOGY, AND GENETICS RESEARCH	2,771,594

*Urbana Subtotal* 5,730,836

***Subtotal, Illinois* 37,549,338**

**INDIANA, West Lafayette**

CROP PRODUCTION AND PEST CONTROL RESEARCH	3,514,487
LIVESTOCK BEHAVIOR RESEARCH	1,471,316
NATIONAL SOIL EROSION RESEARCH	<u>2,766,782</u>

***Subtotal, Indiana***

7,752,585

**IOWA, Ames**

CORN INSECTS AND CROP GENETICS RESEARCH 6,881,204  
NATIONAL ANIMAL DISEASE CENTER

FOOD SAFETY AND ENTERIC PATHOGENS 5,384,398

INFECTIOUS BACTERIAL DISEASES 9,413,272

RUMINANT DISEASES AND IMMUNOLOGY 7,217,472

VIRUS AND PRION 10,029,973

PLANT INTRODUCTION RESEARCH 3,407,852  
NATIONAL LABORATORY FOR AGRICULTURE AND THE  
ENVIRONMENT

SOIL, WATER & AIR RESOURCES RESEARCH 3,428,406

AGROECOSYSTEMS MANAGEMENT RESEARCH 5,323,618

*Subtotal, Iowa* 51,086,195

**KANSAS, Manhattan - CENTER FOR GRAIN AND ANIMAL HEALTH  
RESEARCH**

ARTHROPOD-BORNE ANIMAL DISEASES RESEARCH 3,133,205

ENGINEERING AND WIND EROSION RESEARCH 2,204,583

GRAIN QUALITY AND STRUCTURE RESEARCH 2,973,412  
HARD WINTER WHEAT GENETICS RESEARCH

	2,712,749
STORED PRODUCT INSECT RESEARCH	<u>2,777,678</u>
<i>Subtotal, Kansas</i>	<i>13,801,627</i>
<b>KENTUCKY, Bowling Green</b>	
ANIMAL WASTE MANAGEMENT RESEARCH	2,583,864
<b>KENTUCKY, Lexington</b>	
FORAGE-ANIMAL PRODUCTION RESEARCH	<u>2,635,527</u>
<i>Subtotal, Kentucky</i>	<i>5,219,391</i>
<b>LOUISIANA, Baton Rouge</b>	
HONEY BEE BREEDING, GENETICS, AND PHYSIOLOGY RESEARCH	2,580,696
<b>LOUISIANA, Houma</b>	
SUGARCANE RESEARCH	4,068,690
<b>LOUISIANA, New Orleans - SOUTHERN REGIONAL RESEARCH CENTER</b>	
COMMODITY UTILIZATION RESEARCH	4,449,989
COTTON CHEMISTRY AND UTILIZATION RESEARCH	3,573,813
COTTON FIBER BIOSCIENCE RESEARCH	1,344,318
COTTON STRUCTURE AND QUALITY RESEARCH	3,535,833
FOOD AND FEED SAFETY RESEARCH	4,871,129
FOOD PROCESSING AND SENSORY QUALITY RESEARCH	

	4,509,075
FORMOSAN SUBTERRANEAN TERMITE RESEARCH	2,868,331
	<i>New Orleans Subtotal</i> <u>25,152,488</u>

***Subtotal, Louisiana* 31,801,874**

**MAINE, Orono**

CRANBERRY RESEARCH	374,250
NATIONAL COLD WATER MARINE AQUACULTURE CENTER	<u>820,496</u>

***Subtotal, Maine* 1,194,746**

**MARYLAND, Beltsville**

ANIMAL AND NATURAL RESOURCES INSTITUTE:

ANIMAL BIOSCIENCES AND BIOTECHNOLOGY LABORATORY	6,675,716
ANIMAL IMPROVEMENT PROGRAMS LABORATORY	2,632,700
ANIMAL PARASITIC DISEASES LABORATORY	6,850,965
BOVINE FUNCTIONAL GENOMICS LABORATORY	6,649,867
CROP SYSTEMS AND GLOBAL CHANGE LABORATORY	2,673,959
ENVIRONMENTAL MANAGEMENT AND BY-PRODUCT UTILIZATION LABORATORY	5,196,763
ENVIRONMENTAL MICROBIAL AND FOOD SAFETY LABORATORY	7,773,429
HYDROLOGY AND REMOTE SENSING LABORATORY	4,861,439

SUSTAINABLE AGRICULTURAL SYSTEMS LABORATORY BELTSVILLE HUMAN NUTRITION RESEARCH CENTER:	4,649,332
DIET, GENOMICS AND IMMUNOLOGY LABORATORY	3,796,455
FOOD COMPONENTS AND HEALTH LABORATORY	5,636,649
FOOD COMPOSITION AND METHODS DEVELOPMENT LABORATORY	2,585,426
FOOD SURVEYS RESEARCH GROUP	6,588,506
NUTRIENT DATA LABORATORY	3,137,610
PLANT SCIENCES INSTITUTE:	
BEE RESEARCH LABORATORY	2,476,706
FOOD QUALITY LABORATORY	3,895,437
GENETIC IMPROVEMENT FOR FRUITS AND VEGETABLES LABORATORY	5,420,857
INVASIVE INSECT BIOCONTROL AND BEHAVIOR LABORATORY	6,261,849
MOLECULAR PLANT PATHOLOGY LABORATORY	3,673,159
NATIONAL GERMPLASM RESOURCES LABORATORY	4,309,679
NEMATOLOGY LABORATORY	2,478,053
SOYBEAN GENOMICS AND IMPROVEMENT LABORATORY	4,169,210
SUSTAINABLE PERENNIAL CROPS LABORATORY	4,100,507
SYSTEMATIC MYCOLOGY AND MICROBIOLOGY	



	2,493,211
SOIL AND WATER MANAGEMENT RESEARCH	1,752,683
	<i>St. Paul Subtotal</i> <u>6,793,056</u>
	<b><i>Subtotal, Minnesota</i> 9,436,324</b>
<b>MISSISSIPPI, Mississippi State</b>	
CROP SCIENCE RESEARCH LABORATORY	
CORN HOST PLANT RESISTANCE RESEARCH	2,050,412
GENETICS AND PRECISION AGRICULTURE RESEARCH	4,292,462
POULTRY RESEARCH	2,873,253
	<i>Mississippi State Subtotal</i> 9,216,127
<b>MISSISSIPPI, Oxford</b>	
NATIONAL SEDIMENTATION LABORATORY	
WATER QUALITY AND ECOLOGY RESEARCH	3,345,131
WATERSHED PHYSICAL PROCESSES	5,169,338
NATURAL PRODUCTS UTILIZATION RESEARCH	5,525,076
	<i>Oxford Subtotal</i> 14,039,545
<b>MISSISSIPPI, Poplarville</b>	
SOUTHERN HORTICULTURAL RESEARCH	5,168,880
<b>MISSISSIPPI, Stoneville</b>	
BIOLOGICAL CONTROL OF PESTS RESEARCH	

	5,246,151
CATFISH GENETICS RESEARCH	8,860,750
COTTON GINNING RESEARCH	1,428,364
CROP GENETICS RESEARCH	6,450,422
CROP PRODUCTION SYSTEMS RESEARCH	5,655,407
GENOMICS AND BIOINFORMATICS RESEARCH	1,831,962
HUMAN NUTRITION RESEARCH	273,454
SOUTHERN INSECT MANAGEMENT RESEARCH	4,687,200
SOYBEAN RESEARCH	778,425

*Stoneville Subtotal* 35,212,135

*Subtotal, Mississippi* **63,636,687**

**MISSOURI, Columbia**

BIOLOGICAL CONTROL OF INSECTS RESEARCH	1,692,322
CROPPING SYSTEMS AND WATER QUALITY RESEARCH	3,172,521
PLANT GENETICS RESEARCH	<u>4,239,347</u>

*Subtotal, Missouri* **9,104,190**

**MONTANA, Miles City**

RANGE AND LIVESTOCK RESEARCH

	3,337,966
<b>MONTANA, Sidney - NORTHERN PLAINS AGRICULTURAL RESEARCH LABORATORY</b>	
AGRICULTURAL SYSTEMS RESEARCH UNIT	2,563,705
PEST MANAGEMENT RESEARCH UNIT	2,573,427
	<i>Sidney Subtotal</i> <u>5,137,132</u>
	<b><i>Subtotal, Montana</i> 8,475,098</b>
<b>NEBRASKA, Clay Center - U.S. MEAT ANIMAL RESEARCH CENTER</b>	
ANIMAL HEALTH RESEARCH	1,552,861
ENVIRONMENTAL MANAGEMENT RESEARCH	1,957,037
GENETICS AND BREEDING RESEARCH	4,215,173
MEATS SAFETY & QUALITY RESEARCH	5,349,777
NUTRITION RESEARCH	2,972,038
REPRODUCTION RESEARCH	3,537,864
	<i>Clay Center Subtotal</i> 19,584,750
<b>NEBRASKA, Lincoln</b>	
AGROECOSYSTEM MANAGEMENT RESEARCH	3,175,627
GRAIN, FORAGE, AND BIOENERGY RESEARCH	2,808,228
	<i>Lincoln Subtotal</i> <u>5,983,855</u>

*Subtotal, Nebraska* 25,568,605

**NEW MEXICO, Las Cruces**

COTTON GINNING RESEARCH 1,856,867

RANGE MANAGEMENT RESEARCH 4,174,766

*Subtotal, New Mexico* 6,031,633

**NEW YORK, Geneva**

GRAPE GENETICS RESEARCH 1,662,812

PLANT GENETIC RESOURCES 2,263,266

*Geneva Subtotal* 3,926,078

**NEW YORK, Greenport**

FOREIGN ANIMAL DISEASE RESEARCH 3,840,400

**NEW YORK, Ithaca**

BIOLOGICAL INTEGRATED PEST MANAGEMENT RESEARCH 3,283,196

PLANT, SOIL AND NUTRITION RESEARCH 5,539,605

PLANT-MICROBE INTERACTIONS RESEARCH 1,771,550

*Ithaca Subtotal* 10,594,351

*Subtotal, New York* 18,360,829

**NORTH CAROLINA, Raleigh**

FOOD SCIENCE RESEARCH

	1,310,075
MARKET QUALITY AND HANDLING RESEARCH	1,112,911
PLANT SCIENCE RESEARCH	4,922,910
SOYBEAN AND NITROGEN FIXATION RESEARCH	<u>2,055,687</u>

*Subtotal, North Carolina* 9,401,583

**NORTH DAKOTA, Fargo - RED RIVER VALLEY AGRICULTURAL RESEARCH CENTER**

ANIMAL METABOLISM-AGRICULTURAL CHEMICALS RESEARCH	2,405,557
CEREAL CROPS RESEARCH	4,104,352
INSECT GENETICS AND BIOCHEMISTRY RESEARCH	1,928,232
SUGARBEET AND POTATO RESEARCH	2,290,933
SUNFLOWER AND PLANT BIOLOGY RESEARCH	3,542,935
WEED BIOLOGY RESEARCH	1,511,423

*Fargo Subtotal* 15,783,432

**NORTH DAKOTA, Grand Forks - GRAND FORKS HUMAN NUTRITION RESEARCH CENTER**

DIETARY PREVENTION OF OBESITY-RELATED RESEARCH	4,337,437
HEALTHY BODY WEIGHT RESEARCH	5,224,694

*Grand Forks Subtotal* 9,562,131

**NORTH DAKOTA, Mandan**

NATURAL RESOURCE MANAGEMENT RESEARCH 3,442,163

*Subtotal, North Dakota* 28,787,726

**OHIO, Columbus**

SOIL DRAINAGE RESEARCH 1,477,805

**OHIO, Coshocton**

NORTH APPALACHIAN EXPERIMENTAL WATERSHED RESEARCH 1,250,740

**OHIO, Wooster**

APPLICATION TECHNOLOGY RESEARCH 3,236,110

CORN AND SOYBEAN RESEARCH 879,325

SOFT WHEAT QUALITY RESEARCH 943,096

*Wooster Subtotal* 5,058,531

*Subtotal, Ohio* 7,787,076

**OKLAHOMA, El Reno - GRAZINGLANDS RESEARCH LABORATORY**

FORAGE AND LIVESTOCK PRODUCTION RESEARCH UNIT 2,933,754

GREAT PLAINS AGROCLIMATE AND NATURAL RESOURCES  
RESEARCH UNIT 2,427,656

*El Reno Subtotal* 5,361,410

**OKLAHOMA, Lane - SOUTH CENTRAL AGRICULTURAL RESEARCH  
LABORATORY**

GENETICS AND PRODUCTION RESEARCH

	1,962,617
<b>OKLAHOMA, Stillwater</b>	
HYDRAULIC ENGINEERING RESEARCH	938,916
WHEAT, PEANUT, AND OTHER FIELD CROPS RESEARCH	2,721,669
	<i>Stillwater Subtotal</i> 3,660,585
<b>OKLAHOMA, Woodward</b>	
RANGELAND AND PASTURE RESEARCH	<u>1,645,398</u>
	<i>Subtotal, Oklahoma</i> 12,630,010
<b>OREGON, Burns</b>	
RANGE AND MEADOW FORAGE MANAGEMENT RESEARCH	2,726,833
<b>OREGON, Corvallis</b>	
FORAGE SEED AND CEREAL RESEARCH	4,633,549
HORTICULTURAL CROPS RESEARCH	5,741,888
NATIONAL CLONAL GERMPLASM REPOSITORY	1,484,276
	<i>Corvallis Subtotal</i> 11,859,713
<b>OREGON, Pendleton</b>	
SOIL AND WATER CONSERVATION RESEARCH	<u>1,961,163</u>
	<i>Subtotal, Oregon</i> 16,547,709
<b>PENNSYLVANIA, University Park</b>	
PASTURE SYSTEMS & WATERSHED MANAGEMENT RESEARCH	

	4,216,231
<b>PENNSYLVANIA, Wyndmoor - EASTERN REGIONAL RESEARCH CENTER</b>	
BIOBASED AND OTHER ANIMAL CO-PRODUCTS RESEARCH	3,668,679
DAIRY AND FUNCTIONAL FOODS RESEARCH	4,966,168
FOOD SAFETY AND INTERVENTION TECHNOLOGIES RESEARCH	5,784,714
MOLECULAR CHARACTERIZATION OF FOODBORNE PATHOGENS RESEARCH	6,939,849
RESIDUE CHEMISTRY AND PREDICTIVE MICROBIOLOGY RESEARCH	4,766,582
SUSTAINABLE BIOFUELS AND CO-PRODUCTS RESEARCH	5,416,802
	<i>Wyndmoor Subtotal</i> <u>31,542,794</u>
	<b><i>Subtotal, Pennsylvania</i> 35,759,025</b>
<b>SOUTH CAROLINA, Charleston</b>	
VEGETABLE RESEARCH	4,434,754
<b>SOUTH CAROLINA, Clemson</b>	
COTTON QUALITY RESEARCH	2,355,935
<b>SOUTH CAROLINA, Florence</b>	
COASTAL PLAIN SOIL, WATER AND PLANT CONSERVATION RESEARCH	<u>4,148,647</u>
	<b><i>Subtotal, South Carolina</i> 10,939,336</b>
<b>SOUTH DAKOTA, Brookings</b>	
INTEGRATED CROPPING SYSTEMS RESEARCH	<u>                    </u>

2,968,164

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*Subtotal, South Dakota* 2,968,164

**TEXAS, Beaumont**

RICE RESEARCH 1,428,857

**TEXAS, Bushland - CONSERVATION AND PRODUCTION RESEARCH  
LABORATORY**

RENEWABLE ENERGY AND MANURE MANAGEMENT RESEARCH 1,731,850

SOIL AND WATER MANAGEMENT RESEARCH 5,228,070

*Bushland Subtotal* 6,959,920

**TEXAS, College Station - SOUTHERN PLAINS AGRICULTURAL  
RESEARCH CENTER**

AREAWIDE PEST MANAGEMENT RESEARCH 3,233,491

COTTON PATHOLOGY RESEARCH 1,511,849

CROP GERMPLASM RESEARCH 3,363,939

FOOD AND FEED SAFETY RESEARCH 5,087,980

*College Station Subtotal* 13,197,259

**TEXAS, Houston**

CHILDREN'S NUTRITION RESEARCH CENTER 13,677,579

**TEXAS, Kerrville - KNIPLING-BUSHLAND U.S. LIVESTOCK INSECTS  
RESEARCH LABORATORY**

SCREWWORM RESESARCH 1,023,231

TICK AND BITING FLY RESEARCH 4,640,802

*Kerrville Subtotal* 5,664,033

**TEXAS, Lubbock - CROPPING SYSTEMS RESEARCH LABORATORY**

COTTON PRODUCTION AND PROCESSING RESEARCH 1,187,720

LIVESTOCK ISSUES RESEARCH 1,157,043

PLANT STRESS AND GERMPLASM DEVELOPMENT RESEARCH 3,635,239

WIND EROSION AND WATER CONSERVATION RESEARCH 3,058,531

*Lubbock Subtotal* 9,038,533

**TEXAS, Temple**

GRASSLAND, SOIL AND WATER RESEARCH LABORATORY 3,585,877

**TEXAS, Weslaco - KIKA DE LA GARZA SUBTROPICAL  
AGRICULTURAL RESEARCH CENTER**

BENEFICIAL INSECTS RESEARCH 2,967,672

CROP QUALITY AND FRUIT INSECTS RESEARCH 1,972,766

HONEY BEE RESEARCH 1,616,482

INTEGRATED FARMING AND NATURAL RESOURCES RESEARCH 3,140,728

*Weslaco Subtotal* 9,697,648

*Subtotal, Texas* 63,249,706

**UTAH, Logan**

FORAGE AND RANGE RESEARCH	3,931,926
POISONOUS PLANT RESEARCH	3,292,975
POLLINATING INSECT-BIOLOGY, MANAGEMENT, SYSTEMATICS RESEARCH	<u>1,784,531</u>
	<i>Subtotal, Utah</i> 9,009,432
<b>WASHINGTON, Prosser</b>	
VEGETABLE AND FORAGE CROPS PRODUCTION RESEARCH	3,319,128
<b>WASHINGTON, Pullman</b>	
ANIMAL DISEASE RESEARCH	6,957,540
GRAIN LEGUME GENETICS PHYSIOLOGY RESEARCH	974,874
LAND MANAGEMENT AND WATER CONSERVATION RESEARCH	1,673,928
PLANT GERMPLASM INTRODUCTION AND TESTING RESEARCH	2,735,366
ROOT DISEASE AND BIOLOGICAL CONTROL RESEARCH	1,485,447
WHEAT GENETICS, QUALITY PHYSIOLOGY AND DISEASE RESEARCH	2,686,923
	<i>Pullman Subtotal</i> 16,514,078
<b>WASHINGTON, Wapato</b>	
FRUIT AND VEGETABLE INSECT RESEARCH	4,550,497
<b>WASHINGTON, Wenatchee</b>	
PHYSIOLOGY AND PATHOLOGY OF TREE FRUITS RESEARCH	<u>2,107,760</u>

*Subtotal, Washington* 26,491,463

**WEST VIRGINIA, Beaver**

APPALACHIAN FARMING SYSTEMS RESEARCH CENTER 7,376,867  
**WEST VIRGINIA, Kearneysville - APPALACHIAN FRUIT RESEARCH  
LABORATORY**

INNOVATIVE FRUIT PRODUCTION, IMPROVEMENT AND  
PROTECTION 7,185,870

**WEST VIRGINIA, Leetown**

COOL AND COLD WATER AQUACULTURE RESEARCH 7,157,417

*Subtotal, West Virginia* 21,720,154

**WISCONSIN, Madison**

CEREAL CROPS RESEARCH 2,657,598  
U.S. DAIRY FORAGE RESEARCH CENTER

CELL WALL BIOLOGY AND UTILIZATION RESEARCH 3,019,146

DAIRY FORAGE AND AQUACULTURE RESEACH 4,696,175

ENVIRONMENTALLY INTEGRATED DAIRY MANAGEMENT 1,781,972

VEGETABLE CROPS RESEARCH 3,933,194

*Subtotal, Wisconsin* 16,088,085

**WYOMING, Cheyenne**

RANGELAND RESOURCES RESEARCH 2,313,149

*Subtotal, Wyoming* 2,313,149

**PUERTO RICO, Mayaguez**

TROPICAL CROPS AND GERMPLASM RESEARCH 2,837,405

*Subtotal, Puerto Rico* 2,837,405

**OTHER COUNTRIES**

ARGENTINA, BUENOS AIRES - SOUTH AMERICAN BIOLOGICAL  
CONTROL LABORATORY 532,225

FRANCE, MONTPELLIER - EUROPEAN BIOLOGICAL CONTROL  
LABORATORY 3,078,341

*Subtotal, Other Countries* 3,610,566

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**ARS Research Total** 965,639,582

Repair & Maintenance of Facilities (Arboretum & NAL) 1,553,266

OFFICE OF THE DIRECTOR - WRRC Renovation 495,096

ADMINISTRATOR AND IMMEDIATE STAFFS 54,740,337

NATIONAL PROGRAMS 36,916,510

ADMINISTRATIVE AND FINANCIAL MANAGEMENT 28,557,007

RESEARCH OPERATIONS AND MANAGEMENT 16,994,855

BELTSVILLE AREA OFFICE OF THE DIRECTOR	5,936,605
NORTH ATLANTIC AREA OFFICE OF THE DIRECTOR	3,291,214
MIDWEST AREA OFFICE OF THE DIRECTOR	3,252,327
PACIFIC WEST AREA OFFICE OF THE DIRECTOR	3,751,231
NORTHERN PLAINS AREA- OFFICE OF THE DIRECTOR	3,276,233
SOUTHERN PLAINS AREA OFFICE OF THE DIRECTOR	2,819,470
MID SOUTH AREA OFFICE OF THE DIRECTOR	2,913,196
SOUTH ATLANTIC AREA OFFICE OF THE DIRECTOR	3,093,069
<b>TOTAL ARS</b>	<i>Subtotal, Admin</i> 165,542,054 <b>1,133,229,998</b>

**8. Annual Delivery Cost**

See below.

**UNITED STATES DEPARTMENT OF AGRICULTURE**

Agricultural Research Service

Annual Delivery Cost (FY 2007 - FY 2011)

USDA Strategic Goal 1: Assist rural communities to create prosperity so they are self-sustaining, repopulating and economically thriving.

Program Items	FY 2007 Amount (\$000)	FY 2008 Amount (\$000)	FY 2009 Amount (\$000)	FY 2010 Amount (\$000)	FY 2011 Amount (\$000)
Product Quality/Value Added	95,383	94,310	96,737	99,496	99,950
Livestock Production	38,510	38,077	38,830	39,368	39,547
Crop Production	114,550	113,262	115,396	107,564	119,763
National Agricultural Library	21,428	20,843	21,022	21,213	20,010
Repair and Maintenance	17,635	17,524	17,491	17,461	17,503
Collaborative Research Program	2,959	3,824	2,913	-	-
Miscellaneous Fees	8,727	554	120	167	-
Indirect Costs	28,263	29,000	30,220	29,738	31,030
<b>Total Costs</b>	<b>327,455</b>	<b>317,394</b>	<b>322,729</b>	<b>315,007</b>	<b>327,803</b>
<b>FTEs</b>	<b>2,182</b>	<b>2,154</b>	<b>2,114</b>	<b>2,106</b>	<b>2,436</b>

Note: Total is from 2012 and was based on the Full Year Continuing Resolution.

USDA Strategic Goal 2: Ensure our national forests and private working lands are conserved, restored, and made more resilient to climate change, while enhancing our water resources.

Program Items	FY 2007 Amount (\$000)	FY 2008 Amount (\$000)	FY 2009 Amount (\$000)	FY 2010 Amount (\$000)	FY 2011 Amount (\$000)
Environmental Stewardship	178,547	176,539	179,109	185,975	186,825
Indirect Costs	<u>18,699</u>	<u>19,211</u>	<u>19,901</u>	<u>20,664</u>	<u>20,758</u>
Total Costs	197,246	195,750	199,010	206,639	207,583
FTEs	2,084	2,058	2,024	2,017	1,709

USDA Strategic Goal 3: Help America promote agricultural production and biotechnology exports as America works to increase food security.

Program Items	FY 2007 Amount (\$000)	FY 2008 Amount (\$000)	FY 2009 Amount (\$000)	FY 2010 Amount (\$000)	FY 2011 Amount (\$000)
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Livestock Production	38,510	38,077	38,830	39,368	39,548
Crop Production	91,081	90,058	91,880	107,564	96,348
Indirect Costs	<u>13,572</u>	<u>13,943</u>	<u>14,523</u>	<u>16,326</u>	<u>15,100</u>
Total Costs	143,163	142,078	145,233	163,258	150,996
FTEs	1,079	1,065	1,050	1,056	1,060

USDA Strategic Goal 4: Ensure that all of America's children have access to safe, nutritious and balanced meals.

Program Items	FY 2007 Amount (\$000)	FY 2008 Amount (\$000)	FY 2009 Amount (\$000)	FY 2010 Amount (\$000)	FY 2011 Amount (\$000)
Food Safety	94,818	94,240	95,126	96,837	96,837
Human Nutrition	77,545	76,964	76,778	80,761	80,761
Livestock Protection	78,528	73,967	74,659	80,825	81,194
Crop Protection	178,341	176,334	180,283	184,346	185,140
H1N1 Transfer	-	-	-	1,416	-
Indirect Costs	<u>          </u>				

	<u>44,952</u>	<u>45,868</u>	<u>47,427</u>	<u>49,197</u>	<u>49,325</u>
Total Costs	474,184	467,373	474,273	493,382	493,257
FTEs	3,166	3,130	3,080	3,103	3,077

Note: Annual delivery cost is reported consistent with the President's 2012 Budget and the USDA Strategic Plan FY 2010 - 2015.

## 9. Eligibility Criteria

ARS is not a granting agency and as such does not have programs that distribute money to outside organizations and thus does not have eligibility criteria for its programs.

## 10. Utilization (Participation) Data

In the traditional sense, because ARS is an intramural research agency, it does not have direct outside utilization of its programs by other individuals or entities through granting. However, the agency does execute a large number of extramural agreements with other research organizations and does provide funding to aid in the completion of these projects by our collaborators. A summary of the agency's current extramural agreements is below and a detailed list is attached. The table below reflects the aggregate of agreements currently in force. These agreements may have been entered into and funds obligated as early as 2006.

<b><u>Performing Organization Type</u></b>	<b><u>Number of Agreements</u></b>	<b><u>Dollar Amount</u></b>
Other Federal Agency	1	\$150,000.00
State Agricultural Experiment Station	34	\$36,766,986.24
1862 Land Grant College	1,335	\$189,618,764.02
1890 Land Grant College or Tuskegee Institute	138	\$17,860,097.79
Private University or College	46	\$54,664,158.92
Public University or College (non-land grant)	114	\$53,134,432.50
Private for Profit Organization	14	\$797,632.44
Private non-profit Organization	112	\$78,111,607.51
State or Local Government	8	\$1,642,399.00
Small Business	4	\$836,658.35
Minority-owned Business	1	\$45,000.00
Female Owned Business	2	\$95,000.00
Other	5	\$1,741,095.10
Individual	4	\$293,775.00
Tribal Colleges and Universities	1	\$102,000.00
Foreign	97	\$10,610,575.57
<b>Total</b>	<b>1,916</b>	<b>\$446,470,182.44</b>

<b><u>Type Perf Org Description</u></b>	<b><u>Cooperator Name</u></b>	<b><u>Number of Agreements</u></b>	<b><u>Dollar Amount</u></b>
FR Other Federal Agency	NASA GODDARD SPACE FLIGHT CENTER	1	\$150,000.00
SA State Agricultural Experiment Station	CONNECTICUT AGRICULTURAL EXPERIMENT STATION	2	\$3,950,532.00
SA State Agricultural Experiment Station	MISSISSIPPI AGRI & FORESTRY EXP STATION	29	\$30,708,547.24
SA State Agricultural Experiment Station	RUTGERS-NEW JERSEY AGRICULTURAL EXPER STA	2	\$1,976,457.00
SA State Agricultural Experiment Station	TEXAS AGRICULTURAL EXPERIMENT STATION	1	\$131,450.00
LG 1862 Land Grant College	ARIZONA BOARD OF REGENTS	9	\$2,296,472.94
LG 1862 Land Grant College	AUBURN UNIVERSITY	10	\$5,000,208.94
LG 1862 Land Grant College	BOARD OF REGENTS - UNIV OF WISCONSIN SYSTEM	14	\$913,982.67
LG 1862 Land Grant College	BOARD OF TRUSTEES OF THE UNIV OF ILLINOIS	3	\$935,280.00
LG 1862 Land Grant College	CLEMSON UNIVERSITY	11	\$1,219,728.86
LG 1862 Land Grant College	COLORADO STATE UNIVERSITY	25	\$2,105,979.45
LG 1862 Land Grant College	CORNELL UNIVERSITY	53	\$7,323,596.03
LG 1862 Land Grant College	CURATORS OF THE UNIVERSITY OF MISSOURI	26	\$7,473,576.87
LG 1862 Land Grant College	IOWA STATE UNIVERSITY	50	\$3,090,966.48
LG 1862 Land Grant College	KANSAS STATE UNIVERSITY	43	\$6,817,111.89
LG 1862 Land Grant College	LOUISIANA STATE UNIV AGRICULTURAL CENTER	18	\$8,471,005.47
LG 1862 Land Grant College	MICHIGAN STATE UNIVERSITY	37	\$3,829,112.74
LG 1862 Land Grant College	MISSISSIPPI STATE UNIVERSITY	9	\$7,676,027.00
LG 1862 Land Grant College	MONTANA STATE UNIVERSITY	7	\$151,474.06
LG 1862 Land Grant College	NEW MEXICO STATE UNIVERSITY	21	\$2,366,107.72

LG 1862 Land Grant College	NORTH CAROLINA AGRICULTURAL RESEARCH SERVICE	55	\$3,819,326.99
LG 1862 Land Grant College	NORTH CAROLINA STATE UNIVERSITY	4	\$170,640.00
LG 1862 Land Grant College	NORTH DAKOTA STATE UNIVERSITY	59	\$7,362,212.36
LG 1862 Land Grant College	OHIO STATE UNIVERSITY LIBRARIES	1	\$4,000.00
LG 1862 Land Grant College	OHIO STATE UNIVERSITY RESEARCH FOUNDATION	14	\$2,726,026.25
LG 1862 Land Grant College	OKLAHOMA STATE UNIVERSITY	19	\$693,196.24
LG 1862 Land Grant College	OREGON STATE UNIVERSITY	87	\$7,425,573.67
LG 1862 Land Grant College	PENNSYLVANIA STATE UNIVERSITY	29	\$2,779,442.93
LG 1862 Land Grant College	PURDUE UNIVERSITY	31	\$6,867,373.78
LG 1862 Land Grant College	REGENTS OF THE UNIVERSITY OF CALIFORNIA	89	\$17,035,168.73
LG 1862 Land Grant College	REGENTS OF THE UNIVERSITY OF MINNESOTA	14	\$2,796,725.31
LG 1862 Land Grant College	RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY	7	\$743,699.60
LG 1862 Land Grant College	SOUTH DAKOTA STATE UNIVERSITY	17	\$2,051,651.23
LG 1862 Land Grant College	TEXAS A&M UNIVERSITY	9	\$337,883.00
LG 1862 Land Grant College	TEXAS A&M UNIVERSITY-KINGSVILLE	3	\$74,000.00
LG 1862 Land Grant College	TEXAS AGRILIFE RESEARCH	34	\$5,627,731.56
LG 1862 Land Grant College	THE BOARD OF TRUSTEES, UNIVERSITY OF ILLINOIS	6	\$281,745.08
LG 1862 Land Grant College	THE OHIO STATE UNIVERSITY	14	\$120,464.95
LG 1862 Land Grant College	U OF AK-ALASKA AGRIC & FORESTRY EXP STA	2	\$113,250.50
LG 1862 Land Grant College	U OF ID-IDAHO AGRICULTURAL EXP STA	2	\$140,086.51
LG 1862 Land Grant College	UNIVERSITY OF ALASKA	6	\$2,901,927.79
LG 1862 Land Grant College	UNIVERSITY OF ALASKA MUSEUM	2	\$27,401.00
LG 1862 Land Grant College	UNIVERSITY OF ARIZONA	4	\$73,143.92
LG 1862 Land Grant College	UNIVERSITY OF ARKANSAS	20	\$1,240,258.30

LG 1862 Land Grant College	UNIVERSITY OF CALIFORNIA	3	\$112,500.00
LG 1862 Land Grant College	UNIVERSITY OF CALIFORNIA, DAVIS	58	\$2,126,281.93
LG 1862 Land Grant College	UNIVERSITY OF CONNECTICUT	8	\$5,344,456.98
LG 1862 Land Grant College	UNIVERSITY OF DELAWARE	17	\$689,161.03
LG 1862 Land Grant College	UNIVERSITY OF FLORIDA	32	\$3,088,401.12
LG 1862 Land Grant College	UNIVERSITY OF GEORGIA	7	\$271,828.00
LG 1862 Land Grant College	UNIVERSITY OF HAWAII	23	\$7,054,349.38
LG 1862 Land Grant College	UNIVERSITY OF IDAHO	22	\$2,404,977.12
LG 1862 Land Grant College	UNIVERSITY OF ILLINOIS	44	\$6,211,402.53
LG 1862 Land Grant College	UNIVERSITY OF KENTUCKY	3	\$281,017.72
LG 1862 Land Grant College	UNIVERSITY OF KENTUCKY RESEARCH FOUNDATION	9	\$5,987,369.21
LG 1862 Land Grant College	UNIVERSITY OF MAINE	9	\$417,891.00
LG 1862 Land Grant College	UNIVERSITY OF MARYLAND AT COLLEGE PARK	44	\$5,265,610.54
LG 1862 Land Grant College	UNIVERSITY OF MARYLAND BIOTECHNOLOGY INST	1	\$41,042.00
LG 1862 Land Grant College	UNIVERSITY OF MASSACHUSETTS	2	\$47,319.00
LG 1862 Land Grant College	UNIVERSITY OF MINNESOTA	30	\$1,984,057.37
LG 1862 Land Grant College	UNIVERSITY OF NEBRASKA	31	\$5,076,024.35
LG 1862 Land Grant College	UNIVERSITY OF NEVADA	9	\$625,104.00
LG 1862 Land Grant College	UNIVERSITY OF PUERTO RICO	3	\$220,062.83
LG 1862 Land Grant College	UNIVERSITY OF RHODE ISLAND	1	\$106,680.00
LG 1862 Land Grant College	UNIVERSITY OF TENNESSEE	19	\$3,305,247.57
LG 1862 Land Grant College	UNIVERSITY OF TEXAS MEDICAL BRANCH	3	\$55,948.80
LG 1862 Land Grant College	UNIVERSITY OF VERMONT & ST AGRICULTURAL COL	3	\$54,979.00
LG 1862 Land Grant College	UNIVERSITY OF WISCONSIN - MADISON	40	\$2,419,070.00
LG 1862 Land Grant College	UNIVERSITY OF WYOMING	6	\$416,685.31
LG 1862 Land Grant College	UTAH STATE UNIVERSITY	16	\$2,715,207.87

LG 1862 Land Grant College	VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIV	14	\$4,082,277.28
LG 1862 Land Grant College	WEST VIRGINIA UNIVERSITY RESEARCH CORPORATION	4	\$3,548,993.27
HB 1890 Land Grant College or Tuskegee Institute	ALABAMA A&M UNIVERSITY	3	\$672,747.22
HB 1890 Land Grant College or Tuskegee Institute	ALCORN STATE UNIVERSITY	3	\$1,652,469.83
HB 1890 Land Grant College or Tuskegee Institute	DELAWARE STATE UNIVERSITY	3	\$104,371.11
HB 1890 Land Grant College or Tuskegee Institute	FLORIDA A&M UNIVERSITY	1	\$516,283.00
HB 1890 Land Grant College or Tuskegee Institute	FORT VALLEY STATE UNIVERSITY	1	\$4,000.00
HB 1890 Land Grant College or Tuskegee Institute	NORTH CAROLINA AGRIC & TECH STATE UNIVERSITY	1	\$22,000.00
HB 1890 Land Grant College or Tuskegee Institute	SOUTHERN UNIVERSITY & A&M COLLEGE	1	\$1,262,000.00
HB 1890 Land Grant College or Tuskegee Institute	TENNESSEE STATE UNIVERSITY	3	\$2,233,030.51
HB 1890 Land Grant College or Tuskegee Inst.	TUSKEGEE UNIVERSITY	1	\$125,358.15
HB 1890 Land Grant College or Tuskegee Institute	UNIVERSITY OF ARKANSAS AT PINE BLUFF	5	\$1,261,534.45
HB 1890 Land Grant College or Tuskegee Institute	UNIVERSITY OF MARYLAND/EASTERN SHORE	4	\$503,000.00
HB 1890 Land Grant College or Tuskegee Institute	VIRGINIA STATE UNIVERSITY	1	\$37,029.00
HB 1890 Land Grant College or Tuskegee Institute	WASHINGTON STATE UNIVERSITY	109	\$8,956,772.52
HB 1890 Land Grant College or Tuskegee Institute	WEST VIRGINIA STATE UNIV RES AND DEV CORP	3	\$519,502.00
PR Private University or College	ABILENE CHRISTIAN UNIVERSITY	1	\$5,000.00

PR Private University or College	BAYLOR COLLEGE OF MEDICINE	6	\$17,670,562.00
PR Private University or College	BRANDEIS UNIVERSITY	1	\$249,447.00
PR Private University or College	BRIGHAM YOUNG UNIVERSITY	1	\$30,890.45
PR Private University or College	COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK	2	\$256,341.00
PR Private University or College	DREXEL UNIVERSITY	3	\$10,000.00
PR Private University or College	DUKE UNIVERSITY	1	\$20,000.00
PR Private University or College	EASTERN MENNONITE UNIVERSITY	1	\$15,000.00
PR Private University or College	JOHNS HOPKINS UNIVERSITY	1	\$2,798,370.00
PR Private University or College	MIAMI UNIVERSITY	1	\$268,494.00
PR Private University or College	MOUNTAIN STATE UNIVERSITY	1	\$725,755.49
PR Private University or College	TEXAS CHRISTIAN UNIVERSITY	1	\$20,000.00
PR Private University or College	TUFTS UNIVERSITY	15	\$28,151,966.58
PR Private University or College	TULANE UNIVERSITY	3	\$2,596,653.73
PR Private University or College	WASHINGTON UNIVERSITY IN ST LOUIS	3	\$81,166.00
PR Private University or College	WILLIAM CAREY UNIVERSITY	1	\$14,883.00
PR Private University or College	WILSON COLLEGE	1	\$20,000.00
PR Private University or College	WITTENBERG UNIVERSITY	1	\$8,000.00
PR Private University or College	XAVIER UNIVERSITY	1	\$14,674.35
PR Private University or College	YALE UNIVERSITY	1	\$1,706,955.32
PU Public University or College (non-land grnt)	ARKANSAS STATE UNIVERSITY	2	\$82,979.97
PU Public University or College (non-land grant)	BOARD OF TRUSTEES, SOUTHERN ILLINOIS UNIV	1	\$624,390.00
PU Public University or College (non-land grant)	CALIFORNIA STATE UNIV FRESNO	1	\$27,390.00
PU Public University or College (non-land grant)	COLUMBIA BASIN COLLEGE	1	\$10,000.00
PU Public University or College (non-land grant)	FLORIDA ATLANTIC UNIVERSITY	1	\$1,659,942.12
PU Public University or College (non-land	GEORGE MASON UNIVERSITY	1	\$30,000.00

grant)			
PU Public University or College (non-land grant)	GEORGE MASON UNIVERSITY	3	\$129,680.00
PU Public University or College (non-land grant)	INDIANA UNIVERSITY	1	\$63,631.00
PU Public University or College (non-land grant)	MISSISSIPPI VALLEY STATE UNIVERSITY	4	\$31,276.00
PU Public University or College (non-land grant)	NORTHERN ILLINOIS UNIVERSITY	2	\$61,000.00
PU Public University or College (non-land grant)	OHIO STATE UNIVERSITY AGRICULTURAL TECH INST	1	\$54,667.00
PU Public University or College (non-land grant)	SOUTHEASTERN LOUISIANA UNIVERSITY	1	\$11,700.00
PU Public University or College (non-land grant)	SOUTHERN ILLINOIS UNIVERSITY	1	\$16,000.00
PU Public University or College (non-land grant)	STEPHEN F. AUSTIN STATE UNIVERSITY	2	\$11,000.00
PU Public University or College (non-land grant)	TARLETON STATE UNIVERSITY	1	\$9,955.96
PU Public University or College (non-land grant)	TENNESSEE TECH UNIVERSITY	1	\$10,800.00
PU Public University or College (non-land grant)	TEXAS STATE UNIVERSITY	8	\$2,694,602.00
PU Public University or College (non-land grant)	TRUMAN STATE UNIVERSITY	1	\$9,756.00
PU Public University or College (non-land grant)	UNIVERSITY OF AKRON	1	\$6,600.00
PU Public University or College (non-land grant)	UNIVERSITY OF ARKANSAS AT LITTLE ROCK	1	\$1,153,656.00
PU Public University or College (non-land grant)	UNIVERSITY OF CENTRAL FLORIDA	1	\$151,847.95
PU Public University or College (non-land grant)	UNIVERSITY OF IOWA	5	\$123,500.00

PU Public University or College (non-land grant)	UNIVERSITY OF LOUISIANA AT LAFAYETTE	1	\$33,265.00
PU Public University or College (non-land grant)	UNIVERSITY OF MARYLAND	11	\$448,046.87
PU Public University or College (non-land grant)	UNIVERSITY OF MEMPHIS	1	\$46,628.00
PU Public University or College (non-land grant)	UNIVERSITY OF MISSISSIPPI	15	\$25,963,746.17
PU Public University or College (non-land grant)	UNIVERSITY OF MISSOURI	5	\$1,105,355.00
PU Public University or College (non-land grant)	UNIVERSITY OF NEW ORLEANS	2	\$20,004.00
PU Public University or College (non-land grant)	UNIVERSITY OF NORTH CAROLINA	1	\$9,600.00
PU Public University or College (non-land grant)	UNIVERSITY OF NORTH DAKOTA	8	\$6,477,316.47
PU Public University or College (non-land grant)	UNIVERSITY OF NORTH TEXAS	2	\$431,219.00
PU Public University or College (non-land grant)	UNIVERSITY OF NORTHERN IOWA	1	\$59,826.00
PU Public University or College (non-land grant)	UNIVERSITY OF OKLAHOMA	1	\$3,839.98
PU Public University or College (non-land grant)	UNIVERSITY OF OREGON	1	\$15,000.00
PU Public University or College (non-land grant)	UNIVERSITY OF PITTSBURGH	2	\$71,543.00
PU Public University or College (non-land grant)	UNIVERSITY OF SOUTHERN MISSISSIPPI	1	\$1,300,000.00
PU Public University or College (non-land grant)	UNIVERSITY OF TOLEDO	4	\$2,453,938.77
PU Public University or College (non-land grant)	UNIVERSITY OF WASHINGTON	6	\$773,600.64
PU Public University or College (non-land grant)	UNIVERSITY OF WISCONSIN - MILWAUKEE	1	\$995,206.00

grant)			
PU Public University or College (non-land grant)	WEST CHESTER UNIVERSITY OF PENNSYLVANIA	1	\$39,991.00
PU Public University or College (non-land grant)	WEST TEXAS A&M UNIVERSITY	5	\$831,610.00
PU Public University or College (non-land grant)	WESTERN ILLINOIS UNIVERSITY INC	1	\$75,000.00
PU Public University or College (non-land grant)	WESTERN KENTUCKY UNIVERSITY	3	\$5,005,322.60
PP Private for Profit Organization	AGRICULTURE DEVELOPMENT GROUP, INC.	1	\$137,695.00
PP Private for Profit Organization	BIOTECHNOLOGY FOUNDATION, INC.	1	\$195,122.00
PP Private for Profit Organization	CLEAR SPRINGS FOODS, INC.	1	\$30,000.00
PP Private for Profit Organization	CRAFT TECHNOLOGIES INC	1	\$3,240.00
PP Private for Profit Organization	DUARTE NURSERY/DRY CREEK LABORATORIES	1	\$5,000.00
PP Private for Profit Organization	EMPIRE PROTOTYPE AND PRODUCT DEVELOPMENT,INC	1	\$125,492.44
PP Private for Profit Organization	FABRATE, LLC	1	\$20,000.00
PP Private for Profit Organization	ISCA TECHNOLOGIES	1	\$50,000.00
PP Private for Profit Organization	NORWALT DESIGN, INC.	1	\$59,310.00
PP Private for Profit Organization	PASTEURIA BIOSCIENCE	1	\$48,519.00
PP Private for Profit Organization	PEERBOLT CROP MANAGEMENT	1	\$30,254.00
PP Private for Profit Organization	SMITH HELICOPTERS, INC.	1	\$55,000.00
PP Private for Profit Organization	SPECTIR LLC	1	\$46,000.00
PP Private for Profit Organization	SPECTRUM RESEARCH INC.	1	\$7,000.00
PP Private for Profit Organization	TETRACAM COMPANY, INC.	1	\$5,000.00
PN Private non-profit Organization	AMERICAN ASSOC OF BOTANIC GARDENS & ARBORETA	1	\$165,855.00
PN Private non-profit Organization	AMERICAN BIOLOGICAL SAFETY ASSOCIATION	1	\$4,000.00

PN Private non-profit Organization	AMERICAN CHEMICAL SOCIETY	1	\$3,400.00
PN Private non-profit Organization	AMERICAN COUNCIL FOR FOOD SAFETY & QUALITY	1	\$43,000.00
PN Private non-profit Organization	AMERICAN INDIAN SCIENCE & ENGINEERING SOCIETY	1	\$20,000.00
PN Private non-profit Organization	AMERICAN PHYTOPATHOLOGICAL SOCIETY	1	\$33,000.00
PN Private non-profit Organization	AMERICAN SOCIETY FOR NUTRITION, INC.	1	\$4,000.00
PN Private non-profit Organization	AMERICAN SOCIETY FOR TESTING MATERIALS	1	\$39,933.52
PN Private non-profit Organization	AOAC	1	\$2,000.00
PN Private non-profit Organization	ARKANSAS CHILDREN'S HOSPITAL	3	\$34,243,929.10
PN Private non-profit Organization	ARKANSAS CHILDREN'S HOSPITAL RESEARCH CENTER	1	\$1,637,550.00
PN Private non-profit Organization	AUDUBON NATURE INSTITUTE	1	\$692,046.66
PN Private non-profit Organization	BEET SUGAR DEVELOPMENT FOUNDATION	1	\$58,659.85
PN Private non-profit Organization	BIOTECHNOLOGY RES & DEVELOP CENTER	2	\$9,325,847.00
PN Private non-profit Organization	BOYS, GIRLS, & ADULTS COMM DEV CTR (BGACDC)	1	\$282,500.00
PN Private non-profit Organization	BROOKLYN BOTANIC GARDEN	1	\$5,000.00
PN Private non-profit Organization	CANAAN VALLEY INSTITUTE, INC.	1	\$1,286,972.00
PN Private non-profit Organization	CARY CHRISTIAN CENTER, INC.	1	\$4,000.00
PN Private non-profit Organization	COLD SPRING HARBOR LABORATORY	1	\$548,750.79
PN Private non-profit Organization	CONFERENCE ON ASIAN PACIFIC AMERICAN LEADERSH	1	\$22,500.00
PN Private non-profit Organization	COUNCIL FOR AGRICULTURAL SCI & TECH (CAST)	1	\$20,000.00
PN Private non-profit Organization	CROW VALLEY LIVESTOCK COOP INC	1	\$258,302.24
PN Private non-profit Organization	DELTA HEALTH ALLIANCE	2	\$500,268.00
PN Private non-profit Organization	DONALD DANFORTH PLANT SCIENCE CENTER	1	\$50,000.00

PN Private non-profit Organization	ENVIRONMENTAL RESOURCE COALITION	1	\$96,702.39
PN Private non-profit Organization	FARM FOUNDATION	2	\$57,000.00
PN Private non-profit Organization	FASEB	1	\$5,000.00
PN Private non-profit Organization	GEISINGER CLINIC	1	\$362,085.57
PN Private non-profit Organization	GORDON RESEARCH CONFERENCES	1	\$4,000.00
PN Private non-profit Organization	HAWAII AGRICULTURE RESEARCH CENTER	1	\$1,712,779.00
PN Private non-profit Organization	HIGH PLAINS RCD COUNCIL, INC.	1	\$2,500.00
PN Private non-profit Organization	IMPERIAL VALLEY CONS RES CTR COM	1	\$180,820.00
PN Private non-profit Organization	J. CRAIG VENTER INSTITUTE	3	\$898,755.00
PN Private non-profit Organization	JUST FOOD, INC.	1	\$4,900.00
PN Private non-profit Organization	MALPAIS BORDERLANDS GROUP	1	\$10,000.00
PN Private non-profit Organization	MARSHFIELD CLINIC RESEARCH	1	\$66,000.00
PN Private non-profit Organization	MBI INTERNATIONAL	1	\$962,000.00
PN Private non-profit Organization	MEDSTAR HEALTH RESEARCH INSTITUTE	2	\$286,590.00
PN Private non-profit Organization	METHYL BROMIDE ALTERNATIVES OUTREACH	1	\$40,000.00
PN Private non-profit Organization	MICHAEL FIELDS AGRICULTURAL INSTITUTE	1	\$624,213.00
PN Private non-profit Organization	MISSOURI BOTANICAL GARDEN	1	\$60,000.00
PN Private non-profit Organization	MORTON ARBORETUM	2	\$34,535.00
PN Private non-profit Organization	NAT ASSOC OF SEED AND VENTURE FUNDS (NASVF)	1	\$25,000.00
PN Private non-profit Organization	NATIONAL ACADEMY OF SCIENCES	1	\$50,000.00
PN Private non-profit Organization	NATIONAL CENTER FOR GENOME RESOURCES	6	\$4,378,850.00
PN Private non-profit Organization	NATIONAL COTTON COUNCIL	1	\$333,836.00
PN Private non-profit Organization	NATIONAL TURFGRASS EVALUTAION PROGRAM, INC.	1	\$8,000.00
PN Private non-profit Organization	POLLINATOR PARTNERSHIP	1	\$12,927.00
PN Private non-profit Organization	POTATO VARIETY MANAGEMENT INSTITUTE	1	\$14,237.00

PN Private non-profit Organization	PRACTICAL FARMERS OF IOWA	1	\$173,072.00
PN Private non-profit Organization	RESEARCH FOUNDATION OF SUNY	1	\$236,735.00
PN Private non-profit Organization	RODALE INSTITUTE	4	\$498,062.00
PN Private non-profit Organization	SAMUEL ROBERTS NOBLE FOUNDATION	2	\$11,800.00
PN Private non-profit Organization	SOCIETY FOR RANGE MANAGEMENT	3	\$69,512.00
PN Private non-profit Organization	SOIL AND WATER CONSERVATION SOCIETY	3	\$16,300.00
PN Private non-profit Organization	SUGAR PROCESSING RESEARCH INSTITUTE	1	\$86,666.66
PN Private non-profit Organization	THE CONSERVATION FUND	2	\$11,339,104.00
PN Private non-profit Organization	THE INSTITUTE FOR GENOMIC RESEARCH (TIGR)	1	\$53,625.00
PN Private non-profit Organization	THE RESEARCH FOUNDATION OF SUNY	1	\$11,215.42
PN Private non-profit Organization	THE STUDENT CONSERVATION ASSOCIATION, INC.	2	\$88,608.00
PN Private non-profit Organization	U.S. CIVILIAN RESEARCH & DEVELOP. FOUNDATION	1	\$4,361,346.00
PN Private non-profit Organization	UNIVERSITY OF ALABAMA	2	\$253,193.00
PN Private non-profit Organization	UNIVERSITY OF GEORGIA RESEARCH FOUNDATION	31	\$1,494,236.30
PN Private non-profit Organization	WOODS END RESEARCH LABORATORY	1	\$30,000.00
PN Private non-profit Organization	WORLD FOOD PRIZE FOUNDATION	2	\$477,146.00
SL State or Local Government	ARIZONA COTTON RESEARCH & PROTECTION COUNCIL	1	\$158,699.00
SL State or Local Government	NEVADA TAHOE CONSERVATION DISTRICT	1	\$4,100.00
SL State or Local Government	OKLAHOMA WATER RESOURCE BOARD	1	\$274,100.00
SL State or Local Government	PENNINGTON BIOMEDICAL RESEARCH CENTER	2	\$1,123,500.00
SL State or Local Government	SOIL & WATER CONSERVATION DISTRICT DEKALB COUNTY	1	\$72,000.00
SL State or Local Government	TEXAS ENGINEERING EXPERIMENTS STATION	2	\$10,000.00

SB Small Business	ALASKA BERRIES	1	\$1,658.35
SB Small Business	APPLIED BIOMICS, INC.	1	\$16,188.00
SB Small Business	CRYSTAL RIVER	1	\$30,000.00
SB Small Business	HOUMA AVIONICS, INC.	1	\$5,000.00
SB Small Business	SERVICE SPECIALIST, LTD.	1	\$800,000.00
MO Minority-owned Buisness	FEDERAL ASIAN PACIFIC AMERICAN COUNCIL	1	\$45,000.00
FO Female Owned Business	ASOMBRO INSTITUTE FOR SCIENCE EDUCATION	1	\$13,000.00
FO Female Owned Business	BLUEWAVE MICROBICS, LLC	1	\$82,000.00
OT Other	AKWESASNE TASK FORCE ON THE ENVIRONMENT	1	\$30,000.00
OT Other	BOYCE THOMPSON INST PLANT RSCH, INC.	2	\$1,674,907.10
IN Individual	BARRY LAVINE	1	\$12,075.00
IN Individual	BRENT LARSON	1	\$8,000.00
IN Individual	DARREL M. TEMPLE	1	\$198,700.00
IN Individual	EARLINE STRICKLAND	1	\$75,000.00
TC Tribal Colleges and Universities	CANKDESKA CIKANA COMMUNITY COLLEGE	1	\$102,000.00
FN Foreign	AGRICULTURAL RESEARCH COUNCIL	1	\$33,000.00
FN Foreign	AGRICULTURE AND AGRI-FOOD CANADA	1	\$85,800.00
FN Foreign	AL-QASEMI ACADEMIC COLLAGE	1	\$40,000.00
FN Foreign	ANIMAL SCIENCES INSTITUTE	1	\$243,902.00
FN Foreign	AZERBAIJAN NATIONAL ACADEMY OF SCIENCES	1	\$4,000.00
FN Foreign	BIOTECHNOLOGY & BIOLOGICAL CONTROL AGENCY	3	\$40,000.00
FN Foreign	BIOVERSITY INTERNATIONAL	1	\$165,659.00
FN Foreign	BIOVERSITY INTERNATIONAL - CIAT	1	\$32,580.00
FN Foreign	CABI BIOSCIENCES, U.K.	2	\$987,808.00
FN Foreign	CAPECO	1	\$182,500.00

FN Foreign	CATIE	3	\$150,659.00
FN Foreign	CHINESE ACADEMY OF AGRICULTURAL SCIENCES	1	\$464,508.65
FN Foreign	CHUNG-ANG UNIVERSITY	1	\$20,000.00
FN Foreign	CIMMYT	4	\$441,403.15
FN Foreign	CIRAD-BIOS	2	\$160,900.00
FN Foreign	COCOA RESEARCH INSTITUTE OF GHANA	1	\$80,000.00
FN Foreign	CONCELLAE, AB	1	\$40,000.00
FN Foreign	CONSULTORIA AGROPECUARIA JUNIOR (CONAPEC JR.)	1	\$7,000.00
FN Foreign	CORPOINIAP	1	\$87,000.00
FN Foreign	CSIRO ENTOMOLOGY	1	\$1,835,431.00
FN Foreign	DEPARTMENT OF ANIMAL HEALTH	1	\$269,000.00
FN Foreign	DEPARTMENT OF VETERINARY SERVICES	1	\$13,500.00
FN Foreign	ELHAWAKEER-ASSOCIATION	1	\$40,000.00
FN Foreign	FAR EAST FORESTRY RESEARCH INSTITUTE	1	\$25,000.00
FN Foreign	FEDERAL UNIVERSITY OF SANTA MARIA	1	\$35,000.00
FN Foreign	GYEONGSANG NATIONAL UNIVERSITY	1	\$60,309.00
FN Foreign	HONDURAN FOUNDATION FOR AGRICULTURE RESEARCH	1	\$7,000.00
FN Foreign	ICARDA	4	\$80,000.00
FN Foreign	ICIPE - INTL CENTRE OF INSECT PHYSIO AND ECOL	2	\$185,000.00
FN Foreign	IICA COSTA RICA	1	\$3,000.00
FN Foreign	ILIA CHAVCHAVADZE STATE UNIVERSITY	1	\$13,370.00
FN Foreign	INDIAN COUNCIL OF AGRICULTURAL RESEARCH	1	\$453,000.00
FN Foreign	INIA	1	\$39,000.00
FN Foreign	INIAP	1	\$6,150.00
FN Foreign	INIFAP	2	\$45,500.00

FN Foreign	INRA ANIMAL GENETICS DIVISION	1	\$5,000.00
FN Foreign	INSTITUTE OF BOTANY	1	\$24,000.00
FN Foreign	INSTITUTO DE CULTIVOS TROPICALES	1	\$455,000.00
FN Foreign	INSTITUTO NACIONAL DE TECNOLOGIA AGROPECUARI	3	\$219,890.00
FN Foreign	INSTITUTO UNIEMP	1	\$143,080.00
FN Foreign	INTERNATIONAL INSTITUTE TROPICAL AGRICULTURE	4	\$216,898.00
FN Foreign	INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE	2	\$319,500.00
FN Foreign	INTERNATIONAL POTATO CENTER (CIP)	1	\$4,500.00
FN Foreign	INTERNATIONAL SCIENCE & TECHNOLOGY CENTER	1	\$868,730.00
FN Foreign	KENYA AGRICULTURAL RESEARCH SERVICE	2	\$257,968.00
FN Foreign	KENYA MEDICAL RESEARCH INSTITUTE	1	\$250,000.00
FN Foreign	KYRGYZ NATIONAL AGRARIAN UNIVERSITY	1	\$17,490.00
FN Foreign	MINISTRY OF AGRICULTURE & LAND RECLAMATION	1	\$100,000.00
FN Foreign	NATIONAL GENE BANK OF MOROCCO	1	\$4,000.00
FN Foreign	NATL CTR FOR AGR RESEACH & EXTENSION (NCARE)	1	\$17,000.00
FN Foreign	PHILIPPINE ANIMAL HEALTH CENTER (PAHC)	2	\$487,652.00
FN Foreign	PICTIPAPA	1	\$12,541.00
FN Foreign	PLANT RESEARCH (NZ) LTD	1	\$3,787.28
FN Foreign	POLISH ACADEMY OF SCIENCES	1	\$16,000.00
FN Foreign	PUNJAB AGRICULTURAL UNIVERSITY	1	\$80,000.00
FN Foreign	ROTHAMSTED EXPERIMENT STATION	1	\$5,000.00
FN Foreign	SEOUL NATIONAL UNIVERSITY	2	\$20,000.00

FN Foreign	SIMON FRASER UNIVERSITY	2	\$115,000.00
FN Foreign	SOUTH AFRICAN AGRICULTURAL RESEARCH COUNCIL	1	\$3,000.00
FN Foreign	TEL AVIV UNIVERSITY	2	\$33,000.00
FN Foreign	THE UNIVERSITY OF ADELAIDE	1	\$132,000.00
FN Foreign	UNIVERSIDAD AUTONOMA DE ZACATECA	1	\$2,000.00
FN Foreign	UNIVERSITY OF CALGARY	1	\$22,000.00
FN Foreign	UNIVERSITY OF OTTAWA	1	\$64,940.00
FN Foreign	UNIVERSITY OF READING	2	\$146,265.00
FN Foreign	UNIVERSITY OF SASKATCHEWAN	1	\$7,000.00
FN Foreign	UNIVERSITY OF SCIENCE AND TECHNOLOGY OF CHINA	1	\$15,000.00
FN Foreign	UNIVERSITY OF THE WEST INDIES	2	\$128,574.49
FN Foreign	WUHAN BOTANICAL GARDEN, CHINESE ACADEMY SCIENC	1	\$32,780.00
FN Foreign	ZENTRALVERBAND DER DEUTSCHEN SCHWEINEPRODUKTI	1	\$4,000.00
		<b>1,916</b>	<b>\$446,470,182.44</b>

## 11. Duplication or Overlap with Other Programs

ARS research does not duplicate or overlap other programs. REE and ARS are committed to maximizing federal dollars by ensuring systematic monitoring and evaluation. While the scientific method requires the flexibility to replicate results, ARS and NIFA leadership, program managers, and researchers rigorously track scientific projects to avoid duplication. In addition NIFA and ARS hold joint stakeholder meetings on scientific research to pull together research projects that are compatible and not duplicative.

ARS does play a critical role in providing research relevant to the mission of USDA's action and regulatory agencies and other Federal departments. Examples include:

- Research on bacterial pathogens in produce and meats is relevant to the missions of the Food and Drug Administration and the USDA, Food Safety and Inspection Service, respectively
- Improving conservation practices enhances the environmental benefits of Farm Bill conservation programs and supports the mission of the Natural Resources Conservation Service
- Research on the nutrient needs of children, adults and the elderly provides the science base to undergird U.S. food policy, the *Dietary Guidelines for Americans*, essential to the missions of USDA (Food and Nutrition Service (FNS), Center for Nutrition Policy and Promotion (CNPP), ERS), Health and Human Services (Food and Drug Administration (FDA), CDC, NIH), and the Department of Defense.
- Determining the effects of biotech products on the ground beetle population benefits sustainable agricultural productivity and also is relevant to the mission of USDA, APHIS, Biotechnology Regulatory Services
- Long-term assessment of the effectiveness of biotech products contributes to maintaining crop disease protection but is also relevant to the mission of the Environmental Protection Agency
- Research on tree pathogens benefits fruit tree improvement but is also relevant to forest trees and contributes to the mission of the Forest Service
- Research on reducing cereal grain mycotoxins improves grain quality but is also relevant to the mission of the Grain Inspection, Packers, and Stockyards Administration (GIPSA)
- Research on effective biological control of invasive weeds and pests supports sustainable farming systems but is also be relevant to protecting the U.S. border and the mission of Homeland Security
- Developing new sorghum and forage grass germplasm with high value for animal feed also benefits the mission of the Department of Energy to develop biofuels.
- Creation of planning tools for research, development, and commercial production of biofuels benefits plans for the Department of Defense and the Federal Aviation Administration to achieve diverse fuel sources.
- Research contributing to the sound design, maintenance, and assessment of dams, levees, and channels for water storage and control supports the mission of the Army Corps of Engineers and the Federal Emergency Management Agency.

- Development of vaccines, diagnostic tests and other countermeasures to control foreign animal diseases in coordination with the Department of Homeland Security to help the Animal Plant Health Inspection Services to protect the United States from these diseases.
- Research to develop and validate novel methods to protect United States military deployed abroad from threats posed by disease-carrying insects. This program is in support of the Department of Defense.

ARS partners with other federal agencies in responding to national needs and emergencies through cooperation in Task Forces and Interagency Working Groups that identify urgent research needs and agency roles. Recent examples include interagency task forces and working groups to develop and implement action plans to address Soybean Rust, Avian Influenza, Childhood Obesity, Antibiotic Resistance, Citrus Greening, Ug99 Wheat Stem Rust, Water Resources, and Climate Change. These group's national plans clearly identify the specific roles and responsibilities of ARS research projects and researchers. Often, ARS is responsible for providing unique disease and pest scientific expertise, specialized genetic resources and collections, critical human nutrition and food safety expertise and resources, natural resource management expertise, and nationally coordinated research teams.

ARS partners with the USDA Research, Education and Economics (REE) agencies through the leadership of the Under Secretary and Chief Scientist. One of the most important of these partnerships is with the National Institute of Food and Agriculture (NIFA), which provides grants that support universities and also much collaboration between universities and ARS. ARS research is funded by congressional appropriations that can support multi-year, long-term research while NIFA grants support complementary, shorter-term agricultural research. Cooperation and avoidance of duplication is guided through REE administrative leadership, budget development, and according to REE research priorities. The REE Action Plan identifies important goals for the agencies and specifies the role of ARS, NIFA and the other REE agencies. Other coordination is provided by multiple working groups, committees, and joint customer/stakeholder workshops that insure that ARS long-term research is optimally leveraged with NIFA awards and research supported by other agencies. These types of partnerships are a perfect mesh of interests and collaboration for the public good. The list of accomplishments that have come from partnerships between ARS and land-grant schools is long and impressive. Examples include:

- The Interagency Working Group on Plant Genomes, guides research on plant genome sequencing with NIFA supporting sequencing projects and ARS supporting crop genome database to curate and distribute the data information to crop breeders and other researchers (REE Action Plan, Goal 8).
- ARS manages and safeguards the national genebanks and seed collections. NIFA has recently awarded a Triticeae grant to a university-led project that will evaluate accessions in the ARS small grains collection for weather stress tolerance traits.

- The USDA BioEnergy Science team guides interagency cooperative research on bioenergy with ARS researchers developing new bioenergy feedstock lines.
- ARS and NIFA national program leaders include their counterparts in national program planning workshops including some joint workshops such as the 2011 joint ARS-NIFA Animal Genomics Workshop.

In addition to complementing the work of other agencies, ARS ensures that duplication and overlap are avoided within its own programs by developing nationally coordinated research Action Plans for each of the ARS National Programs. The ARS Office of National Programs and National Program Leaders provide oversight to guarantee that individual ARS project plans are targeted to the problem priorities and optimally coordinated to achieve the expected results. The National Programs are planned centrally with extensive input with external customers, stakeholders, research partners, and ARS scientists. Those providing perspectives on problems to be solved and research needs include producers, industry and other agricultural processors, consumers, Administration officials, representatives of USDA action and regulatory agencies, other government agencies, Congress, non-Governmental groups ( *e.g.*, commodity groups and advisory groups), state and local governments, national and international trade organizations, university scientists, private researchers, and government laboratories. Research collaborations among Agency scientists and with non-ARS scientists are a frequent outcome of the input and planning process, which ensures complementary objectives and approaches, prevents redundancies, and leads to research projects and programs that have impact for the public. Routinely, the agency's senior line managers and field scientists also meet with customers, stakeholders, and partners to build a strong understanding of regional and local issues.

Input from these constituencies leads to development of an Action Plan that provides the documentation of needs and researchable problems, which guides development of individual research project plans. Those plans – which include an assessment of related research already accomplished or in progress – are reviewed by peer panels who have the Action Plan in hand. This rigorous process, developed by ARS in response to a mandate in the 1995 Farm Bill, is a further check point for ensuring that research will solve problems without wasteful programmatic redundancies.

In an era of limited available funds, there is a strong incentive to not repeat what others in the agricultural research arena are doing unless there is a stronger public good provision requirement. ARS national leaders and scientists participate on over 160 Federal interagency working groups, and an uncounted but similarly large number of formal and informal professional associations and an even larger number of private-academic-ARS scientist work collaborations. As a result, ARS prevents redundancies in its programs, complements the missions of many other science-based Departments and agencies, and achieves much of the value in its research through mission-driven responsiveness to customer needs.

### **Intra-Agency Duplication**

As an example of how the agency conducts research on important issues in multiple locations across the country without duplicating itself, the agency would like to highlight three particular programs that have multiple scientists collaborating across the country to answer complex research questions without unnecessary duplication.

## ARS WATERSHEDS

The Agricultural Research Service (ARS) operates a network of approximately 23 Benchmark Watersheds, Experimental Ranges, and associated/related research facilities that collect long-term physical, chemical, and biological data on agricultural sustainability, climate change, ecosystem services, and natural resource conservation at the watershed or landscape scale. Data records extend as far back as 98 years. The distribution of these sites across the nation gives them great value because the interactions of agricultural production systems with natural resources are highly environment-dependent. ARS sustains this land-based infrastructure for research and environmental management testing to enable understanding and forecasting of the Nation's capacity to provide agricultural commodities and other ecosystem goods and services under geographically variable, ever-changing environmental and resource-use conditions.

In addition to supporting high-quality, location-based research, these sites provide an unparalleled opportunity to make important comparisons between very different environments, across large distances. The multi-location approach allows ARS to develop research questions that are shared and coordinated across sites; provide the capacity to address these large-scale questions across sites through shared research protocols; collect compatible data sets across sites; provide the capacity and infrastructure for cross-site data analysis; and generally facilitate and foster shared engagement in agricultural research across the nation's highly diverse environments.

The watershed/rangeland network is a key infrastructure for the research in many ARS National Programs and addresses the needs of other USDA agencies, such as the evaluation and improvement of Farm Bill conservation programs through the Conservation Effects Assessment Project (CEAP). Collectively, the sites are a platform to support multi-organization research and funding efforts; a resource for developing and testing regional- and national-scale hypotheses that cannot be undertaken by individual locations alone; and a foundation for developing long-range, multi-agency/institutional funding plans.

During the last 10 years, a concept for a Long-Term Agroecosystems Research (LTAR) network has been proposed in a number of highly visible publications, e.g., the 2003 National Research Council report, *Frontiers in Agricultural Research*, which urged the USDA to adapt a strategic, long-term approach to food and agricultural research. Creation of a new LTAR network would cost tens of millions of dollars, and universities or other organizations could not likely duplicate the existing ARS resource and its long-term data records. Two of ARS' Experimental Range research sites are already part of the National Science Foundation's (NSF) Long-Term Ecological Research (LTER) Network; three have been selected to become part of NSF's proposed National Ecological Observatory Network (NEON). Thus, the geographically distributed LTAR network needed by the scientific community already exists in ARS' experimental watershed/rangeland network.

ARS' unique watershed/rangeland resource is widely available for partnerships with non-USDA organizations, and research in cooperation with university scientists, other Federal agencies, and others is widespread within the network.

## ARS BEE RESEARCH

The bee industry is essential for the security of the Nation's food supply. Pollination is responsible for \$15 billion in added crop value; bee pollinated crops include important field crops such as alfalfa, and many fruits and nuts, major sources of vitamins. The bee industry is threatened by invasive mites (varroa and tracheal), predators (small hive beetle), diseases (American foulbrood, chalkbrood, viruses), insecticide poisoning, Africanization of managed colonies, the pressures of migratory beekeeping, and other problems leading to decreased colony health and manageability. With the appearance of colony collapse disorder in 2007, 30% or more of the Nation's colonies are now lost annually, an unsustainable situation that threatens the entire bee industry and crops such as almond and apple that are totally dependent on bee pollination. In response, ARS has the core national responsibility for ensuring an adequate force of pollinators, and conducts honey bee research at four laboratories, in Arizona, Louisiana, Maryland, and Texas. In addition, ARS conducts research on other (non-honey bee) pollinating bees in Utah. Each laboratory has a unique regional advantage and research role:

- Arizona, Tucson, the **“Bee Health and Nutrition Laboratory”**: 1) determines nutritional needs of bees and develops supplementary diets such as a highly successful protein diet now commercialized as MegaBee; 2) determines the negative effects of fungicides and bactericides on bee bread, the fermented pollen-based protein diet that bees store to feed their brood; 3) conducts research for beekeepers that transport colonies for pollination, particularly into California, where crops pollinated by bees have a value in excess of \$12.7 billion; 4) identifies new compounds for varroa mite control, such as newly commercialized plant beta-acids from hops; 5) develops tools to manage the genetics of commercial colonies in Africanized areas; 6) and maintains an Africanized Honey Bee (AHB) Identification Service.
- Louisiana, Baton Rouge, the **“Bee Breeding Laboratory”**: 1) focuses uniquely on breeding improved bees, and has developed a Southern-based island system for isolation of breeding stocks during breeding; 2) selected and commercialized the Russian bee for varroa and tracheal mite resistance (and high honey production and survival in harsh climates); 3) and is using molecular and other techniques to determine genes for introgression of resistance traits into bee lines preferred by beekeepers for their docility, honey production, and other characteristics.
- Beltsville, Maryland, the **“Bee Disease Laboratory”**: 1) has a Bee Disease Diagnosis Service that works with APHIS to prevent introduction of new pathogens and pests; 2) has been lead in developing antibiotics for controlling bee bacterial diseases and kits for detection of bee viruses for maintenance of pure stock; and, 3) is the laboratory leading international efforts to exploit the genomes of bees and their parasites and pathogens.
- Texas, Weslaco, the **“Bee IPM Laboratory”**: 1) conducts research in a region that has served as a pathway for invasive problems, e.g., Africanized honey bee; 2) is the

principal laboratory developing systems, including miticide resistance management, for control of bee pests; and 3) is working to elucidate bee immunity to disease.

- Utah, Logan, the “**Native Bee Laboratory**”: 1) is the only ARS facility (and only large facility in the world) developing alternative species of bees for pollination of crops and for land restoration; and, 2) maintains the premier bee systematics laboratory.

## ARS BEEF PRODUCTION RESEARCH

Beef cattle research is conducted in the USDA-ARS in 3 primary locations: the U.S. Meat Animal Research Center in Clay Center Nebraska (USMARC), Fort Keogh Livestock and Range Research Laboratory in Miles City, Montana and the Sub Tropical Agriculture Research Station in Brooksville, Florida (STARS). Research and priority for these ARS labs is outlined below. In addition, ARS conducts research in forage efficiencies, manure management, range and pasture management, parasite control, climate change/adaptation and forage toxicology at various other locations where cattle and/or sheep serve as experimental units, but are not the focus of the primary research objectives.

**USMARC:** Research at USMARC is focused on bovine genetic and genomics and improvement of beef cattle growth and efficiencies in typical corn belt pasture production systems. Beef cattle research is specifically focused on improving feedlot nutrient utilization efficiency, enhancing reproductive efficiencies, improving meat quality and consumer acceptance, combating bovine respiratory disease and improving the management and adaptability of feedlot cattle to environmental stressors. USMARC also conducts significant research in emerging genetic and genomic technologies to improve the rate of genetic improvement for numerous traits of economic importance for the beef industry.

**Fort Keogh:** Research at Fort Keogh in Miles City Montana is focused on range cattle production efficiencies particularly on cow-calf production and the interface between beef cattle production and range-forage management and ecosystem services on open range lands in the Western US. Specific beef cattle research includes genetic and genomic technology development to improve the productivity and efficiency of cattle grazing open range and the improvement of reproductive efficiencies of cows in typical Western range production environments. Additional research is focused on rumen ecology and the relationship between the rumen microbiome and beef cattle production efficiencies, particularly in cow-calf production systems.

**STARS:** Research at STARS in Brooksville Florida is focused on breed improvement of cattle adapted to the severe production environments of the subtropics which include additional stressors of poorer quality forages, extreme heat and humidity, and significantly increased disease and parasite infestation challenges than cattle production in the rest of the U.S. Beef cattle production in the subtropics of the US is largely confined to the cow-calf sector but represents 40% of the total U.S. beef cow herd. Specific research is being conducted to improve the Brahman (*Bos indicus*) breed and their crosses to enhance adaptation throughout the

subtropics and tropics around the world. Brahman cattle exhibit adaptive characteristics for these extreme environments but are discriminated against for poor dispositions, inferior reproductive performance, inferior feedlot performance, and inferior carcass quality particularly meat tenderness. To ensure the sustainability and competitiveness of beef producers in subtropical and tropical environments Brahman cattle are being genetically improved to consistently demonstrate better performance and efficiency for these critical economic traits.

## 12. Waste Fraud and Abuse

There are currently no fraud, waste, and abuse audits ongoing. The agency utilizes various internal procedures to prevent and detect fraud, waste, and abuse instances and provide an annual assurance statement to the Department of Agriculture Chief Financial Officer with our assessment of the effectiveness of our procedures. Over the past several years, the assurance statement has not identified any exceptions related to fraud, waste, and abuse. Some of the procedures that support our assurance statement are as follows:

- Office of Management and Budget Circular A-123 Appendix A “Internal Control over Financial Reporting” covering Financial Reporting, Reimbursable Agreements, Property Management, Funds Management, Budgeting, and Human Resources
- Consolidated Assistance, Review, and Evaluations of ARS Area offices and Locations
- National Program Reviews
- National Institute of Standards and Technology and Federal Information Security Management Act Risk Assessments
- Human Resources Management Evaluations
- Quality Control Reviews of Near Field Communications (NFC) Data Elements
- Facilities Contracting and Engineering Management Design Review Board and Contract Review Board Meetings
- Safety, Health, and Environmental Management Reviews, Evaluations, and Studies
- Procurement and Personal Property Management Reviews
- Purchase Card Audits and Reviews

### Open Audit Summary

ARS is undergoing several Governmental Accountability Office (GAO) and Office of the Inspector General (OIG) audits. The focus of the majority of these audits is how effective and efficient ARS is in conducting its research, securing and protecting select agents, addressing critical and emerging issues (such as Colony Collapse Disorder) and managing its resources. In the table below is a breakout of the different types of audits ongoing at ARS.

<b>Audit Entity</b>	<b>Program Audits</b>	<b>IT Audits</b>	<b>Financial and Administrative Audits</b>	<b>Fraud, Waste and Abuse Audits/Investigations</b>	<b>Total Open Audits</b>
<b>GAO</b>	<b>11</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>12</b>

<b>OIG</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>7</b>
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### **Open GAO Audit Findings**

There is currently one GAO audit with open findings that ARS must address related to Agroterrorism Response and Recovery Efforts. ARS has responded to these findings and is awaiting additional instructions. In our response, ARS did not disagree with the findings, however the agency believes that additional information is required to further explain observations made in the report.

### **GAO Audits (In Progress)**

120788, DOD Research Facilities and Administration Cost Reimbursement  
311044, Update to the 2005 Wireless Network Security Report  
361174, Quality Assurance of Carbon Offsets in U.S. Climate Change Programs  
361177, The USDA Protocols and Standards to Ensure the Safety of Meat and Other Food Procured by Schools  
361185, Renewable Energy Initiatives  
361191, Ethanol Blends and Risk  
361204, Agroterrorism Response and Recovery Efforts  
361216, Chesapeake Bay Action Plan  
361223, Antibiotic Use in Food and Animals  
361260, USDA Efforts to Reduce E. Coli  
460612, High Containment Laboratories: GAO Assessment of Commissioned Reports on Biosafety and Biosecurity  
460619, Duplication of Federal Inspections of High-Containment Laboratories  
OIG Audits (In Progress)  
50401-01-11, Fiscal Year 2011 USDA Consolidated Financial Statements Audit  
50501-1-12, USDA's Security over Domain Name Systems Services  
50501-2-12, FY 2011 Federal Information Security Management Act Audit  
50601-01-22, Effectiveness of the Departments Recent Efforts to Entrance Agricultural Trade  
50703-01-HQ, Oversight and Control of USDA ARRA Activities  
50099-84-HY, USDA's Response to Colony Collapse Disorder  
50501-01-IT, USDA's Management and Security Over Wireless Handheld Devices

### **13. Effect of Administrative Pay-go**

None.