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Department of
Agriculture

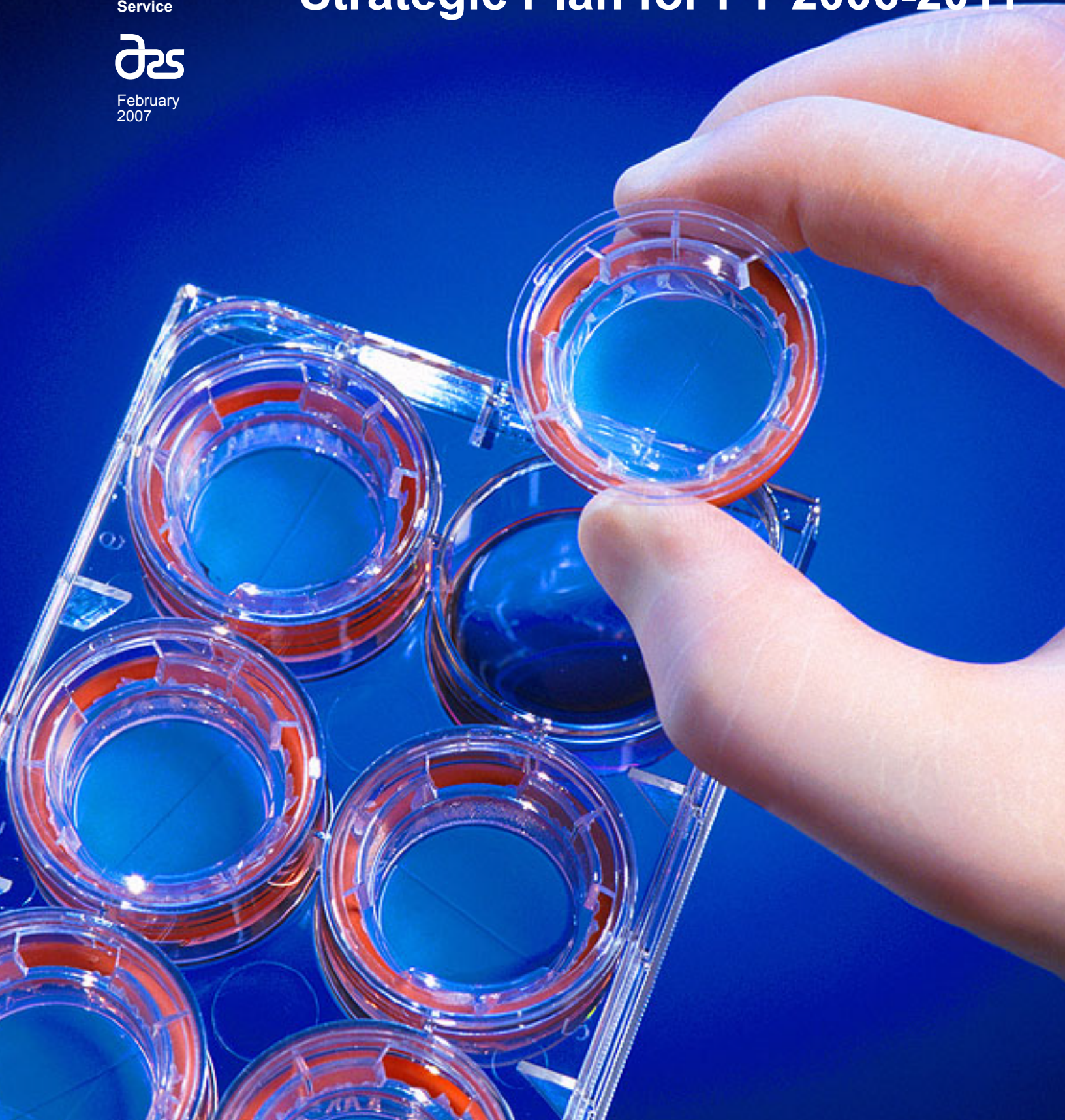
Agricultural
Research
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Strategic Plan for FY 2006-2011



Abstract

U.S. Department of Agriculture, Agricultural Research Service. 2007. ARS Strategic Plan for FY 2006-2011. The Service, Washington, D.C.

This publication is the Agricultural Research Service's strategic plan for 2006 through 2011; the plan describes the ARS national programs and lays out the agency's strategies and activities under six strategic goals that encompass specific objectives and also several management initiatives.

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Copies are also available for download, free of charge, at www.ars.usda.gov.

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Message from the Administrator

I am pleased to present the Agricultural Research Service's (ARS) Strategic Plan for 2006-2011. This plan documents the science information and technology ARS will develop and disseminate to help address and achieve the Department of Agriculture (USDA) goals to serve the food and agriculture system and other public interests related to the environment, food production and safety, human nutrition, and economic development.



ARS has successfully developed and used a series of strategic and implementation plans over the last 25 years to guide its research program. The ARS Strategic Plan meets the requirements of the Government Performance and Results Act (GPRA) of 1993, requiring Federal agencies to focus on the long-term outcomes of their work. The Plan also supports the goals contained in the USDA Strategic Plan 2005-2010. Like the earlier ARS Strategic Plan, the new plan identifies performance measures that will indicate progress toward the goals and objectives, outlining the specific research activities needed to address each performance measure. The Plan also reinforces ARS' National Program structure and accommodates current accountability mechanisms designed to evaluate the effectiveness of Federal programs.

ARS has a long and distinguished history of service to American agriculture. As our world becomes more interdependent, the benefits of ARS research will directly affect producers and consumers around the world. This new Strategic Plan will help guide the Agency's scientific activities and the accompanying transfer of ARS research products to producers, consumers, action and regulatory agencies, the private sector, and other customers and stakeholders. With the continued support of the American people, USDA, Congress, and our dedicated workforce, ARS will meet the challenges and opportunities outlined in this Strategic Plan.

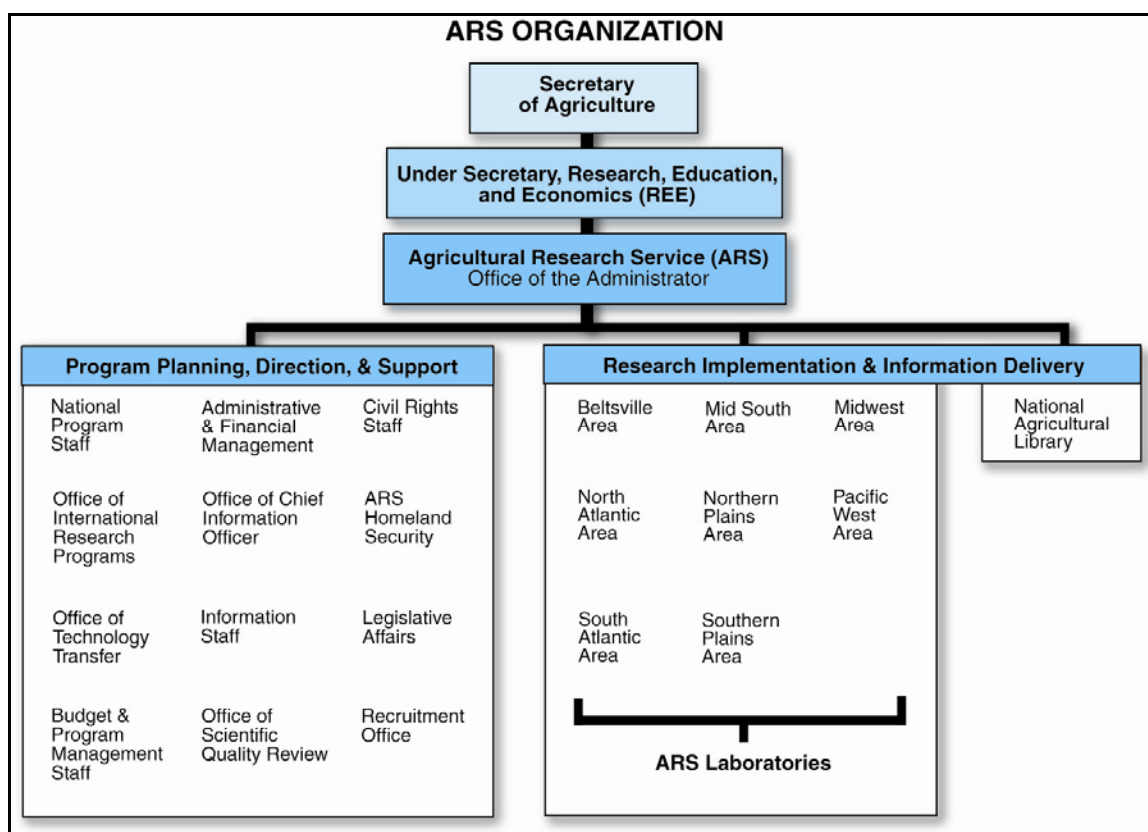
I would like to thank the members of the ARS Strategic Planning Team who helped prepare this plan. The members were David M. Klurfeld, Chair; Kelly J. Baker; Eleanor G. Frierson; Ronald D. Green; Jeffrey R. Kurtz; Marilyn A. Low; Maria G. Pisa; Patrick A. Reilly; Jane F. Robens; Sally M. Schneider; Jeffrey J. Steiner; Daniel A. Strickman; Mark A. Wertz; and Gail C. Wisler. The strategic planning activities were coordinated by David A. Rust. The ARS plan was developed, revised, and finalized exclusively by Federal employees after extensive consultation with ARS customers, stakeholders, and partners. The new Strategic Plan could not have been successfully completed without the conscientious efforts of the entire team.

The 2006-2011 ARS Strategic Plan and GPRA Annual Performance Plans and Reports are available on the ARS Web site: <http://www.ars.usda.gov>; (click on "National Programs").

Edward B. Knipling
Administrator

Introduction

ARS is the principal in-house research agency of the USDA. It is one of the four component agencies of the Research, Education, and Economics (REE) mission area. Congress first authorized Federally supported agricultural research in the Organic Act of 1862, which established what is now USDA. That statute directed the Commissioner of Agriculture "... To acquire and preserve in his Department all information he can obtain by means of books and correspondence, and by practical and scientific experiments..." The scope of USDA's agricultural research programs has been expanded and extended more than 60 times since the Department was created. During World War II, USDA's various research components were brought together into the Agricultural Research Administration (ARA). In 1953, the ARA was reorganized into ARS. Today, with a staff of over 8,500 employees, ARS carries out research at over 100 laboratories throughout the Nation and in several foreign countries. The research ranges from animal and crop protection and production research to human nutrition, food safety, and natural resources research.



History

Agricultural research and library services can trace their history back to 1862 with the creation of USDA and the Department's first USDA research bulletin on the sugar content of grapes and their suitability in wine. Since then, ARS scientists have been responsible for hundreds of research breakthroughs and discoveries, from the mass production of penicillin and the discovery of the viroid (the smallest known agent of plant disease), to the methods for producing orange juice and instant potato flakes. More recently, ARS scientists developed the most complete genetic maps for cattle and swine. An extensive timeline of ARS events is available at <http://www.ars.usda.gov/is/timeline/comp.htm>. A timeline of some important events in U.S. agricultural history:

- 1862 – USDA and Agricultural Library established.
- 1868 – USDA began research on animal diseases.
- 1902 – First plants bred for disease resistance.
- 1906 – Live virus vaccine developed for hog cholera.
- 1929 – Foot-and-Mouth disease eradicated from the United States.
- 1938 – Four regional research centers established to develop new uses for farm products.
- 1942 – USDA begins publication of the “Bibliography of Agriculture.”
- 1943 – Texas Cattle Fever eradicated.
- 1950s – Development of permanent press cotton and flame resistant cotton fabrics.
- 1954 – DEET insect repellent developed.
- 1958 – National Seed Storage Laboratory established to provide long-term storage of plant germplasm.
- 1959 – Phytochrome isolated, and its role in controlling flowering and seed germination demonstrated.
- 1966 – Screwworm fly eradicated from the United States using the sterile-male-release technique.
- 1968 – ARS chemist Robert Holley awarded the Nobel Prize in Physiology or Medicine for the nucleotide sequence of transfer RNA.
- 1970 – AGRICOLA (AGRICultural OnLine Access) database launched.
- 1971 – Marek's disease vaccine developed for chickens.
- 1976 – Superslurper patented; a combination of starch and a synthetic chemical that absorbs hundreds of times its own weight in water.
- 1978 – United States declared free of hog cholera.
- 1981 – First Foot-and-Mouth disease vaccine developed.
- 1986 – Germplasm Resources Information Network established, the world's most comprehensive database of agriculturally important plants.
- 1990 – Oatrim fat replacer for food developed from soluble oat fibers and natural enzymes.
- 1998 – First gene-based test for Johne's disease in cattle developed.
- 2000 – First cloned transgenic cow produced that carries a gene designed to enhance animal health and well-being.
- 2001 – Piglet cloned by ARS scientists and colleagues at the Roslin Institute in Scotland.
- 2004 – “Defender,” a high-yielding potato cultivar with resistance to late blight in the foliage and tubers, released by Prosser and Aberdeen scientists.

Vision

Leading the Nation towards a better future through agricultural research and information.

Mission Statement

ARS conducts research to develop and transfer solutions to agricultural problems of high national priority and provides 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.
- Provide economic opportunities for rural citizens, communities, and society as a whole.

Guiding Principles and Values

In carrying out the goals of its Strategic Plan, ARS will:

- Provide leadership to solve critical national agricultural technical problems.
- Develop and transfer high quality scientific research, technologies, and information.
- Support long-term research to provide a foundation for problem solving and policy formulation.

- Promote interdisciplinary research and systems approaches.
- Respond to the needs of customers, stakeholders, and partners.
- Promote integrity, ethical conduct, and public accountability in all our activities.

Role of Intramural Research

ARS, USDA's primary in-house research agency, has a unique and important role as a Federally-funded, intramural research agency. With the ability to fund projects over the long term, ARS is able to maintain continuity in its research efforts to solve problems that universities and private industry would not be able to address. Unlike other private or primarily extramural research agencies, ARS is able to:

- Conduct research to produce objective and credible scientific results.
- Respond to emergencies through the rapid mobilization of technical expertise and resources.
- Carry out projects over the long-term and maintain continuity of research.
- Aid in the development of regulatory policy based on sound science.

LEGISLATIVE MANDATES

ARS research is authorized by the Department of Agriculture Organic Act of 1862 (7 U.S.C. 2201 note), Agricultural Research Act of 1935 (7 U.S.C. 427), Research and Marketing Act of 1946 (Pub. L. 79-733), as amended (7 U.S.C. 427, 1621 note), Food and Agriculture Act of 1977 (Pub. L. 95-113), as amended (7 U.S.C. 1281 note), Food Security Act of 1985 (Pub. L. 99-198) (7 U.S.C. 3101 note), Food, Agriculture, Conservation, and Trade Act of 1990 (Pub. L. 101-624) (7 U.S.C. 1421 note), Federal Agriculture Improvement and Reform Act of 1996 (Pub. L. 104-127), Agricultural Research, Extension, and Education Reform Act of 1998 (Pub. L. 105-185), and Farm Security and Rural Investment Act of 2002 (Pub. L. 107-171).

In structuring this Strategic Plan, ARS has carefully crafted its Objectives, Performance Measures, and Actionable Strategies to address all of the applicable statutory provisions in the “Purposes of Agricultural Research, Extension, and Education” as amended by Pub. L. 104-127, Title VIII, Sec. 801, Apr. 4, 1996, 110 Stat. 1156. The “Purposes” are as follows:

The purposes of Federally supported agricultural research, extension, and education are to:

- Enhance the competitiveness of the U.S. agriculture and food industry in an increasingly competitive world environment.
- Increase the long-term productivity of the U.S. agriculture and food industry while maintaining and enhancing the natural resource base on which rural America and the U.S. agricultural economy depend.
- Develop new uses and new products for agricultural commodities, such as alternative fuels, and develop new crops.
- Support agricultural research and extension to promote economic opportunity in rural communities and to meet the increasing demand for information and technology transfer throughout the U.S. agriculture industry.
- Improve risk management in the U.S. agriculture industry.
- Improve the safe production and processing of, and adding of value to, U.S. food and fiber resources using methods that maintain the balance between yield and environmental soundness.
- Support higher education in agriculture to give the next generation of Americans the knowledge, technology, and applications necessary to enhance the competitiveness of U.S. agriculture.
- Maintain an adequate, nutritious, and safe supply of food to meet human nutritional needs and requirements.

NATIONAL PROGRAMS

ARS organizes its research activities under 19 National Programs under four broad categories: Animal Production and Protection; Nutrition, Food Safety, and Quality; Crop Production and Protection; and Natural Resources and Sustainable Agricultural Systems. To best address issues of agricultural importance, ARS makes regular adjustments to this program structure. The structure appears below.

Animal Production and Protection

- Food Animal Production
- Animal Health
- Veterinary, Medical, and Urban Entomology
- Aquaculture

Nutrition, Food Safety, and Quality

- Food Safety, (Animal and Plant Products)
- Human Nutrition
- Quality and Utilization of Agricultural Products

Crop Production and Protection

- Plant Genetic Resources, Genomics, and Genetic Improvement
- Plant Biological and Molecular Processes
- Crop Production
- Plant Diseases
- Crop Protection and Quarantine
- Methyl Bromide Alternatives

*Natural Resources and Sustainable Agricultural Systems**

- Water Availability and Watershed Management
- Soil and Air Resource Management
- Pasture, Forage, and Range Land Systems
- Agricultural Waste and Byproduct Utilization
- Agricultural System Competitiveness and Sustainability
- Bioenergy

*The National Programs within this division are currently being realigned. The new structure that is in the process of being implemented is listed above.

NATIONAL AGRICULTURAL LIBRARY

The National Agricultural Library (NAL), the largest agricultural library in the world, was established by Congress in 1862 as the primary agricultural information resource in the Nation. NAL, which has the dual mandates of serving as one of four national libraries and serving as USDA's library, became part of ARS in 1994. The Library's unique, comprehensive collections of more than 4 million items have been declared a heritage asset of USDA and constitute the Nation's fundamental base of agricultural knowledge and institutional history.

NAL's responsibilities also include providing leadership in developing and operating a comprehensive agricultural library and information network, and the Library is leading development of a National Digital Library for Agriculture (NDLA). Every day of the year, NAL provides a wealth of information products and services to hundreds of thousands of customers, including policymakers, teachers, farmers, researchers, librarians, regulators, inspectors, foresters and other agricultural specialists, the business community, and others who access NAL databases and the NAL Web site.

NAL delivers products and services such as: AGRICOLA (AGRICultural OnLine Access), the 4,000,000+ record NAL online catalog, index to the literature of agriculture, and the premier free-of-charge finding tool for agricultural information; DigiTop (Digital DeskTop Library for USDA), which provides USDA staff worldwide with desktop access to digital information; www.nutrition.gov and www.invasivespeciesinfo.gov, authoritative Web portals delivered on behalf of agencies within and outside USDA; and AgNIC (Agriculture Network Information Center), which unifies the delivery of agricultural data and information available on Web sites of AgNIC alliance members. The Library's work in collecting, preserving for perpetuity, and ensuring permanent access to agricultural

information is fundamental to the continued well-being and growth of U.S. agriculture and agricultural development worldwide.

PARTNERSHIPS WITHIN USDA AND WITH OTHER FEDERAL AGENCIES

ARS plays a critical role in providing research support to USDA's action and regulatory agencies and other Federal departments and agencies. ARS annually provides, through reimbursable agreements, over \$200 million in research support. Examples include research on bacterial pathogens in produce for the Food Safety and Inspection Service, the safety of irradiated foods for the Food and Drug Administration, and forecasting wind erosion for the Natural Resources Conservation Service. ARS conducts research in collaboration with the following departments and agencies:

- Agricultural Marketing Service
- Animal and Plant Health Inspection Service
- Center for Nutrition Policy and Promotion
- Cooperative State Research, Education, and Extension Service
- Economic Research Service
- Farm Service Agency
- Food and Nutrition Service
- Food Safety and Inspection Service
- Foreign Agricultural Service
- Forest Service
- Grain Inspection, Packers and Stockyard Administration
- National Agricultural Statistics Service
- Natural Resources Conservation Service

ARS also supports the mission of the following U.S. Federal entities through its research and development:

- Centers for Disease Control and Prevention
- Department of Defense
- Department of Energy
- Department of Homeland Security
- Department of Interior

- Department of State
- Environmental Protection Agency
- Food and Drug Administration
- National Institutes of Health
- National Aeronautics and Space Administration
- Office of the U.S. Trade Representative

- Congress
- Scientific organizations
- Academic and educational organizations
- Medical organizations
- Health and dietary organizations
- Environmental organizations
- News media
- Information professionals and library communities

BENEFICIARIES, CUSTOMERS, STAKEHOLDERS, AND PARTNERS

A listing of ARS' customers, beneficiaries, stakeholders, and partners is shown below. Sometimes an individual/organization can be at the same time a customer, beneficiary, stakeholder, and partner or any combination thereof.

Beneficiaries—Individuals whose well-being is enhanced by the Agency's activities:

- Domestic consumers of agricultural products produced within or imported into the United States.
- Foreign consumers of agricultural products exported from the United States
- U.S. Federal/State agencies that influence and/or are influenced by agricultural policies/activities

Customers—Individuals or organizations using ARS products or services:

- Producers (farmers, growers, and ranchers), processors, and marketers
- National/international government organizations
- Commodity and futures markets
- International trade organizations
- International science and research organizations
- Department of Agriculture/other Federal departments and agencies
- State and local governments

Stakeholders—Individuals or organizations interested in the work of ARS:

- Congress
- Department of Agriculture and other Federal/State departments and agencies that influence and/or are influenced by agricultural policies/activities
- ARS employees
- National and international organizations
- Producer, processor, and marketing organizations
- Food and commodity organizations
- Trade organizations
- Environmental organizations
- Retail organizations
- Consumers
- Foreign governments
- Advocacy groups
- Scientific, Technical, and Medical (STM) Publishers

Partners—Individuals or organizations working with ARS collaboratively:

- Institutions of higher education
- Federal/state research agencies
- Private industry
- Library and information services communities
- International organizations

STRATEGIC PLAN FRAMEWORK

The ARS Strategic Plan adopts the USDA Strategic Goals and, to the greatest extent possible, the structure and substance contained in the Departmental Plan. Like the Department's Plan, ARS' Plan is focused primarily on programmatic goals and objectives.

In the Department Plan, USDA clearly recognizes the unique and important role research plays in achieving all its programmatic goals and objectives. This has been articulated in the USDA Plan as follows: "Across all USDA objectives, research—which provides the foundation for modern agriculture—is key. Developing commercially feasible renewable resources (such as bioenergy), food-based health products (such as nutraceuticals and functional foods), and manufacturing products (such as adhesives, lubricants, insulators, fibers, dyes, and other bioproducts) creates new demand for agricultural products and helps reduce U.S. dependence on foreign sources of nonrenewable resources. Scientific advances, coupled with spatial imaging technology, enable early detection and mitigation of naturally occurring or human-caused threats to food security before they can inflict major damage. Genetics and molecular biology hold promise to reduce recurring problems of plant and animal disease, invasive species, post-harvest losses, and food-related health issues. Development of advanced agronomic practices based on rapidly emerging imaging communication and information technologies will continue to reduce the need for water, energy nutrients, and other input requirements while improving production efficiency to facilitate U.S. agricultural competitiveness globally. Finally, education builds scientific and agricultural literacy, and recruits, retains, and graduates the

best and the brightest of a diverse population, ensuring the value of future research."

ARS works to solve problems for multiple customers in agriculture, including national and local groups as well as government action agencies; it also addresses the need for basic scientific information of importance to the field. This is achieved by managing a portfolio of both short- and long-term problem solving and long-term, fundamental research. Agency accomplishments include research published in peer-reviewed scientific journals, technology transferred to industry customers, and information used by other agencies to establish Federal policy and regulations.

Goals and Explanatory Statements

The ARS Strategic Plan is focused on achieving six broad Goals, which are taken directly from the USDA Strategic Plan and the REE Mission Area Strategic Plan.

Objectives

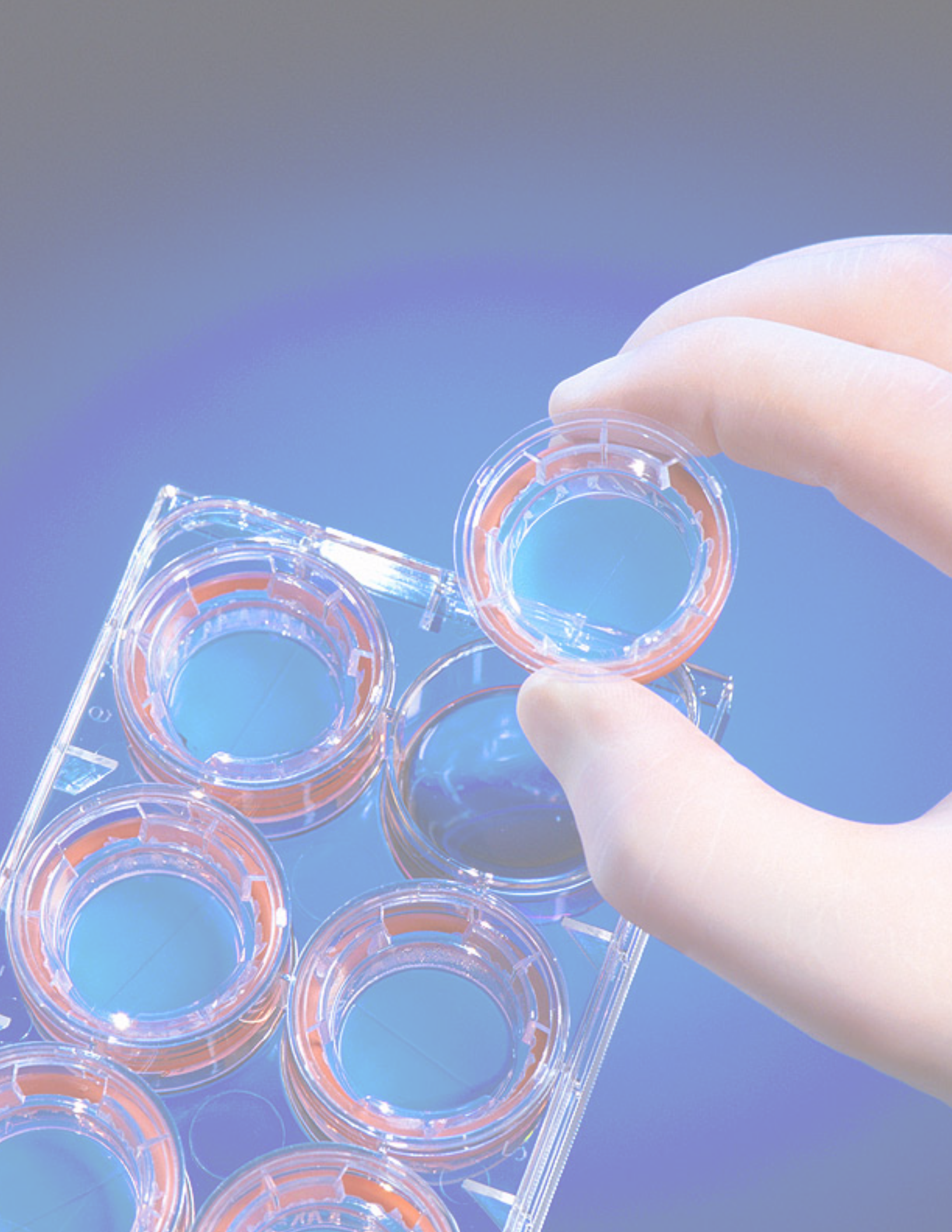
Each Goal includes several objectives that more precisely focus on the mission and work of ARS. ARS derives the substance of some of its objectives from the USDA and REE Strategic Plans, while others are tailored to meet the specific research mission of the Agency. The Objectives, Performance Measures, and Actionable Strategies also incorporate the aims of the "Purposes of Agricultural Research, Education, Extension, and Education" set forth in section 801 of the Federal Agricultural Improvement and Reform Act of 1996.

Performance Measures

The performance measures describe specific measurable achievements that indicate progress towards reaching the broader objectives and goals. In each annual performance plan, the Agency will identify specific performance indicators and anticipated outcomes that will, if accomplished, measure progress towards achieving the objectives and goals. Each Performance Measure also establishes a baseline and anticipates a target to be reached by 2011. Baselines are established using the most recent available data, and therefore baseline dates may vary from Performance Measure to Performance Measure.

Actionable Strategies/Activities

These include the specific research activities that ARS anticipates conducting during the next five years to address each Performance Measure.



Strategic Goal 1:

Enhance International Competitiveness of American Agriculture

Expanding global markets for agricultural products is critical for the long-term economic health and prosperity of our food and agricultural sector. U.S. farmers have a wealth of natural resources, cutting-edge technologies, and a supporting infrastructure that result in a production capacity beyond domestic needs. Expanding global markets will increase demand for agricultural products and contribute directly to economic stability and prosperity for America's farmers.

To expand overseas markets and facilitate trade, various USDA agencies assist in the negotiation of new U.S. trade agreements, the monitoring and enforcement of existing trade agreements, the administration of market development and export promotion programs, and the adoption of science-based regulatory systems and standards. In supporting these USDA activities, ARS plays a significant role, particularly under Objective 1.3: Improve the Sanitary and Phytosanitary System to Facilitate Agricultural Trade. However, ARS research in this capacity falls under Goals 1 and Goal 4. In working to protect crops from diseases, ARS also enhances the international competitiveness of American agriculture. Therefore, ARS has elected to report this category of research under Objective 4.2: Reduce the Number, Severity, and Distribution of Agricultural Pest and Disease Outbreaks. Relevant information is reprinted under both Objective 1.3 and Objective 4.2 for the reader's convenience.

OBJECTIVE 1.1: EXPAND AND MAINTAIN INTERNATIONAL EXPORT OPPORTUNITIES

Activities related to this objective are primarily carried out by other USDA agencies.

OBJECTIVE 1.2: SUPPORT INTERNATIONAL ECONOMIC DEVELOPMENT AND TRADE CAPACITY BUILDING

Activities related to this objective are primarily carried out by other USDA agencies.

STRATEGIC RESULT: INCREASED EXPORT OPPORTUNITIES FOR U.S. AGRICULTURE

OBJECTIVE 1.3: IMPROVE THE SANITARY AND PHYTOSANITARY (SPS) SYSTEM TO FACILITATE AGRICULTURAL TRADE

Sanitary and Phytosanitary (SPS) barriers put in place to protect humans, animals, and plants from foreign pests, diseases, and contaminants continue to increase due to the lack of regulatory capacity in various countries and/or the lack of sound science. These technical barriers impede agricultural trade around the world. Reduced trade flows due to SPS barriers limit U.S. exports and efforts of developing countries to participate in and benefit from global trade. In response to these problems, USDA uses its extensive expertise and works closely with other U.S. agencies to strengthen regulatory coordination, streamline procedures to enhance trade, and encourage the use of sound science in addressing SPS and biotechnology issues.

ARS provides the sound scientific basis that USDA can use to work aggressively with its private sector trading partners and international organizations to develop a stronger system of international guidelines. These new guidelines will foster the widespread adoption of science-based regulatory systems, helping to protect the life and health of humans, animals and plants within the United States as well as facilitating trade.

Key Outcome: An improved global SPS system for facilitating agricultural trade.

The ARS research in support of Strategic Goal 1, Objective 1.3 is reported on page 17 as Performance Measure 4.2.5 under Strategic Goal 4, Objective 4.2. This performance measure is reprinted below along with the relevant Actionable Strategies:

Provide environmentally sound fundamental and applied scientific information and technologies to action agencies, producers, exporters, and importers of commercially important plant and animal products in support of exclusion, early detection, and eradication of quarantine pests and pathogens that can impede foreign trade.

Baseline 2006

Developed and implemented 5 strategies for exclusion, detection, and eradication of quarantine pests and pathogens. Provided data in support of the needs of industry, APHIS, and other action agencies. New technologies developed and implemented by action agencies that have opened new export markets.

Target 2011

Improved knowledge and understanding of quarantine pest and pathogen biology and epidemiology leading to 30 new technologies implemented by industry, APHIS, or other action agencies to mitigate risk of pests and pathogens resulting in expanded export markets while protecting the safety and security of American agriculture.

(Reprinted from Performance Measure 4.2.5 on page 17).

Actionable Strategies/Activities for Objective 1.3

- Develop research technologies to mitigate animal and plant health issues that impede trade.
- Develop new technologies to quickly and accurately detect and eradicate key quarantine pests and pathogens.
- Find environmentally acceptable, effective means of removing quarantine pests from U.S. animal and plant commodities to increase export trade opportunities.
- Reduce/remove risks of introducing pests to other countries to expand markets to U.S. growers.
- Support action agencies with research to remove quarantine barriers to movement of U.S. commodities.
- Develop management strategies to exclude quarantine pests and pathogens from entry to important agricultural production areas to safeguard American agriculture.

biotechnology is not yet fully accepted internationally, which has led to much debate and questioning about the possible risks of American products that have been bioengineered. In addition, there are also a number of sanitary/phytosanitary issues that have proved to be significant barriers to trade.

Key External Factors

There are several key external factors that will affect ARS' ability to provide the science-based solutions needed to enhance the competitiveness of American agricultural producers. In particular, there has been a rise in global concern about environmental issues that have led to mandates and protocols that threaten the ability of American products to compete internationally. The methyl bromide ban, for example, has taken effect in the United States but not in developing nations, threatening the competitiveness of certain American agricultural products. Biotechnology also continues to impact international market opportunities and global competitiveness. This technology promises to increase production efficiency, improve food quality, and enhance nutritional value of foods. However,

Strategic Goal 2: Enhance the Competitiveness and Sustainability of Rural and Farm Economies

American consumers benefit from agricultural products that minimize their food costs and maximize their consumption choices. However, many within the agricultural production sector are suffering from low commodity prices that have remained relatively unchanged for decades, while the costs of fuels and other purchased inputs have continued to rise. The Nation's rural economic vitality depends on the ability of producers to profitably produce agricultural products, including food, fiber, industrial products, and fuels, while at the same time enhancing the natural resource base upon which crop and livestock production depends. Future financial success will depend on increasing productivity and production and conversion efficiencies, accessing new markets for specialized products, developing biobased technologies that provide new opportunities for U.S. farmers, and utilizing tools and information to mitigate risks and rapidly make adjustments to changing market conditions. Because there is great diversity in the farm sector driven by varying available resources, climate, and individual preferences, an equally diverse range of solutions is needed. Also, the needs, concerns, and opportunities of large farms may differ from those of smaller or intermediate sized farms, regardless of location. Therefore, research will need to provide producers options in terms of what is best for them for their respective circumstances.

ARS conducts basic and applied research to develop new and more efficient technologies and systems for producing and processing agricultural products that can enhance the efficiency and profitability of producers as well as provide

improved and new products for consumers. ARS researchers work to produce biofuels and other biobased products that expand markets for agricultural products, reduce national dependence on foreign sources, and enhance environmental sustainability. ARS also promotes livestock and crop productivity through genetic and genomic research, and the development of technologies that enhance the economic value of agricultural products.

STRATEGIC RESULT: PROVIDE NEW SCIENTIFIC AND TECHNOLOGICAL CAPABILITIES THAT WILL EXPAND DOMESTIC MARKETS FOR AGRICULTURAL PRODUCERS

OBJECTIVE 2.1: EXPAND DOMESTIC MARKET OPPORTUNITIES

Technological progress is creating new and expanded markets for agricultural products. New technologies will provide consumers with new and improved food, textiles, and fibers. Biobased technologies promise new opportunities for U.S. farmers to take advantage of energy and industrial markets. Currently, U.S. agriculture is the source of various products such as biopolymers, industrial chemicals and films, and clean burning bioethanol and biodiesel that are derived from plants and livestock byproducts rather than petroleum or other nonrenewable natural resources. New markets are also emerging for products and strategies to mitigate environmental concerns, such as the use of carbon sequestration to offset greenhouse gas emissions. ARS is in a position to bring biological and physical sciences together with engineering in a coordinated research

program to expand a variety of market opportunities, particularly for the sustainable commercial production of bioenergy, biofuels, and biobased products.

Key Outcomes: Technologies to enable dramatic increases in the sustainable production of bioenergy, increased energy security, and reduced energy costs for the agricultural sector. Technologies leading to new and improved foods, fibers, and biobased products that expand agricultural markets and provide new and improved products for consumers here and abroad.

Performance Measure

2.1.1 Create new scientific knowledge and innovative technologies that represent scientific/technological advancements or breakthroughs applicable to bioenergy.

Baseline 2004
Four technological breakthroughs or scientific advancements that make significant contributions toward reducing the cost and increasing profitability, improving the efficiency, increasing the yield, and increasing the sustainability of producing or converting biobased feedstocks into biofuels.
Target 2011
Cumulatively, 24 technological breakthroughs or scientific advancements that make significant contributions toward reducing the cost and increasing profitability, improving the efficiency, increasing the yield, and increasing the sustainability of producing or converting biobased feedstocks into biofuels.

2.1.2 Develop cost effective, functional industrial and consumer products, including higher quality, healthy foods, that satisfy consumer demand in the United States and abroad.

Baseline 2004
Non-food, non-fuel biobased products derived from renewable agricultural resources represent a small fraction of the market for petroleum-based industrial products and some are not yet economically competitive. Also, many agricultural products are marketed as low-value commodities, with post-harvest spoilage decreasing return to producers. Healthy foods are often not convenient or readily accepted by significant numbers of consumers. In FY 2005, four new biobased products and food items with improved quality, nutritional or functional characteristics were developed by ARS and used by customers, both domestic and foreign.
Target 2011
Cumulatively, 20 new technologies developed by ARS and adopted for uses that provide food crops and products with higher quality and extended shelf life; convenient and acceptable healthy foods; non-food, non-fuel biobased products with cost and performance features comparable or superior to petroleum-based products; and valuable co-products from agricultural residues and processing wastes.

Actionable Strategies/Activities for Objective 2.1

- Design and breed plants for the high-yield, sustainable production of biorefinery feedstocks with optimal qualities for conversion to biofuels, biopower, and bio-products.
- Develop technologies for the sustainable production and collection of biomass feedstocks, including on-farm methods to harvest, handle, transport, and store biomaterial such as energy crops, plant residue, and animal manure.
- Develop processes for fractionation or pretreatment of feedstocks to add value to biomaterials through increased energy density and quality.
- Design on-farm systems to supply energy needs for on-farm use as well as for distributed energy generation of liquid fuels and electricity.
- Develop technologies that improve the energy efficiency and reduce the cost of converting biomaterials via biological or thermochemical processes into fuels and coproducts.
- Devise value-added coproducts from biofuel production, thereby increasing the commercial viability of biorefineries.
- Develop technologies that expand the range of feedstocks for biorefineries and that maximize the utility and assure the quality of biofuels.
- Assess trends in agricultural production, identifying surpluses of commodities, residues, and byproducts for their potential economic market value.
- Assess opportunities for new/improved technologies for foods and biobased products.
- Identify attributes that define quality of foods and biobased products.
- Improve understanding of relationships between raw material/feedstock composition, component molecular structure/physical structure, and end-use quality, function, and end-user acceptance.
- Develop rapid, non-destructive methods for detection and measurement of physical/chemical quality attributes and quality defects.
- Determine influence of pre-harvest factors on quality, including genetics, production practices, and environment.
- Determine influence of post-harvest factors on quality, including storage, handling, grading, and processing.
- Enhance intrinsic product quality and consistency.
- Identify and characterize functional compounds and components in agricultural commodities and their byproducts.
- Develop functional biobased intermediates or products.
- Identify and characterize by-product components for potential value-added food or biobased products.
- Convert low value agricultural byproducts or their components into higher value food or biobased products.
- Develop improved and new techniques and technologies to convert agricultural products into value-added food or biobased products.
- Develop commercially viable biobased substitutes for petroleum-derived products.
- Improve/develop processes and technologies that are environmentally benign.
- Develop automated, high-throughput, online grading, sorting, and packaging systems for food products.

- Evaluate effects of safety and environmental protocols on quality of foods.
- Improve storage technologies that maintain quality and nutrition and increase shelf life.
- Develop functional food ingredients or products.

OBJECTIVE 2.2: INCREASE THE EFFICIENCY OF DOMESTIC AGRICULTURAL PRODUCTION AND MARKETING SYSTEMS

Fundamental to the long-term sustainability of agricultural production is the maintenance of an efficient, profitable, and economically competitive operation. Intense competition in global markets and pressure on U.S. farm policy to reduce price supports continue to emphasize the need for American agriculture to pursue and market higher value agricultural products. Furthermore, U.S. agricultural production and marketability is constantly influenced by factors such as unpredictable weather, disease and pest outbreaks, and changing consumer demands. Research must respond to consumer demands for healthy and safe products to ensure a sustainable and profitable agricultural production system that capitalizes on an abundant source of raw material for value-added food, fiber, and industrial products. The resulting technologies must effectively differentiate U.S. agricultural products from competing sources and provide customers with value-added processes that enhance product quality and value.

ARS research programs work to develop and transfer technology and information that make up the centerpieces of an efficient and economically sustainable agricultural sector. To improve the value and production efficiency of American crops and crop production, ARS takes responsibility for maintaining genetically diverse germplasm

resource collections, which protects our genetic resource base and aids in plant and animal genetic research. In addition, ARS develops and disseminates science-based information to help U.S. agricultural producers manage unforeseen risks from climate, weather, pests, and disease outbreaks. Through these activities, ARS works to improve production efficiency and productivity to maintain profitability while enhancing the natural resource base upon which agriculture depends.

Key Outcome: Information and technology producers can use to compete more economically in the market place.

Performance Measures

2.2.1 Develop systems and technologies to reduce production costs and risks while enhancing natural resource quality.

Baseline 2006
Twelve new technologies and systems developed and used by customers to reduce the cost and increase profitability, improve the efficiency, or increase yield, and increase the sustainability of production.
Target 2011
Cumulatively, 29 technologies and systems developed and used by customers that utilize new configurations of practices and technologies to reduce the cost and increase profitability, improve the efficiency, or increase the yield, and increase the sustainability of production.

2.2.2 Develop new technologies, tools, and information contributing to improved precision animal production systems to meet current and future food animal production needs of diversified consumers, while simultaneously minimizing the environmental footprint of production systems and enhancing animal well-being.

Baseline 2006

Ten new technologies developed and used by ARS customers to increase production efficiency and enhance the economic value and well-being of U.S. food animal production while decreasing the environmental footprint of production systems.

Target 2011

Cumulatively, 35 new technologies developed and used by ARS customers.

2.2.3: Expand, maintain, and protect our genetic resource base, increase our knowledge of genes, genomes, and biological processes, and provide economically and environmentally sound technologies that will improve the production efficiency, health, and value of the Nation’s crops.

Baseline 2006

Ten new technologies developed and used by ARS customers to increase production efficiency and enhance the economic value and quality of U.S. crop production while decreasing the environmental footprint of production systems.

Target 2011

Cumulatively, 35 new technologies developed and used by ARS customers.

Actionable Strategies/Activities for Objective 2.2

- Integrate new science-based knowledge, management practices, technologies, or decision support tools to optimize efficient, economical, and environmentally sustainable production systems that are size- and scale-appropriate for a variety of farms and ranches.

- Identify optimal configurations of management practices for production systems that reduce production costs and risks.
- Develop sustainable systems for using available on-farm resources to produce biobased energy, fuel, and products.
- Conduct and support research to better understand and address consumer needs, tastes, and preferences.
- Utilize precision management, automation, and decision support technologies to increase production system efficiencies and enhance environmental benefits.
- Develop production strategies that utilize consumer preference and supply chain economic information to demonstrate how producers can respond to changing markets and increase economic opportunities.
- Provide scientific knowledge and analyses that inform policymakers seeking solutions to increase the profitability, efficiency, and competitiveness of American agriculture.
- Use industry, Federal, State, and local partnerships to convey research results, information transfer, and adoption of best agricultural practices.
- Characterize diverse germplasm for traits of economic importance in food animals.
- Develop and implement improved methods for genetic evaluation of food animals, including the assimilation of genomic information with pedigreed phenotypic data.
- Develop improved food animal management and production systems for enterprise profitability, reduced animal stress, and environmental stewardship to allow genetically improved livestock to fully express their production potential.
- Capitalize on the availability of annotated genome sequences of chicken, cattle, swine,

- and bioinformatic platforms through use of functional genomic, proteomic, and metabolomic approaches to improve reproductive rates, efficiency of nutrient utilization, and the quality and yield of animal products, and to increase innate animal resistance to environmental stressors.
- Develop improved genomic and bioinformatic infrastructure for sheep, turkeys, and important farmed aquaculture species.
 - Identify important genes and their regulatory pathways affecting economically important traits in food animals.
 - Improve germplasm preservation technologies for male and female gametes in poultry, swine, and aquatic animals.
 - Increase the number of catalogued secure populations of cattle, swine, sheep, goats, poultry, and aquatic species in the National Animal Germplasm Program.
 - Evaluate and develop production systems that enhance economic opportunities for small and mid-sized producers, including forage-based livestock production systems for beef and dairy production and aquaculture systems.
 - Acquire information and processes to increase the use of plant proteins in place of fish meal for carnivorous aquaculture species.
 - Identify diagnostic tools, biologics, and disease resistant strains of aquaculture species to protect aquaculture species against major pathogens and improve productivity.
 - Create effective nutritional programs for food animal production systems that efficiently capture and utilize byproducts of biofuel production.
 - Develop and release crop germplasm with enhanced resistance to pests, pathogens, and weather damage.
 - Develop and release new crop germplasm resources for commercial use that have enhanced protein and oil quality.
 - Develop and release new crops that differentiate the U.S. agricultural production base to provide higher value products.
 - Identify new genetic methods and tools to identify specific genes that mediate end product traits desired by consumers, such as nutritional content, oil, grain quality, disease resistance, and stress tolerance in agricultural crops.
 - Produce tools to identify specific genes that lead to improved crop quality and composition of agricultural commodities.
 - Improve plant genetic transformation systems to expand their usefulness, and improve exploitation of genome sequence information to identify valuable genes in raw germplasm collections.
 - Develop DNA markers linked to genes that confer resistance to biotic and abiotic stress to accelerate plant germplasm evaluation and breeding.
 - Describe the structure, function, and regulation of agriculturally important genes and their protein products in model plants and crop plants.
 - Construct and maintain physical, genetic, and transcript maps to facilitate comparative analyses among plant genomes.
 - Identify, acquire, and expand the genetic base of crops through new accessions to enhance the diversity of plant germplasm collections.
 - Maintain and preserve a spectrum of crop genetic diversity in state-of-the-art genebanks.
 - Expand characterizations and evaluations of crop genetic resources to provide detailed genetic descriptions that facilitate their use in research and crop breeding.

STRATEGIC GOAL 2

- Expand characterizations and evaluations of beneficial organism genetic resources to provide detailed genetic descriptions that facilitate their use in research and enhanced crop production.
- Expand characterizations and evaluations of pest and pathogen genetic resources to provide detailed genetic descriptions that facilitate their use in research and pest and pathogen management.
- Make available crop, pest, pathogen, and beneficial organism genetic resources for research and development.
- Maintain genetic and genomic databases and effective “bioinformatic platforms” that distribute genomic information via standard software from the Internet.
- Expand the genetic base of crops through recurrent genetic recombination and selection for adaptation so as to facilitate use by geneticists and breeders.
- Strengthen breeding and evaluation of specialty crops and minor agronomic crops that have increasing economic importance.
- Create crop production systems and technologies that harness genetic potential to maximize profits and provide secure food, fiber, and flower supplies and ensure market competitiveness.
- Produce and implement sustainable, integrated crop production systems for the management of arthropod, weed, and disease pests through an integrated holistic system of biological, physical, cultural, and chemical methodologies.
- Improve understanding of the effects of management practices on crop productivity and quality.
- Develop mechanical harvesting systems to greatly increase labor productivity, reduce costs, and maintain quality, especially for, but not limited to, fruit, vegetable, greenhouse, and nursery crops.
- Identify the means to provide site specific application of pest control strategies.
- Produce technologies and information to help applicators ensure appropriate application and delivery of pesticides to target and comply with safety and regulatory requirements.
- Create and test remote and noninvasive sensor technology (e.g., acoustics) for pest detection, quantification, and eradication.
- Develop and test sensors for selective harvesting, particularly for fruit and horticultural crops.
- Evaluate system components that will enhance ornamental and food crop production within controlled environments and provide flexibility to meet changing market demands.
- Identify effective pest management strategies for pollinators.
- Develop sustainable pollinator management systems to improve on-farm profitability.

OBJECTIVE 2.3: PROVIDE RISK MANAGEMENT AND FINANCIAL TOOLS TO FARMERS AND RANCHERS

Activities related to this objective are primarily carried out by other USDA agencies.

Key External Factors

There are numerous external factors that play a role in the ability of ARS to enhance the competitiveness of farm economy. Recent concerns about the oil supply have led to increased interest in the development of biofuels as a source of energy and to reduce on-farm fuel use. This issue could greatly impact agricultural production practices and give rise to many opportunities for producers as the demand for corn, soybeans, and other biomass crops increases dramatically.

Globalization of agricultural commodity production also remains a factor that is continually impacting the trade environment and affecting the demand and price for certain agricultural products. Globalization also increases the risk of exotic diseases and pests, posing a potential threat in both animal and plant production. Technology advancements play a key role in the competitiveness and sustainability of rural and farm economies, as they increase the efficiency of agricultural production and provide opportunities for the production of new value-added products that enhance economic benefits to producers.

Strategic Goal 3:

Support Increased Economic Opportunities and Improved Quality of Life in Rural America

Approximately 20 percent of Americans live in rural communities. Although farm income provides an important source of revenue for some rural families, the majority are not dependent on agriculture and rely on local, off-farm employment to supplement their farm income. Many rural residents depend on Government aid to provide them with financial and technical assistance for business and industry, water and waste disposal, community facilities, advanced telecommunications and broadband infrastructure, electric utilities, and housing.

Programs and activities related to this goal are primarily carried out by other USDA agencies. However, ARS has a large and very positive impact on rural America. For example, the National Agricultural Library operates the Rural Information Center (RIC). (<http://ric.nal.usda.gov/>) The Center assists local communities by providing information and referral services to local, tribal, state, and Federal government officials; community organizations; libraries; businesses; and citizens working to maintain the vitality of America's rural areas. The RIC Web site contains over 3,000 links to sources of current and reliable information on a wide variety of rural resources and funding sources, including RIC's Database: Federal Funding Sources for Rural Area Databases (http://ric.nal.usda.gov/nal_web/ric/ffd.php).

The Rural Information Center information and referral services include:

- Responding to a broad array of information requests on topics such as successful strategies, models, and case studies of community development projects; small business attraction, retention, and expansion; housing programs and services; tourism promotion and development; recycling

programs and community water quality; and technology transfer to rural areas.

- Developing customized information products in response to specific inquiries (e.g., assistance in economic revitalization issues; local government planning projects; funding sources; technical assistance programs; research studies, etc.)

In addition, in support of the White House Initiative on Tribal Colleges and Universities (TCU), ARS provides opportunities to American Indian communities through Memoranda of Understanding, specific cooperative agreements, and various programs and activities. ARS helps to strengthen the management and administrative infrastructure of TCU libraries; provides facilities and equipment to the libraries; sponsors internships, fellowships, lectures, career fairs, workshops, and other learning and training opportunities for TCU students and faculty; and provides student tuition assistance. These outreach efforts are intended to improve the quality of life in Native American communities by ensuring their access to USDA sponsored programs.

However, in planning future research, ARS organizes its research program around the other four programmatic USDA/ARS Strategic Plan goals. In conducting research to ensure the quality and safety of food and other agricultural products, assess the nutritional needs of Americans, sustain a competitive agricultural economy, and enhance the natural resource base and the environment, ARS helps to provide economic opportunities for rural citizens, communities, and society as a whole.

Strategic Goal 4: Enhance Protection and Safety of the Nation's Agriculture and Food Supply

A secure and efficient agricultural production system is critical to providing the American consumer with a safe and healthy food supply. To maintain such a system, it is necessary to minimize production losses; maintain market viability; promote responsible environmental stewardship; and prevent, monitor, and control diseases that affect animals and humans. Diseases can negatively affect agricultural production systems by causing direct harm to livestock, threatening the health of agricultural workers and the public, and impacting trade.

ARS is an essential partner in ensuring the safety of the Nation's crop and animal products, producing the knowledge that the Nation needs to constantly improve and protect agricultural processes and products. As the agroecosystem evolves in response to changing conditions and human needs, ARS develops the knowledge to protect the Nation's agricultural supply from new threats presented by pathogens, parasites, environmental stresses, and arthropods. The Agency also participates in the development of new, practical technologies, and in the transfer of commercially viable concepts to industry. ARS research and technologies are used by many other Federal and private groups and action agencies, such as the Departments of Defense and Homeland Security, to protect the health of personnel, the integrity of property, and the environmental safety of logistic operations.

STRATEGIC RESULT: A SAFE U.S. FOOD SUPPLY AND AGRICULTURAL PRODUCTION SYSTEM

OBJECTIVE 4.1: PROVIDE THE SCIENTIFIC KNOWLEDGE TO REDUCE THE INCIDENCE OF FOODBORNE ILLNESSES IN THE U.S.

For the Nation to have safe and affordable food, the food system must be protected at each step from production to consumption. The production and distribution system for food in the United States encompasses a diverse, extensive, and easily accessible system that is open to the introduction of pathogens (bacteria, viruses and parasites), bacterial toxins, fungal toxins (mycotoxins), and chemical contaminants through natural processes, global commerce, and intentional means. In response to these threats, crop and livestock production systems must be protected during production, processing, and preparation from pathogens, toxins, and chemicals that cause disease in humans.

To ensure the security of production systems, ARS conducts basic, applied, and developmental research resulting in new technologies, new and improved management practices, pest management strategies, sustainable production systems, and methods of controlling potential contaminants. These ARS activities are key to providing a safe, plentiful, diverse, and affordable supply of food, fiber, and other agricultural products.

Key Outcome: Reduction in foodborne illness associated with the consumption of meat, poultry and egg products.

Performance Measure

4.1.1 Develop new technologies that assist ARS customers in detecting, identifying, and controlling foodborne diseases that affect human health.

Baseline 2005
Thirteen new technologies developed and used by ARS customers to detect, identify, and control the most critically and economically important foodborne contaminants causing illness, death, or chronic disease that impact public health and industry, as determined by FSIS, APHIS, ERS, CDC, FDA, DHS, DoD, Risk Assessment Consortium, Codex Alimentarius Commission, and consumer and commodity organizations.
Target 2011
Cumulatively, 40 new technologies developed and used by ARS customers.

Actionable Strategies/Activities for Objective 4.1

- Develop an understanding of the transmission and dissemination of food safety pathogens during the transport and slaughtering process, using knowledge of biology and epidemiology as well as surveillance data of pathogens in animal production.
- Study the respective roles of ecology, genomics, chemical residues, and host-pathogen relationships during animal production to gain an understanding of the transmission and dissemination of pathogens and toxins in and among food producing animals.
- Develop intervention strategies to control food safety pathogens in animal production that

will provide technologies to help producers present pathogen free animals for slaughter, and produce pathogen free eggs and milk.

- Identify the factors responsible for mediating antimicrobial resistance in foodborne and commensal bacteria; the mechanisms of antimicrobial resistance transmission; and the incidence, persistence, and rates of dissemination.
- Develop and validate detection technologies that have regulatory, industry, and research uses for solving preharvest and postharvest pathogen and chemical contamination problems.
- Develop online, computerized sensing systems that will assist and improve regulatory and in-house inspection systems, minimizing the problems of human error and variability, while increasing commercial processing productivity and profitability.
- Develop improved food production, processing, handling, distribution, and storage techniques by identifying the factors that contribute to the spread of pathogens and developing techniques to eliminate cross contamination.
- Develop new and innovative intervention technologies for food processing by improving an understanding of these technologies' modes of action and their effects on the microbial ecology of a food product.
- Utilize/apply leading edge technologies, such as genomics and proteomics, for the development of rapid diagnostic technologies. This allows for rapid and discriminatory detection and enumeration of pathogens during processing and storage and the development of predictive models and risk assessments, both of which are critical in assisting regulatory agencies in making food safety decisions that impact public health and

industry in developing Hazard Analysis and Critical Control Point plans.

- Conduct research that allows the expansion of exposure assessment, dose response, risk characterization, and overall Quantitative Microbial Risk Assessment, including the development of more robust predictive and process risk models that specifically address hazards in complex food matrices.
- Determine the effect of intrinsic and extrinsic factors on virulence mechanisms that directly impact pathogenicity and the emergence of new pathogen types.
- Establish technologies to protect food that has been identified as at-risk, strengthen and expand laboratory preparedness, and develop rapid and confirmatory laboratory technologies to analyze suspect foods for select agents, toxins, and chemical contaminants.
- Develop and validate technologies, including online methods, which have regulatory, industry, and research uses for solving mycotoxin contamination problems.
- Determine fungal/insect/crop/environment interactions present during both fungal and plant growth and maturation, using this knowledge to develop effective new control strategies, including agronomic practices, competitive exclusion, and insect controls, to prevent toxin accumulation of fungal or plant origin in crop plants.
- Develop optimum production practices and the ability to predict when mycotoxin contamination may occur in the field.
- Use -omic technologies (*e.g.*, genomics and proteomics) to elucidate the dynamics of the fungal-crop relationship; identify both the genes and regulatory elements in the biochemical pathways that lead to mycotoxin formation; and provide the basis for

mycotoxin control through resistant crops. Use this information to assist in developing crop varieties that will not support fungal growth and toxin production.

OBJECTIVE 4.2: REDUCE THE NUMBER, SEVERITY AND DISTRIBUTION OF AGRICULTURAL PEST AND DISEASE OUTBREAKS

Safeguarding workers, property, domestic animals, and crop plants from pests and diseases is essential to American agriculture. Left without protection, agricultural production would decrease dramatically, threatening the Nation's prosperity and security. Because the United States is the world's largest exporter of agricultural goods, threats to U.S. agriculture are threats to our trading partners as well. Many pests and diseases are native to the United States; others have succeeded in becoming invasive pests, and yet others are likely to be introduced and established. Resources for preventing these problems are always going to be scarce in relation to the challenges, so the best knowledge available is necessary to focus the effort. An increasingly global agricultural economy and the threat of agroterrorism make the recognition and identification of potential new problems important and their prevention all the more challenging.

In the course of agricultural production, processing, and marketing, a wide array of pathogens and pests can threaten efficiency. The extent of damage depends on several factors. Influences such as globalization, international commerce, and the industrialization of agriculture can necessitate the increased movement of animals during production, lead to an increased presence of arthropod vectors, and increase the resistance of disease-carrying pathogens, ultimately increasing the severity of diseases and pests for crops, livestock, or even humans. Researchers' efforts to

improve the efficacy of early detection and surveillance systems; increase the availability of vaccines, biotherapeutics, insecticides, and other protection systems; and develop effective quarantine measures can greatly decrease the severity of diseases and pests.

ARS plays a vital role in defending the Nation’s agriculture from pathogens and pests, providing the knowledge necessary for agriculture to adapt to changing conditions. To shape its research efforts, the Agency regularly examines Homeland Security issues that might affect the quality of the Nation’s food and fiber. ARS conducts research to find the best methods of protecting and treating agricultural commodities in storage facilities; reduce contamination from improper storage practices; and develop integrated systems for risk assessment, surveillance, treatment, and monitoring of pests and diseases. ARS maintains partnerships with Federal and State agencies and industry and professional organizations, whereby knowledge and discoveries are refined and applied to develop products and integrated systems to optimize protective efforts against pests and pathogens.

Key Outcome: The knowledge the Nation needs for a secure agricultural production system and healthy food supply.

Performance Measures

4.2.1 Provide scientific information to protect animals, humans, and property from the negative effects of pests, infectious diseases, and other disease-causing entities.

Baseline 2005

Two research studies completed that had significant impact on the scientific community and will lead to new technologies for protection of humans, property, and livestock from harm due to pests or diseases.

Target 2011

Cumulatively, complete 10 research studies that have significant impact on the scientific community, leading to development of technologies for the integration of prevention and treatment strategies to manage top priority endemic and exotic threats to livestock, humans, and property.

4.2.2: Develop and transfer tools to the agricultural community, commercial partners, and government agencies to control or eradicate domestic and exotic diseases and pests that affect animal and human health.

Baseline 2005

One technologies used by the commercial and government sectors relevant to the protection of humans, property, and domestic animals.

Target 2011

Cumulatively, transfer five technologies to the commercial and government sectors.

4.2.3: Develop control strategies based on fundamental and applied research to reduce losses caused by plant diseases, nematodes, arthropods, and weeds that are effective and affordable while maintaining environmental quality. Develop technically and economically feasible alternatives to preplant and postharvest use of methyl bromide.

Baseline 2006
Developed eight new, environmentally sound management practices that include crop resistance/tolerance through classical breeding and biotechnology, rapid and reliable diagnostics, pesticide development and use, and cultural and biological control. Biorationals have been studied and improvements explored that will provide additional protection for agriculturally important plants from pests and pathogens.
Target 2011
Specific information and technology using methods cited above will be made available to producers and the research community to exclude, control, and/or better manage disease and pest outbreaks as they occur. Strategies and approaches will be made available to producers to identify and control and/or effectively manage over 10 new and emerging crop diseases and pests.

4.2.4: Provide needed scientific information and technology that is environmentally acceptable to producers of agriculturally important plants in support of exclusion, early detection and eradication, control, and monitoring of invasive arthropods, weeds, nematodes, and pathogens; enhanced sustainability; and restoration of affected areas. Conduct biologically-based integrated and area-wide management of key invasive species.

Baseline 2006
Developed and implemented strategies for management of key invasive pest species, such as the Asian longhorned beetle, leafy spurge, melaleuca, glassy-winged sharpshooter, whiteflies, and other species. Provided data in support of industry needs, APHIS and other action agencies. Conducted Areawide pest management programs for five insects and weeds. Increased systematic capabilities for fungal, bacterial and viral plant diseases and insect pests. Developed data for use in risk analyses of biological control agents, particularly with regard to modeling prediction of risk and protection of non-target species. NAL continued to operate www.invasivespeciesinfo.gov .
Target 2011
Improve knowledge and understanding of the ecology, physiology, epidemiology, and molecular biology and genomics of endemic and emerging diseases and pests. Incorporate this knowledge into at least 10 management strategies to minimize chemical inputs and increase production. Expand systematics of arthropods, fungi, and other biological collections' infrastructure.

4.2.5 Provide environmentally sound fundamental and applied scientific information and technologies to action agencies, producers, exporters, and importers of commercially important plant and animal products in support of exclusion, early detection, and eradication of quarantine pests and pathogens that can impede foreign trade.

Baseline 2006
Developed and implemented five strategies for exclusion, detection, and eradication of quarantine pests and pathogens. Provided data in support of needs of industry, APHIS, and other action agencies. New technologies developed and implemented by action agencies that have opened new export markets.
Target 2011
Improved knowledge and understanding of quarantine pest and pathogen biology and epidemiology, leading to 30 new technologies implemented by industry, APHIS, or other action agencies to mitigate risk of pests and pathogens resulting in expanded export markets while protecting the safety and security of American agriculture.

Actionable Strategies/Activities for Objective 4.2

- Make available reliable diagnostic molecular assays to detect and identify emerging pathogens and pests.
- Develop diagnostic reagents, methods, and protocols established for validation by action agencies and State cooperators.
- Conduct genomic sequencing of multiple strains of fungi, bacteria, and viruses to identify origins and movement of organisms and to apply data to improved diagnostic methods.
- Identify new natural enemies for introduction to management programs.
- Expand systematics of insects, mites, weeds, pathogens, and nematodes for application to biological control and management.
- Develop alternatives to methyl bromide as a soil treatment to control quarantine and non-quarantine soilborne pathogens, pests, and weeds and as a postharvest commodity treatment for control of quarantine and non-quarantine insects.
- Implement Integrated Pest Management Systems and Areawide Suppression Programs.
- Improve predictive modeling capabilities for tracking new pests and pathogens.
- Increase interdisciplinary research for pest and disease management.
- Conduct epidemiological investigations to understand disease transmission mechanisms.
- Identify and apply new technologies that increase our understanding of virulence factors and host defense mechanisms. Priority will be given to identification of genes that convey virulence traits in pathogens; factors that modulate infectivity, gene functions, and mechanisms; genetic profiles that provide specified levels of disease resistance under field conditions; and mechanisms that facilitate the spread of pests and infectious diseases.
- Improve knowledge and understanding of the ecology, physiology, epidemiology, and molecular biology of existing and emerging diseases and pests. This knowledge will be incorporated into pest risk assessments and management strategies to minimize chemical inputs and increase production.
- Develop new knowledge and integrated pest management approaches to control pest and disease outbreaks as they occur. Strategies and approaches will be available to producers to control emerging crop diseases and pest outbreaks.
- Improve eradication of invasive species.
- Reduce risks and losses from invasive species to our agronomic crops.
- Enhance taxonomic knowledge of potential predators for invasive species through weed identification; systematics; biologically-based, integrated pest management; and ecosystem management.
- Develop data needed to support registration of pest control materials for minor crops.
- Develop research technologies to mitigate animal and plant health issues that impede trade.
- Develop new technologies to quickly and accurately detect key quarantine pests and pathogens.
- Find environmentally acceptable, effective means of removing quarantine pests from U.S. animal and plant commodities to increase export trade opportunities.
- Reduce/remove risk of introducing pests to other countries to expand markets to U.S. growers and producers.

- Support action agencies with research to remove quarantine barriers to movement of U.S. commodities.
- Develop management strategies to exclude quarantine pests and pathogens from entry to important agricultural production areas to safeguard American agriculture.
- Develop new technologies and strategies to eradicate key quarantine pests and pathogens.
- Develop advanced information systems and services in the areas of food safety and invasive species.

much more quickly. In addition, protecting food safety and representing the safety of the food supply to the public are likely to become more challenging as we apply new technologies to answer the need for an ever increasing food supply produced and distributed with less negative impact on the environment. Bioengineering based on genomics and proteomics will be a key technology for more efficient agriculture, but it will have to be applied safely and in a manner that informs the public that it is safe. Increases in the sheer volume of food distribution and storage are likely to challenge the traditional systems that keep these processes safe.

Key External Factors

There are several external factors that will significantly impact the protection and safety of the Nation's agriculture and food supply. As the Agency establishes and executes its mission, the objectives of ARS research will be greatly influenced by globalization, bioterrorism, and new challenges to food safety. Most notably, globalization has had a great impact on American agriculture. On the positive side, it creates new markets for U.S. products and creates a more complete distribution of the world's food supply. On the negative side, globalization creates the potential for the redistribution of microbiological, botanical, and animal pests. Because of this ongoing danger, it is necessary to develop new and improved methods to detect, identify, eliminate, and if needed, mitigate the economic and health related impact of these threats to our agriculture and our trading partners. While globalization increases the risk of unintentional introduction of biological threats to agriculture, bioterrorism is the intentional introduction of threat species. Presumably, such intentional introduction would select agents based on their efficient use as weapons and therefore pose an even greater threat to U.S. agriculture than unintentional introductions. The same steps are necessary to manage an intentional introduction (*i.e.*, risk assessment, surveillance, control/eradication, and monitoring), but they would need to be taken

Strategic Goal 5:

Improve the Nation's Nutrition and Health

Improving the Nation's health requires improving the quality of the American diet.

The United States is experiencing an obesity epidemic resulting from multifaceted causes including sedentary lifestyles, selection of readily available high calorie foods, and increasing portion sizes. In addition, 4 of the top 10 causes of death in the United States—heart disease, cancer, stroke, and diabetes—are strongly associated with the quality of our diets—diets too high in calories, saturated fat, sodium, and added sugars, and too low in fiber rich foods such as fruits, vegetables, and whole grains. There is an increasing demand for foods that taste good, are convenient, economical, and yet offer nutrition and health benefits. Building a strong connection between agriculture and human health is an important step to providing a nutritionally enhanced food supply. Promoting healthier food choices and educating Americans to balance caloric intake with sufficient daily physical activity are vital steps to preventing obesity and decreasing risk for chronic diseases.

ARS conducts research to identify nutritive and health promoting components in foods, improve the understanding of human nutrient requirements at all stages of the life cycle, and better understand the relationships between diet and health. The Agency also determines the composition and bioavailability of beneficial components in foods, conducts the national "What We Eat in America" food consumption survey to track the nutritional quality of the American diet, and conducts research on dietary interventions and strategies for modifying diets, food choices, and physical activity behaviors. The outcomes of these combined research efforts provide a scientific knowledge base to evaluate the healthfulness of the American diet and food supply, and to establish sound dietary recommendations for Americans, such as the Dietary Reference Intakes

and the USDA/HHS Dietary Guidelines. The information is widely used by policymakers, Government agencies, industry, and educators to promote better diets, reach children early, and enable people to make healthful food and lifestyle choices.

OBJECTIVE 5.1: ENSURE ACCESS TO NUTRITIOUS FOOD

Activities related to this objective are primarily carried out by other USDA agencies.

STRATEGIC RESULT: SIGNIFICANT CHANGE IN THE NATION'S NUTRITION STATUS

OBJECTIVE 5.2: PROMOTE HEALTHIER EATING HABITS AND LIFESTYLES

The prevalence of obesity in the United States has doubled during the past two decades, making it a critical public health problem. High quality research is required to address this multifaceted problem. Good health is dependent on adequate physical activity combined with consumption of foods with the right balance of nutrients to meet an individual's needs within caloric requirements.

Building databases of food composition is critical to developing healthy diets. Also important is improving the health promoting value of foods through selection, biotechnology, processing, and other practices. ARS research will monitor food consumption patterns of Americans across time, define ways to prevent obesity (particularly in minority populations who are particularly susceptible to this condition) improve health through dietary manipulation, and help establish optimal levels of nutrients/foods to maximize health.

Key Outcome: Eating habits more consistent with dietary guidelines for Americans.

Performance Measures

5.2.1 Monitor food consumption/intake patterns of Americans, including those of different ages, ethnicity, regions, and income levels, and measure nutrients and other beneficial components in the food supply. Provide the information in databases to enable ARS customers to evaluate the healthfulness of the American food supply and the nutrient content of the American diet.

Baseline 2005
Three food intake and nutrient content databases released by ARS and used by ARS customers to establish Federal dietary policy guidelines, food assistance and feeding programs, and food labeling to safeguard the health of the American people. Also, NAL continued to operate nutrition.gov.
Target 2011
Cumulatively, 25 new databases developed and released to ARS customers.

5.2.2 Define the role of nutrients, foods, and dietary patterns in growth, maintenance of health, and prevention of obesity and other chronic diseases. Assess bioavailability and health benefits of food components. Conduct research that forms the basis for and evaluates nutrition standards and Federal dietary recommendations.

Baseline 2005
Three Federal and Institute of Medicine reports used to establish Federal nutrition policy and regulations that employ ARS research results in formulating recommendations to safeguard the health of the American people.

Target 2011
Cumulatively, 23 new reports using ARS research to develop authoritative positions on nutrition and health issues.

5.2.3: Publish research findings not encompassed under the other performance measures for this objective likely to significantly advance the knowledge of human nutrition, extensively influence other researchers in the same or related field, or yield important new directions for research.

Baseline 2003
Six research studies published in peer reviewed biomedical literature with the potential to strongly influence the field of human nutrition or have demonstrated impact through high citation rates.
Target 2011
Cumulatively, 30 new scientific papers will be published that generate high impact among the research community.

Actionable Strategies/Activities for Objective 5.2

- Develop new methodologies to measure nutrients and other bioactive components of food.
- Obtain, evaluate, and provide food composition data in appropriate databases.
- Monitor the dietary intake and improve the quality of methodology for collecting such data from individuals, subgroups, and the overall population. Provide dietary intake data in databases.
- Develop multidimensional, pharmacokinetic models to predict human bioavailability of health promoting components in foods.

- Conduct research to establish nutrient requirements for all stages of the life cycle to better understand the bioavailability of nutrients in foods and the role of nutrition in disease prevention and health promotion. Special emphasis will be placed on studies that contribute to establishment of “Dietary Reference Intakes” and “Dietary Guidelines for Americans.”
- Test efficacy of the “Dietary Guidelines for Americans” to prevent obesity and other chronic health problems.
- Perform studies aimed at understanding why consumers make the food choices that they do and carry out interventions that will successfully persuade consumers to make healthier eating and physical activity choices.
- Understand better the interactions between genes and diet, determining the health benefits obtained in response to nutrients or other food components studied within the food matrix. This includes how genetic diversity, especially in targeted subpopulations, affects the response to nutrients and other food components and how genetic diversity interrelates with risk factors for obesity and chronic diseases.
- Identify, characterize, modulate, and document the health benefits for humans of biologically active components in agricultural crops and animals. Perform human studies on the most promising new foods and food components following preclinical evaluations.
- Identify new biomarkers for assessing nutritional and health status.
- Expand and enrich the knowledge base of information about nutrition and health through the continued development of nutrition.gov.

OBJECTIVE 5.3: IMPROVE NUTRITION ASSISTANCE PROGRAM MANAGEMENT AND CUSTOMER SERVICE

Activities related to this objective are primarily carried out by other USDA agencies.

Key External Factors

External factors that affect the nutritional quality of the American diet include societal changes as well as recent technology developments. Societal change, including changes in lifestyle and population dynamics, is a key external factor in the mission to improve American health. For various reasons, there has been a steady increase in the consumption of fast food products and other processed foods that are high in saturated or trans fat and added sugars, combined with a steady decline in physical activity levels. These trends clearly play a role in the rising incidence of obesity and in obesity related health problems. To combat these trends, there is a great need for better intervention strategies to improve nutritional habits. Advancements in technology—genomics and proteomics, bioengineering, and decision modeling—may play a key role in providing solutions. With these technological developments, scientists can develop ways to modify the nutritional quality of foods, producing food products lower in saturated fat and sugars and higher in vitamins and minerals. However, while technology can improve foods, the key change needed is behavioral, and more effective intervention strategies are needed to reverse current dietary trends. Research is needed to study the nutrients in foods and determine how the body uses them. With this knowledge, scientists will be able to better understand the nutritional needs of Americans in relation to their dietary habits and help them improve their dietary habits.

Strategic Goal 6:

Protect and Enhance the Nation's Natural Resource Base and Environment

There is no substitute for fresh water, high quality soils, and clean air in productive agricultural ecosystems. Reliable supplies of food, fiber, feed, forages, and energy feedstock are essential for a productive agricultural sector and the maintenance of goods and services derived from the Nation's crop, pasture, and range lands. Agriculture relies on a healthy natural resource base whose sustainability depends on sound, science-based agricultural practices.

ARS research activities are designed to help ensure that the Nation's natural resources meet the long term needs of a vibrant society with its increasing population while enhancing the quality of life for producers, rural communities, and the Nation. To achieve these goals, ARS conducts multidisciplinary research to solve problems arising from the interaction between agriculture and the environment, and develops new practices and technologies to conserve the Nation's natural resource base and balance production efficiency with environmental quality. Since environmental quality is a global problem, ARS is expanding collaboration with international research institutions with the aim to produce technologies and practices that mitigate the adverse impacts of climate on agriculture and agriculture on the environment.

STRATEGIC RESULT: HEALTHY WATERSHEDS, HIGH QUALITY SOILS, AND SUSTAINABLE AGRICULTURAL SYSTEMS

OBJECTIVE 6.1: ENHANCE WATERSHEDS' CAPACITIES TO DELIVER SAFE AND RELIABLE FRESH WATER

Water is fundamental to life and is a basic requirement for virtually all of our agricultural, industrial, urban, and recreational activities, as well as the sustained health of watersheds. ARS conducts fundamental and applied research on the processes that control water availability and quality for the health and economic growth of the American people. The Agency is working to develop and transfer to producers, action agencies, local communities, and resource advisors new knowledge, improved technologies, conservation practices, and decision support systems that will enable them to reuse degraded waters, improve water conservation, and increase water use efficiency in agriculture. This research will provide the tools to reduce the transport of agricultural pollutants and the associated degradation of terrestrial and aquatic ecosystems. The overall goal is to provide knowledge and tools to enhance water availability and quality, mitigate the adverse impact of droughts and floods on rural and urban communities, and improve the health of our Nation's watersheds.

Key Outcome: Safe, abundant, and reliable water resources.

Performance Measure

6.1.1 Develop technology and practices to reduce the delivery of agricultural pollutants by water on farms and ranches and quantify the environmental benefit of conservation practices in watersheds.

Baseline 2005

Four agricultural practices and technologies developed and used by customers to enhance water quality and availability.

Target 2011

Cumulatively, 10 agricultural practices and technologies will have been developed and used by customers to enhance water quality and availability.

Actionable Strategies/Activities for Objective 6.1

- Develop methods to conserve water and reuse degraded waters to mitigate the impacts of drought and enhance water availability.
- Develop measurement techniques to quantify the fate and transport of agricultural pollutants.
- Develop conservation practices to reduce transport of agricultural pollutants and decision support systems to evaluate the effectiveness of conservation practices on improving water availability and quality.
- Provide the knowledge and techniques to evaluate, improve, and restore stream corridors and riparian ecosystems.
- Provide the knowledge and tools to monitor and assess the status and trends of watershed health.

OBJECTIVE 6.2: IMPROVE SOIL AND AIR QUALITY TO ENHANCE CROP PRODUCTION AND ENVIRONMENTAL QUALITY

High quality soil and air resources are essential for enhanced crop production and environmental stewardship. Productive soils enable efficient cycling of nutrients, help sequester atmospheric carbon, contribute to improved water and air quality, and foster other ecosystem services such as wildlife habitat. However, soils are vulnerable to degradation and damage through natural processes and human activities.

Air quality and atmospheric gas composition also have an impact on, and are in turn impacted by, agricultural production. Research is needed to control gaseous and particulate matter emissions from agricultural operations to protect air quality and mitigate impacts on climate.

ARS provides agricultural producers and land managers with strategies and technologies to enhance soil and air quality, and provides Federal and State agencies with science-based information to establish policy and regulatory decisions. For example, ARS research develops remedies for soil conditions limiting crop production and adversely affecting environmental quality. The Agency also works toward further developing safe and productive applications of animal manure and selected industrial and municipal byproducts as a low cost means of enhancing soil properties and improving crop production. Additionally, ARS is developing new measurement and prediction tools to determine the effects of agricultural land management practices on soil quality. In addressing its research objectives, ARS works to balance the stewardship of air and soil resources with the attainment of profitable and sustainable agricultural yields.

Key Outcome: Enhanced crop production and improved environmental quality.

Performance Measure

6.2.1 Develop practices and technologies to enhance soil resources and reduce emissions of particulate matter and gases from crop production lands, agricultural processing operations, and animal production systems.

Baseline 2005
Six agricultural practices and technologies to enhance soil and air natural resources developed and used by customers and partners.
Target 2011
Cumulatively, 18 agricultural practices and technologies to enhance soil and air natural resources will be developed and used by customers and partners.

Actionable Strategies/Activities for Objective 6.2

- Develop and evaluate management practices and technologies to overcome soil limitations that inhibit food, feed, fiber, and energy production and degrade environmental quality.
- Measure and predict carbon sequestration and greenhouse gas emissions (*i.e.*, carbon dioxide, methane, nitrous oxide) across a range of climate, soil, and crop production systems to facilitate market-based incentives and conservation program decisions.
- Develop and evaluate practices, technologies, and decision tools to measure, predict, and control emissions of particulate matter and gases from agricultural operations to enhance air quality and limit greenhouse gas emissions.
- Measure and predict the impact of atmospheric composition and climate variation on agricultural systems, and develop

technologies to enable agricultural systems to adapt to change.

- Develop management practices, control technologies, and decision tools to reduce or eliminate atmospheric emissions, loss of nutrients, and offsite transport of pathogens and pharmaceutically active compounds from animal production operations.
- Develop guidelines for safe and effective agricultural uses of manure and selected municipal and industrial byproducts to lower production costs, improve soil properties, and reduce use of energy and petroleum-based products.

OBJECTIVE 6.3: CONSERVE AND USE PASTURE AND RANGE LANDS EFFICIENTLY

Healthy, vigorous plant communities on diverse lands protect soil quality, prevent soil erosion, and provide sustainable forage and cover for livestock and wildlife. They also provide fiber and a diverse habitat for wildlife, improve water quality and sequester atmospheric carbon dioxide. The four serious threats that pose an increasing risk to the values, goods, and services provided by public and private pasture and range lands are wildfire, invasive species, loss of open space, and reduced profitability.

ARS works with public and private land stewards to maintain/enhance watersheds and landscapes and their environmental services. The Agency produces the scientific knowledge needed to actively manage pasture and range lands and maintain the health, diversity, and resilience of these ecosystems.

Key Outcomes: Pasture and range land management systems that enhance economic viability and environmental services.

Performance Measure

6.3.1 Improved management practices and technologies for managing pasture and range lands to improve economic profitability and enhance environmental values.

Baseline 2005

Fifteen new technologies or strategies provided to pasture, forage, and range land managers to conserve and restore natural resources while supporting profitable production.

Target 2011

Cumulatively, 39 new technologies or strategies will be provided to pasture, forage and range land managers to conserve and restore natural resources while supporting profitable production.

Actionable Strategies/Activities for Objective 6.3

- Provide new environmentally acceptable practices and technologies for controlling invasive weeds and reduce wildfires.
- Provide science-based information and technologies to better manage environmental services while improving the economic effectiveness of forage-based livestock, bioenergy, and turf systems.
- Provide improved grass and forage legume germplasm to meet economic and environmental objectives including conserving and improving pasture, forage, turf, and range land condition; plant vigor and diversity; water management; and environmental stewardship.
- Accelerate development of methodologies and technologies to measure and monitor pasture

and range land health and assess and document the benefits of conservation practices.

- Provide cost-effective practices and strategies for restoring degraded pasture, forage, and range lands.
- Develop and promote grazing and harvested forage practices and technologies for livestock and bioenergy production that reduce input costs and increase sustainability.
- Develop and promote management practices and technologies that reduce animal exposure to toxic plants.

Key External Factors

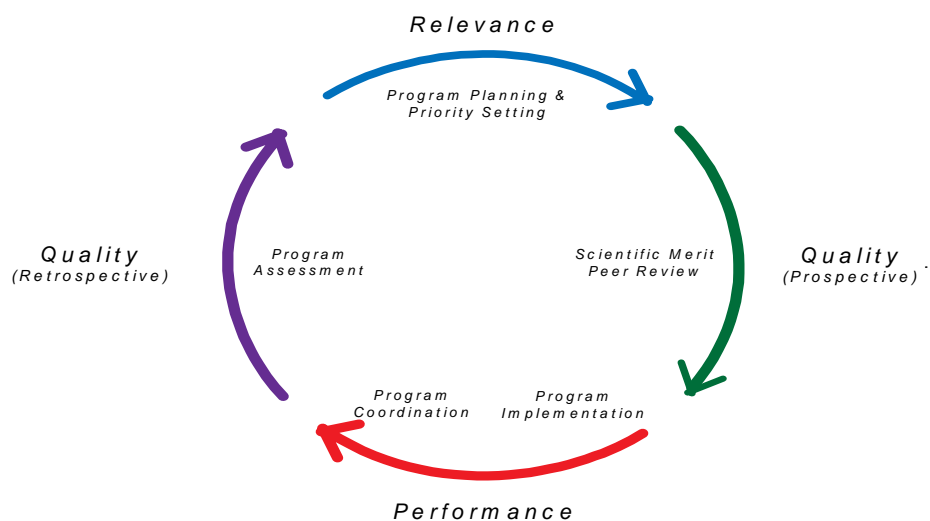
A number of external factors affect ARS' ability to enhance the quality of the Nation's natural resources, all related to concerns about the potential effects of agricultural practices on soil, water, and air quality. Concerns about global climate change and the accumulation of greenhouse gases in the atmosphere have increased demand for research to simultaneously reduce greenhouse gas emissions from agricultural lands and increase carbon sequestration. Concerns about the future availability of fresh water supplies have increased demand for technologies to reduce the export of fertilizers, herbicides, pesticides, and pharmaceuticals from agricultural lands, while assessing the efficiency of current conservation practices and the efficacy of restoring degraded lands in agricultural watersheds. Demographic changes and economic growth impact the value of land, and are associated with a rising interest in short term profitable uses for land at the expense of long term sustainability and natural resource management. In pasture and range land systems, competition for use of available water for agricultural, urban and suburban, and industrial needs has increased demand for research on the water use efficiency of various agricultural alternatives, as well as comparisons of the effects

of agriculture versus urban and suburban development on both water quantity and quality. Extreme weather events, such as flooding, drought, hurricanes, and other natural disasters, tend to exacerbate issues associated with quality, quantity, and stewardship of natural resources. In combination, these trends drive research needs to find ways to improve the quality of air, soil, and water resources, increase nutrient availability and carbon storage in soils, and conserve or restore biodiversity and ecosystem function in agricultural watersheds on both private and public lands. If sustainable agronomic practices are not developed to keep pace with increasing demands due to population growth and economic development on food, fiber, feed, and renewable energy from agricultural land, further erosion of quantity and quality of these ecosystems will ensue with profound adverse impacts on the National's economy and environmental security.

ARS Management Initiatives

ARS is continually assessing the relevance, quality, and performance of its research, providing agricultural information to the public through the National Agricultural Library and print and electronic media, ensuring adequate facilities to support Agency research, and ensuring a workplace conducive to personal and professional development.

RELEVANCE, PERFORMANCE, & QUALITY



The 5-year process depicted conceptualizes how ARS conducts its business of research. Relevance, Quality (Prospective and Retrospective), and Performance—represent what ARS does to ensure that its research is successful. Program Planning and Priority Setting, Scientific Merit Peer Review, Program Implementation and Coordination, and Program Assessment prescribe the actions that ARS undertakes to assure that its research is of the highest quality.

MANAGEMENT INITIATIVE 1: ENSURING THE QUALITY, RELEVANCE, AND PERFORMANCE OF ARS RESEARCH (COVERS ALL RESEARCH OBJECTIVES)

The Office of Management and Budget (OMB) has established Governmentwide R&D Investment Criteria that are designed to assess the relevance, quality, and performance of Federally funded research, and ARS adopted the R&D Investment Criteria as a tool to measure its research. To establish the relevancy of the Agency’s research programs, ARS relies on organized interactions with customers, stakeholders, and partners. Peer reviews conducted by the Office of Scientific Quality Review (OSQR) and the Research Position Evaluation System (RPES) ensure the quality of the Agency’s research and scientific workforce. All research projects are assessed annually to determine the number of currently approved milestones that were met/not met during the preceding fiscal year. Near the end of the 5-year program cycle, National Programs are subject to retrospective reviews, which verify the scientific impact and programmatic relevance of the work conducted under each National Program Action Plan. Performance Measure

MI 1.1 Relevance: ARS’ basic, applied, and developmental research programs are well conceived, have specific programmatic goals, address high priority national needs, and have direct relevancy in achieving ARS’ long-term goals.

Baseline 2004
As assessed against the Program Action Plans, the Agency’s long-term goals, and the priority needs of U.S. agriculture, 97.1% of ARS’ projects were conducting highly relevant research.
Target 2011
100% of ARS’ projects will be conducting highly relevant research.

MI 1.2 Quality: ARS' research projects are reviewed for quality by National Program using independent external peer review panels at the beginning of the 5-year National Program cycle.

On average, one fifth of the Agency's research projects are reviewed annually by external peer panels. Most projects receive initial scores of needing "No Revision," "Minor Revision," or "Moderate Revision" and are certified after any needed revisions, based on review panel comments, are made. The remaining projects, rated as needing "Major Revision" or as "Not Feasible", receive detailed comments from the review panel and are revised. When these revised projects are examined again by the panel, the majority receive scores of "No," "Minor," or "Moderate" revision needed. Those few projects (approximately 3% of all projects) still rated as needing "Major Revision" or "Not Feasible" after a second review are terminated and resources redirected to high priority projects. A strength of this peer review process is the opportunity to incorporate recommendations of peer panels and enhance ARS research.

The Research Position Evaluation System (RPES) conducts peer reviews of all ARS scientists on a three- to five-year cycle. RPES is designed to ensure that ARS will continue to classify and evaluate scientists through a peer process to ensure the highest quality scientific workforce.

Baseline 2005

RPES conducted 392 scientific peer reviews of ARS scientists: 181 (46.2%) were upgraded, 203 (51.8%) remained in grade or were referred to the Super Grade Panel, 3 (0.8%) could not be graded because of insufficient information, and 5 (1.3%) had a grade/category problem.

Target 2011

RPES will conduct 400 scientific peer reviews of ARS scientists.

OSQR and the Peer Review Process

OSQR and the Peer Review Process. The Office of Scientific Quality Review (OSQR) manages the ARS peer review system for research projects, which gives researchers the opportunity to obtain constructive feedback from their external peers. These reviews are conducted by panels made up almost entirely of non-ARS scientific professionals, including an external chairperson with expert knowledge pertinent to the research being reviewed. In their evaluations, panels assess each Project Plan's research methodology, probability of success, and scientific merit. The peer review panel provides comments and scores each project as needing "No Revision," "Minor Revision," "Moderate Revision," "Major Revision" or as "Not Feasible."

Baseline 2005

Using an average based on cumulative scores for the past five years, 76.1% of projects received scores of No, Minor, Moderate revision needed upon initial review and, overall, 97% received such scores by the completion of the review.

Target 2011

Using a cumulative five-year average, 80% of the projects reviewed will receive initial scores of No, Minor, or Moderate revision needed and 98% receive such scores by completion of review.

MI 1.3 Performance: ARS will monitor the percentage of annual research project milestones met.

All research projects are assessed annually to determine the number of currently approved milestones that were met/not met during the preceding fiscal year. Information as to why a milestone was not met (including mitigating circumstances) is collected and will be used for making program management decisions. ARS projects a 10 percent baseline level of milestones not met due to personnel attrition. Thus, the maximum achievable milestone target is reduced in real terms to 90 percent.

Each National Program is reviewed by external review panels at the end of its 5-year National Program cycle. The panel provides a written report on the quality of accomplishments, impact of the research, and thorough constructive critique recommendations for the next National Program cycle. Twenty percent of National Programs are reviewed annually.

Baseline 2004
85.3% of ARS project milestones were fully or substantially met.
Target 2011
89% of ARS' project milestones will be fully or substantially met.

Baseline 2004
NPS completed three National Program Reviews.
Target 2011
NPS will complete National Program Reviews for all Programs in the first 5-year cycle and will begin reviews for the programs currently in the second 5-year cycle.

National Program Assessment Process
 National Program Assessment is the final step of the ARS National Program cycle. The National Program's performance is assessed by an external panel of knowledgeable customers and stakeholders against commitments (research goals, objectives, products, outcomes) identified in the National Program Action Plan created at the beginning of the 5-year National Program cycle. The National Program Action Plan defines the research to be done by ARS in response to needs identified by users of ARS research. This input is gathered from customers and stakeholders at workshops, from regulatory agencies, and from Congress (legislation). Performance is evaluated based on the quality of the research leading to actual impact or progress toward anticipated benefits to end-users, scientific communities, and/or broader society.

Actionable Strategies/Activities for Management Initiative 1

- Conduct an annual assessment of projects to determine if they have maintained direct relevance in achieving ARS' long term goals and the priority needs of U.S. agriculture. Those projects considered of lower relevance will be redirected into higher priority research areas/objectives. *(Relevance)*
- Receive summary information from OSQR, using a statistical rolling average, of the results achieved during the initial panel review. *(Quality)*
- Receive a summary each year of peer reviews that RPES conducts on ARS scientists. *(Quality)*
- Assess each project's progress against each approved milestone, indicating whether it was fully met, substantially met, or not met with an explanation for the latter two ratings. Line management will review and concur in these assessments. Each year, NPS will review these assessments to validate their conclusions. *(Performance)*
- Assess National Programs to gauge the level of past performance and establish the research priorities and direction of the program for the next five-year cycle. This process, covering approximately 20 percent of the Agency's research program each year, provides valuable input to the writing teams that are drafting

Action Plans for the next five-year program cycle. *(Performance)*

MANAGEMENT INITIATIVE 2: ENSURE PROVISION AND PERMANENT ACCESS OF QUALITY AGRICULTURAL INFORMATION FOR USDA, THE NATION, AND THE GLOBAL AGRICULTURAL COMMUNITY VIA THE NATIONAL AGRICULTURAL LIBRARY

The National Agricultural Library (NAL) (<http://www.nal.usda.gov/>) has statutory mandates to identify, collect, preserve in perpetuity, and provide access to quality information relevant to agriculture; serve as one of four national libraries; serve as USDA's library; provide leadership in developing and operating a comprehensive agricultural library and information network; and provide specialized information services through such NAL information centers and programs as the Animal Welfare Information Center (AWIC) (<http://awic.nal.usda.gov/>), the Rural Information Center (RIC) (<http://ric.nal.usda.gov/>), the Food Safety Research Information Office (<http://fsrio.nal.usda.gov/>), and the Agriculture Network Information Center (AgNIC) (<http://www.agnic.org/>). The library serves a large and broad customer base, including such audiences as policymakers, researchers, agricultural specialists, farmers, members of the library, educational and agribusiness sectors, food stamp recipients, and the general public. Recently, the library, with partners in the land-grant university and agricultural information service communities, has initiated development of the National Digital Library for Agriculture (NDLA).

Performance Measures

MI 2.1 The services and collections of the National Agricultural Library continue to meet the needs of its customers.

Baseline 2005

The National Agricultural Library total annual volume of customer service transactions exceeded 82 million.

Target 2011

The National Agricultural Library total annual volume of customer service transactions exceeds 145 million.

NAL Service Delivery

The National Agricultural Library manages the world's largest agricultural information collections, designated as a USDA heritage asset, which include more than four million physical items as well as extensive digital information products including databases, digital full-text journals, and digital full-text books and maps. AGRICOLA (AGRICultural OnLine Access), NAL's online catalog and index to the agricultural literature, serves as the finding tool for these collections and is made available free of charge by NAL at <http://agricola.nal.usda.gov> and by a number of commercial companies. In addition to providing extensive reference, research, information center, and document delivery services delivered to a global clientele, NAL provides 24/7 access for USDA staff worldwide to an array of digital information products via DigiTop (NAL's Digital DeskTop Library for USDA). NAL has initiated development of a digital repository to preserve for perpetuity USDA publications and other essential agricultural information assets.

MI 2.2 The National Agricultural Library and partners implement the National Digital Library for Agriculture.

Baseline 2005

The NAL and partners began formal discussions about developing the National Digital Library for Agriculture (NDLA).

Target 2011

The NDLA comprises more than 100 partner institutions that preserve and provide access to quality digital information, including millions of pages of digital content; is recognized widely, used extensively, and valued by the agricultural community; and is the U.S. agriculture component of the global digital science and technology knowledge base.

National Digital Library for Agriculture

Since its inception in 1862, the National Agricultural Library has partnered with many institutions to develop and deliver information products and services. These partners include other national libraries within and outside the United States, inter-library lending partners around the world, and the member institutions of AgNIC (Agriculture Network Information Center). Advances in digitization and digital publishing technologies and the Web have made it possible for the Library and its partners to envision a National Digital Library for Agriculture (NDLA), which will leverage the resources of NAL and many partner institutions to provide unified, easy, 24/7 access to and permanent preservation of the Nation's agricultural information assets. The NDLA will become the U.S. agriculture component of the global digital science and technology knowledge base.

Actionable Strategies/Activities for Management Initiative 2

- Understand the information needs of NAL and NDLA beneficiaries, customers, stakeholders, and partners by conducting large scale as well as targeted surveys, focus groups, and other assessment instruments in order to anticipate and meet needs.
- Deliver unified, easy to use, convenient 24/7 digital services designed to meet customer needs and preferences.
- Deliver rapid information and services concerning “hot topics” and emerging issues of critical national importance.
- Improve information delivery to underserved customer audiences.
- Develop NAL and NDLA brands to raise visibility.
- Market NAL and NDLA services to specific audiences.
- Increase advocacy and outreach initiatives.
- Deliver training to optimize use of NAL and NDLA programs and services.
- Optimize NAL structure, information technologies, and workflows to reflect increased movement to digital programs and services.
- Recruit and retain a service-oriented, technologically-adept workforce.
- Foster a culture of innovation and creativity within the NAL and NDLA communities.
- Partner with important technology concerns to expose NAL and NDLA content and to develop shared technical standards in conformance with national policies.
- Extend partnerships with USDA and other Federal agencies to develop targeted information services.
- Continue to lead national science portals such as science.gov, nutrition.gov, and invasivespeciesinfo.gov.
- Collaborate with other national science and technology information partners to create science.world.
- Conserve the rare and at-risk items in the NAL physical collection to secure the Nation’s agricultural heritage.
- Broaden and deepen the NAL physical and digital information collections.
- Extend and enrich AGRICOLA by including links to online full-text publications and continually enhancing the NAL Thesaurus.
- Expand the audience and content for the NAL Digital Repository.
- Advance NAL and NDLA preservation and digitization programs.

MANAGEMENT INITIATIVE 3: DEVELOP A MODEL EQUAL EMPLOYMENT OPPORTUNITY (EEO) PROGRAM THAT WILL PROVIDE INFRASTRUCTURE NECESSARY TO CREATE AND MAINTAIN A DIVERSIFIED WORKPLACE FREE FROM DISCRIMINATION, HARASSMENT, OR RETALIATION, AND CHARACTERIZED BY AN ATMOSPHERE OF INCLUSION AND CAREER DEVELOPMENT OPPORTUNITIES.

Performance Measure

MI 3.1 Take proactive steps to increase representation of minorities, women, and employees with targeted disabilities in the workforce; improve retention; increase career development opportunities; and increase diversity in award recognition programs.

Baseline 2005
The FY 2005 Area Management Directive 715 (MD-715), Annual EEO Program Report was used as a management tool to identify potential barriers to creating and maintaining a diversified and qualified workplace, and to develop action plans to reduce/eliminate the barriers.
Target 2011
Reduce/eliminate barriers identified in the MD-715, Annual EEO Program Report.

Actionable Strategies/Activities for Management Initiative 3

- Expand outreach activities in K-12 schools (long-term goal), universities/colleges, and minority serving institutions and organizations to educate students and faculty about scientific research and diversify the workforce.
- Review and assess the utilization of the student programs [Student Temporary Employment Program (STEP), Student Career Experience Program (SCEP), and postdoctoral

research associate programs]. Encourage managers to convert students who have previously participated in the program from the STEP to the SCEP.

- Ensure that all employees complete mandatory USDA and recommended training.
- Introduce Multigenerational Training and sponsor a Multigenerational Diversity Day.
- Determine if there is a need to create and maintain a formal pilot mentoring program to develop ARS' human capital to its fullest extent
- Maintain and increase involvement in knowledge management and mentoring activities to strengthen our workforce.
- Create, implement, and maintain a secure and confidential electronic exit interview process to determine why employees choose to leave ARS. Develop a plan to overcome any obstacles in the workforce.
- Encourage employees to utilize the ARS programs such as career development, mentoring, and Special Emphasis Programs, and to serve on EEO/Diversity Advisory Committees.
- Promote consistency in new employee, Research Leader, and scientist orientation programs throughout ARS regarding all components of the EEO Program.
- Identify barriers to parity among minorities and women in Agency award recognition programs; increase award recognition parity among minorities and women.
- Ensure that civil rights personnel are more visible to all employees, i.e., Area Civil Rights Managers, EEO/Diversity Committees, Civil Rights Staff participating in the CARE (Consolidated Assistance, Review, and Evaluation) Program and the Human Capital Management Assessments.

MANAGEMENT INITIATIVE 4: DEVELOP OUTREACH ACTIVITIES THAT WILL ENABLE ARS TO BETTER SUPPORT THE USDA INITIATIVE TO INCREASE SERVICES TO LIMITED RESOURCE, SOCIALLY DISADVANTAGED, AND/OR HISTORICALLY UNDERSERVED FARMERS AND RANCHERS.

USDA has identified a number of issues related to how it serves or fails to serve that segment of the U.S. agricultural community that has been historically underserved by many Government programs. These studies did not identify specific issues or problems in the USDA research programs, but in 2000, ARS decided to take a more active approach to see how the knowledge and technologies developed through its intramural research activities could be made available to Outreach target populations (historically underserved, limited resource, and/or socially disadvantaged).

Performance Measures

MI 4.1 Bring the benefits of ARS research to underserved populations and organizations serving these target populations by providing them with access to ARS-generated knowledge and technology that enables them to increase their productivity and profitability.

Baseline 2005
ARS has an Agency Outreach Coordinator and an Outreach Coordinator in every Area. The Agency Outreach Coordinator will answer directly to the Associate Administrator of NPS. The Outreach Coordinators are responsible for actively seeking ways to reduce/eliminate internal barriers that prevent target populations from accessing ARS research products.
Target 2011
Area Outreach Coordinators will identify organizations and individuals that serve the underserved populations who are potential users of ARS research and work to reduce/eliminate barriers to their participation.

MI 4.2 Identify significant Outreach activities and report them annually to the USDA Office of Outreach.

Baseline 2005
ARS identified 20 significant Outreach activities and reported them to the Departmental Office of Outreach as requested.
Target 2011
ARS will cumulatively report 100 significant Outreach Activities to the USDA Office of Outreach and through the GPRA Annual Performance Report.

Actionable Strategies/Activities for Management Initiative 4

- Provide leadership to forge interagency efforts to better serve underserved populations (partnerships within USDA, and with other Federal agencies, State agencies, universities, and private organizations)
- Increase extramural agreements with organizations that serve underserved populations.
- Increase the number of invitations extended to representatives of underserved populations to participate in program workshops, symposia, project/program reviews, and site/location reviews.
- Increase the number of research collaborations and technology transfer activities focused on meeting the special needs of this target population.
- Identify good examples of recent research that can or will be useful to target populations and ways to help them access this information.
- Ensure that appropriate employees are aware of the outreach initiative and their responsibilities in it.
- Promote knowledge of the outreach initiative to new employees, as appropriate.

ARS Administrative and Financial Management (AFM) Initiatives

OVERVIEW OF AFM INITIATIVES

ARS' Administrative and Financial Management (AFM) initiatives link with USDA's management initiatives to support more efficient program operations and deliver scientific excellence and public service.

AFM expects to:

- Ensure an efficient, high performing, high quality, diverse workforce to fully accomplish the ARS mission and work cooperatively with partners and the private sector.
- Ensure ARS sustains a clean annual audit opinion and provides access to quality financial information through financial systems that meet the needs of their users.
- Enhance ARS effectiveness through effective and automated services for acquisition, personal property, and administrative management.
- Link budget decisions and program priorities more closely with program performance and consider the full cost of programs.
- Reduce improper payments by establishing targets and corrective actions.
- Efficiently and effectively manage real property through good stewardship (*i.e.*, acquisition, maintenance, and disposal) of ARS' real property assets.
- Award extramural agreements in an efficient and timely manner, and ensure they are legally and fiscally sound and in full compliance with established policies and procedures.

- Ensure systems fully meet needs for AFM information and guidance in support of the President's Management Agenda and E-Gov initiatives.

Below is a brief summary of AFM's priorities.

IMPROVE HUMAN CAPITAL MANAGEMENT

The AFM strategic plan contains objectives related to improved management of ARS human capital. The plan focuses on strategic workforce planning, leadership development, optimizing organizational structures to address current and future challenges, and improving performance management to maximize employee performance.

The AFM strategic plan identifies human capital challenges and implements an accountability system to monitor and address these challenges. Such challenges include meeting the demand for cutting edge research talent, creating a workforce with a combination of skills not previously required, and fully supporting the Department's mission.

In managing its human capital and delivering its services to customers, ARS will continue to focus on ensuring civil rights and equal employment opportunity for everyone, regardless of race, color, national origin, gender, religion, age, sexual orientation, disability, political belief, marital or familial status, or any other factor. ARS is committed to continuous civil rights progress in the workplace, program delivery, and the efficient processing of complaints.

AFM plans to:

- Identify current and future skill gaps through an effective workforce planning process.
- Deliver human resource services through the implementation of e-HR tools.
- Improve individual and organizational performance through the development of position descriptions, standard performance plans, and training and knowledge management strategies.
- Ensure that ARS fosters a workplace atmosphere conducive to achieving the Agency's mission.

IMPROVE FINANCIAL MANAGEMENT

Effectively managing the use of taxpayer dollars is a fundamental Federal responsibility. ARS intends to ensure that all funds spent are accounted for properly to taxpayers, Congress, and the Government Accountability Office (GAO). The AFM Financial Management Division (FMD) works to improve financial management in partnership with the USDA Office of the Chief Financial Officer (OCFO).

AFM-FMD plans to:

- Ensure that ARS meets all appropriation level accounting and reporting requirements, and ensure that all reports continue to indicate an accurate financial picture and that reporting difficulties are rapidly resolved.
- Prepare the financial workforce for transitions to updated financial systems.
- Provide support to ARS travelers with professional customer-oriented travel and transportation staff and a Web-based travel system.
- Ensure financial management bulletins and undocumented business practices are

incorporated into policies and procedures for the agency.

IMPROVE ACCOUNTABILITY AND PROGRAM STEWARDSHIP OF THE ARS EXTRAMURAL AGREEMENTS PROGRAM

Stewardship and accountability for Federal funds obligated to extramural agreements require ARS personnel to be actively engaged in monitoring financial expenditures and technical activities of the Cooperator during the performance of the extramural agreement.

AFM-Extramural Agreements Division (EAD) plans to:

- Require successful completion of mandatory training for all ARS Authorized Departmental Officer's Designated Representatives (ADODRs). The training material will provide ADODRs with the fundamental knowledge of responsibilities required to effectively monitor extramural agreements.
- Deliver annual training to ARS administrative personnel serving as Authorized Departmental Officers (ADOs), to ensure effective and efficient administration and close out of extramural agreements.
- Ensure extramural agreement bulletins and policies and procedures are developed, updated, and published as appropriate.

IMPLEMENT COMPETITIVE SOURCING

ARS plans to assess the opportunities and, where appropriate, implement competitive sourcing reasonably and rationally to achieve significant cost savings and improved performance and to better align the Agency's workforce to its mission. This initiative is aimed at improving organizations through efficient and effective competition

between public and private sources. ARS will work with USDA to continue to simplify and improve the procedures for evaluating sources. ARS will also better publicize the activities subject to competition to maximize the benefits of this initiative.

ELIMINATE IMPROPER PAYMENTS

Based on recent audit estimates, Federal agencies make more than \$45.1 billion in improper payments annually. This USDA initiative requires agencies to measure their improper payments annually, develop improvement targets and corrective action plans, and track the results annually to ensure that corrective actions are effective. AFM will work with the Department plan to:

- Work with Department and Agency officials to reduce the number of improper payments made.
- Recover, where possible, overpayments made to individuals and organizations.

IMPROVE REAL PROPERTY MANAGEMENT

By Executive Order (E.O.) 13327, Federal Real Property Asset Management establishes the framework for improved use and management of real property owned, leased, or managed by the Federal Government. It is the policy of USDA to promote the efficient and economical use of the Department's real property assets and to assure management accountability for implementing Federal real property management reforms. Based on this policy, ARS recognizes the importance of real property resources through increased management attention, the establishment of clear goals and objectives, improved policies and levels of accountability, and other appropriate actions. AFM supports the Department's real property

asset management program and the following strategic objectives used for real property management improvement:

- Assess the risk of improper payments in all its programs annually.
- Maximize facility utilization and co-locate Agency operations when possible.
- Carry out accurate inventories and describe real property assets using the Corporate Property Automated Information System (CPAIS).
- Use performance measures as part of the asset management decision process.
- Provide management information to determine the appropriate levels of investment.
- Dispose of unneeded assets.
- Use appropriate public and commercial benchmarks and best practices to improve asset management.
- Provide for safe, secure, and healthy workplaces.

SUPPORT FAITH-BASED AND COMMUNITY INITIATIVE

This initiative strives to support the essential work of faith-based and community organizations. AFM supports this initiative by ensuring the acquisition process allows these organizations to compete on equal footing for ARS contracts.

ARS Office of the Chief Information Officer (OCIO) Management Initiatives

OVERVIEW OF MANAGEMENT INITIATIVES

ARS works through its Office of the Chief Information Officer (OCIO) to enable more effective and efficient research mission delivery through a strengthened information and technology management program. The premise of this program is based on the following vision statement:

ARS information systems are mission driven and responsive to customer needs; they are reliable, secure, user friendly, relevant, innovative, well planned, and managed effectively.

Effective information systems flow from mission requirements. This relationship dictates a structured, comprehensive, and ongoing review of information systems and the technology needed to support ARS mission and internal and external customer needs. Because ARS is the government entity uniquely responsible for creating new knowledge and the data, information, and technology necessary for a sustainable and globally competitive American agriculture, the Agency's information technology program must provide a safe and reliable environment to support the creation, storage, and dissemination of this knowledge.

The ARS OCIO works in consultation with the ARS Executive Information Technology (IT) Steering Committee to define the strategic direction of the Agency's information technology program in the ARS IT Strategic Plan, which

defines ARS' IT strategic goals, objectives, and strategies. The plan identifies key information management issues and provides the framework for developing integrated information systems and technology through further definition and specification of architecture components and information elements. OCIO then works in coordination with the Agency's IT specialists to implement these IT strategies with broad Agencywide impact.

EXPAND ELECTRONIC GOVERNMENT

OCIO facilitates the Agency's implementation of broad Federally and USDA-mandated IT programs focused on expanding electronic government. OCIO will continue to work with the USDA Office of the Chief Information Officer (USDA-OCIO) to achieve this goal. Specifically, OCIO will work with the USDA-OCIO on key areas for effective IT management, such as Enterprise Architecture, Federal Information Security Management Act (FISMA), and Capital Planning and Investment Control, as well as on network efficiency, reliability, and capacity to ensure support of E-Government projects.

Actionable Strategies/Activities for OCIO Management Initiatives

- Ensure that the ARS mission drives its information systems and the deployment of information technology.
- Ensure that ARS information systems are reliable, secure, relevant, innovative, well planned, and managed effectively.
- Invest in appropriate human resources and infrastructure to ensure effective management of high quality information and state-of-the-art technology.
- Ensure information systems support research and technology transfer through development and dissemination of ARS advanced knowledge-based systems, decision tools, and databases.
- Ensure that researchers, educators, and the public have an awareness of and access to research accomplishments and agriculturally related information.