USDA Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

ARS Strategic Plan 2023-2026

Finding Solutions to Agricultural Challenges with Agility, Innovation, and Relevance

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MESSAGE FROM THE ARS ADMINISTRATOR

Dr. Simon Liu, ARS Administrator

In 2022 alone, ARS produced 51 new licenses, 40 new patents, and published 3,935 peer-reviewed journal articles. With 90+ ARS locations, 8,000 employees, and 600+ research projects spanning 15 national programs, ARS is delivering scientific tools and innovative solutions for American farmers, producers, industries, and communities. However, long-term challenges such as a changing climate, and rapidly evolving issues such as a global pandemic, require agility, innovation, and relevance (AIR) in our response. As the new ARS Administrator, I am filled with hope and determination as we rise to meet these challenges and deliver scientific solutions to national and global agricultural challenges with agility, innovation, and relevance as the common thread throughout our work.

To fulfill our mission, ARS must be agile in responding to these challenges in a timely fashion. We must become even more agile to quickly adapt to new technologies, changing environments, or unexpected challenges in our research process. This can involve a variety of different skills, such as the ability to pivot to new research questions or methods, to effectively collaborate with colleagues or stakeholders, to quickly learn new techniques or technologies, or to effectively communicate findings and progress.

Our shared vision at ARS is to serve as a global leader in agricultural discoveries through scientific excellence. Innovation is the key to scientific excellence leading to agricultural discoveries. To realize our vision, ARS must expand our innovation culture and make innovation a part of our DNA. Innovative research can take many forms, such as the development of new theories or models, the use of novel techniques or methods, or the application of existing ideas or approaches in new contexts or to new problems.

ARS can also foster innovation by staying current on new developments in their fields, seeking out diverse perspectives and experiences, treating each other with dignity and respect and collaborating with others who have different expertise or approaches. As a part of our mission, ARS's job is finding solutions to agricultural problems that affect Americans every day from field to table. To fulfill our duties, ARS's research must be relevant. Research relevance is crucial for ensuring that our research has the potential to make meaningful contributions to the industry, society, or world. There are several factors that can contribute to the relevance of our research. These include the timeliness of the research, the importance of the research question or problem being addressed, the potential practical or societal implications of the research, and the potential to contribute to the existing body of knowledge in the field.

I know that achieving our goals will not be easy, but I am confident that with your support and your hard work, we can build a strong AIR ARS family, and achieve our strategic goals that align to the USDA Strategic plan.

About the Agricultural Research Service

President Lincoln signed a congressional act establishing "The People's Department" or the U.S. Department of Agriculture (USDA) in 1862. At the time, about half of all Americans lived on farms compared to just 2% today. Between 1948 and 2019, agricultural productivity increased an average 1.42% annually; with U.S. farm output rising 2.7 times its 1948 levels. Agricultural exports grew dramatically during the last half of the 20th century, thanks in part to the 1953 establishment of the Agricultural Research Service (ARS)—the primary scientific research agency within USDA.

Over the last 70 years, ARS has been the source of 75+ new crop cultivars, and superior breeds for all U.S. food animals, including aquacultural breeds. ARS has maintained and improved the genetic base of U.S. crops and livestock, providing enormous benefits for U.S. and global agriculture. Other noteworthy ARS breakthroughs include the discovery of the molecular structure of one of the ribonucleic acids (RNAs) that helped to elucidate protein synthesis or the process by which living cells convert food into new cell-building material. The development of soybeans with resistance to root knot nematodes and other foliage-feeding insects, promoting what was a minor forage crop to the nation's second most valuable crop. ARS scientists developed the universal soil loss equation model that simulates how soil erodes and is used worldwide for managing land sustainably. ARS scientists created fire-resistant textiles through the discovery of THPC, a compound that forms a tough black char instead of bursting into flames [1], and identified nine core principles for freezing vegetables that ensured the survival and growth of the U.S. frozen food industry. Later, ARS scientists developed DEET, the active ingredient in many commercial repellants, which is used to protect people from malaria-bearing mosquitoes and pests. ARS scientists also discovered Taxol, the anticancer compound used for treatment of ovarian, breast, and other varieties of cancer. ARS has become a trusted source for quality nutritional data to guide industry and U.S. policy, and uncovered the unique nutritional needs of elderly people, infants, and other specialized groups. [2]

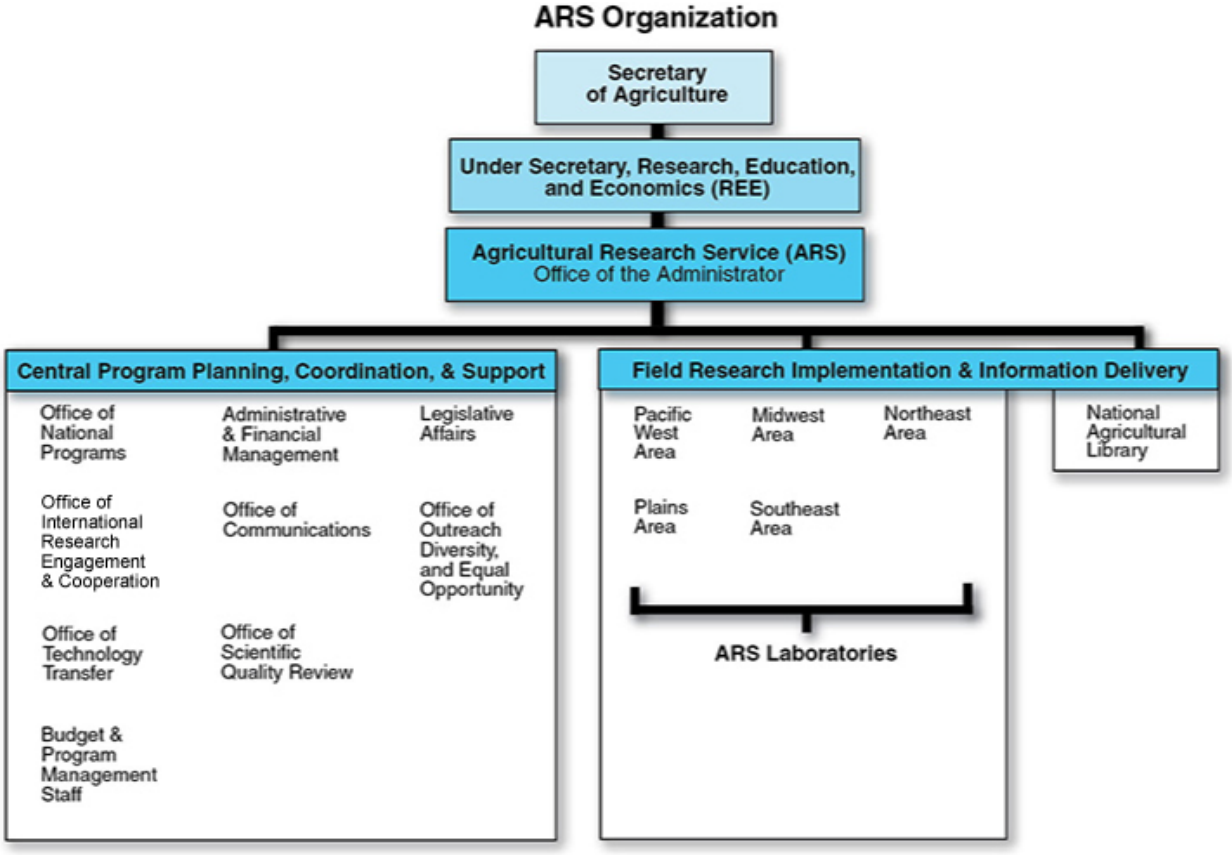
Recently, on March 20th, 2023, the Intergovernmental Panel on Climate Change (IPCC) released its sixth assessment report (AR6). The report documents the devastating consequences of rising greenhouse gas emissions around the world and presents the risks of not changing course. Among the many conclusions drawn from projected rising global temperatures, the report documents that climate change has slowed agricultural productivity in middle and low latitudes, and estimates that a global temperature increase of just 1.5 degree C would cause 950 million people across the world's drylands to experience water stress, heat stress and desertification, while simultaneously, putting 24% of the global population at risk to flooding. [3] It is currently estimated that one U.S. farm feeds 166 people annually in the U.S. and abroad, but the global population is expected to increase by 2.2 billion by 2050, which will require the world's farmers to grow 70% more food that they currently produce. [4] Therefore, USDA, ARS and American farmers will need to work together to address the significant challenges that lie ahead. As it has always done, ARS will move forward with scientific excellence, creativity, innovation, integrity, leadership, collaboration, accountability, transparency, diversity, respect, inclusiveness, and public service. These values underpin ARS' commitment to delivering innovative, scientific tools and solutions for American farmers, producers, land managers, industry, and communities to support the

[1] https://www.ars.usda.gov/is/timeline/fabric.htm
[2] https://www.ars.usda.gov/is/AR/archive/dec99/accomp1299.htm
[3] https://www.wri.org/insights/2023-ipcc-ar6-synthesis-report-climate-change-findings
[4] https://www.fb.org/newsroom/fast-facts#:~:text=One%20U.S.%20farm%20feeds%20166%20people%20annually%20in,soybeans%20are%20the%20top%20three%20U.S.%20farm%20products.

nourishment and well-being of all people; sustain our nation's agroecosystems and natural resources; and ensure the economic competitiveness and excellence of our agriculture.

How ARS is Organized

ARS is categorized as a Research, Education, and Economics (REE) agency within USDA, and the ARS Administrator reports through the REE Under Secretary to the Secretary of Agriculture. ARS's work is conducted by two main groups, the Central Program Planning, Coordination, and Support group, and the Field Research Implementation and Information Delivery group. These groups are composed of offices that specialize in planning, coordination, and support and regional ARS laboratories and the National Agricultural Library that specialize in research implementation and information delivery.



Central Program Planning, Coordination and Support Group

Nine offices make up the Central Program Planning, Coordination and Support group. These nine offices are described below.

Office of National Programs

The Office of National Programs (ONP) is the principal organizational office of ARS that assesses the full spectrum of scientific needs of the Agency, leads program direction by development of 5-year National Program Action Plans, reassigns research projects to high priority problems, addresses program areas which lack adequate resources with the Area Directors and develops budget recommendations for new research program initiatives for the Administrator. The Budget Division develops the new initiatives into Departmental budget proposals. The ONP adjusts the ARS Six-Year Implementation Plan based on Executive, Congressional, and Agency priorities. The ONP selects research programs to be implemented

and recommends allocations of Agency resources accordingly. This includes distribution of base funds, lapse salary funds, and program increases to research units.

Office of International Research Engagement and Cooperation

The ARS Office of International Research Engagement and Cooperation (OIREC) enhances the productivity, effectiveness, and impact of ARS research through mutually beneficial international research projects. USDA international research cooperation supplies solutions to current and future agricultural productivity and sustainability challenges beyond what can be achieved through domestic research alone. OIREC supports ARS leadership in global science and technology engagements so that ARS can identify emerging ideas and solutions wherever they arise, increase the impact of research and development spending, and deliver new knowledge and technologies to those who will benefit from them. OIREC is the main contact for international activities in ARS. Working with the ARS Office of National Programs**,** OIREC regional international affairs specialists catalyze strategic international partnerships that can enhance the productivity, effectiveness, and impact of ARS National Programs, as well as further the goals of the U.S. government.

Office of Technology Transfer

The ARS Office of Technology Transfer (OTT) encourages, promotes, and facilitates the adoption and commercialization of technology resulting from ARS research, helping to move USDA research discoveries to the marketplace. Although research results are sometimes transferred directly from ARS to end users, the private sector more often serves as the essential delivery mechanism and intermediary between ARS research and the realization of public benefit. Private sector partners facilitate technology transfer by providing the complementary assets needed for the adoption of research outcomes. Because the ARS mission is to transfer technologies for broad public use by the most effective mechanism, ARS pursues patents and licensing principally to incentivize commercialization and to facilitate technology transfer to the marketplace.

Budget Program Management Staff

The ARS Budget Program Management staff coordinates preparation of the Agency's budget estimates and provide direction and administration of the Agency's budgetary functions including development, presentation, and administration of the budget. The office also reviews program and legislative proposals for program and budget related implications and analyzes program and resource issues and alternatives.

Administrative and Financial Management

The Administrative and Financial Management (AFM) also known as the REE Business Center is a centralized Business Center that provides premier customer service and business administration to the Research, Education, and Economics (REE) Mission Area. The primary responsibilities of the Business Center include supporting mission-critical operation, streamlining key business functions, and reducing costs through team-based and cross-functional approaches. The REE Business Center is comprised of six core functions:

1.) Acquisition and Property Division
2.) Facilities Division
3.) Financial Management and Agreements Division
4.) Homeland Security Division
5.) Human Resources Division
6.) Information Technology Services Division

Office of Communications

The ARS Office of Communications informs the Nation of the nature and progress of ARS research through a coordinated, multi-media approach. The Staff creates and sends materials to both the mass media and diverse user groups representing consumers, farmers, industry, government, scientists, and educators. The Staff responds promptly and effectively to changing demands for information, to inform Congress and taxpayers of the benefits derived from Agency research and speed the flow of technology to the public and private sectors. The Office of Communications has four branches:

1.) External Communications
2.) Media Relations
3.) Visual Information
4.) Internal Communications

Office of Scientific Quality Review (OSQR)

The Office of Scientific Quality Review is a congressionally mandated, independent entity within the Agricultural Research Service (ARS), tasked with ensuring the highest scientific quality for the Agency's People, Projects, and Programs. OSQR's mission is to promote effectiveness and integrity as a staff to administer quality peer reviews of USDA's people, projects and programs; to ensure accountability of the Agency's research and the scientists who conduct it; to achieve greater efficiency, and program improvement by providing unique expert perspective on the science foundation of ARS. To accomplish this they use the Research Position Evaluation System (RPES), the Project Plan Peer Review (PPPR) and the National Program Retrospective Assessment (NPRA).

Legislative Affairs

The ARS Legislative Affairs Office (LAO) coordinates the agency's legislative program, serves as the focal point for the exchange of information with the Congress, advises on the implementation of congressional directives, and provides the ARS leadership with information on congressional activities and legislation of interest or affecting the agency. In addition, LAO helps ARS locations plan events involving participation of their elected officials and is the point of contact for the Secretary's Office of Congressional Relations and the Under Secretary for Research, Education and Economics for ARS information requested by Congress.

Office of Outreach, Diversity, and Equal Opportunity (ODEO)

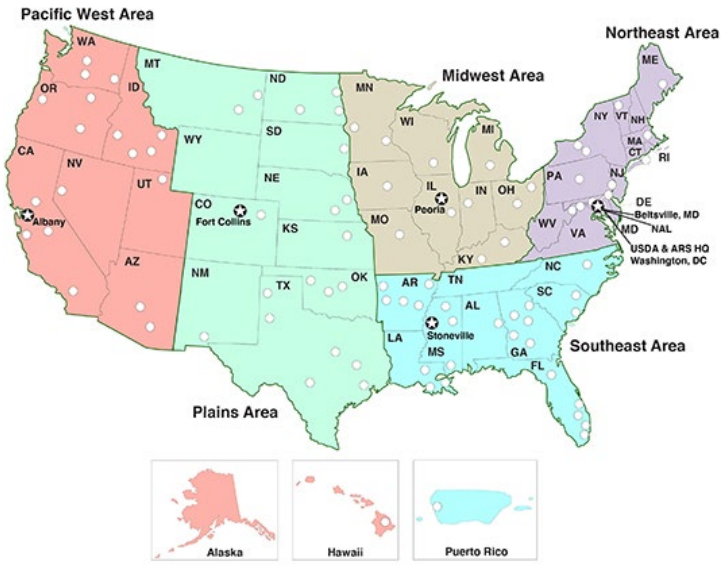
The Office of Outreach, Diversity, and Equal Opportunity (ODEO) has oversight responsibility for the Equal Employment Opportunity (EEO) Program to ensure compliance with all applicable civil rights laws, regulations, policies, and procedures, and to ensure a workforce free of discrimination and harassment. Timely and effective processing of issues and complaints as they arise are critical to the success and long-term viability of the Agency's workforce and accomplishment of research priorities. Equally as is important to ensure allegations of discrimination are handled appropriately and timely, is the Agency's commitment to proactive preventing discrimination from occurring. The Agency's approach to proactive prevention of discrimination is twofold: expanding diversity and equity initiatives to include special emphasis programs; and as well as, to help mitigate and improve communication in the workforce through a myriad of techniques including but not limited to ensuring a robust Cooperative Resolution Program.

Field Research Implementation and Information Delivery

Within the Field Research Implementation and Information Delivery Group there are five regional ARS laboratories and the National Agricultural Library.

Pacific West Area

The Pacific West Area (PWA) has four major goals: 1.) to conduct high-quality, relevant research with impact; 2.) hire and retain a highly qualified, diverse workforce that strives for continual improvement; 3.) empower employees in their jobs and hold them accountable; and 4.) understand and respond to internal and external customer needs. PWA embodies a spirit of innovation while embracing an environment of diversity, integrity, and transparency in pursuit of these goals.



Plains Area

Plains Area (PA) scientists at 21 research locations in 9 states are addressing ARS's goals through the 85 to 100 agricultural and nutritional research programs typically underway in the PA at any one time. The PA is dedicated to providing superior service to all our customers and employees to further the ARS research mission and the multi-disciplinary research efforts underway in the PA. More specifically, the PA will:

- Provide excellent service, support, encouragement and guidance to PA employees and customers/stakeholders.
- Exceed external customer and internal staff expectations.
- Serve as facilitators to achieve Department, Agency, and location strategic objectives.
- Foster positive communication designed to provide accurate information, improve processes and morale, and foster employee and Management Unit success.
- Actively promote ARS research.
- Operate as a cohesive team.
- Embrace diversity and diverse approaches to solving problems.
- Work smart and efficiently.
- Serve as a model office for PA and ARS.
- Achieve fulfillment in our jobs.

Midwest Area

The Midwest Area (MWA) research has a direct impact on our standard of living and the quality of modern life. MWA scientists conduct research to develop economically and environmentally sustainable agricultural systems that improve the yield and quality of crops and livestock, improve human health, create crop-based alternatives to petroleum-derived fuels and products, and protect the environment. If agricultural problems arise such as new pests or diseases of crops or livestock, the MWA has the capacity to respond rapidly to protect the food supply. The MWA develops solutions to reduce food-borne illness and finds ways to improve the nutritional value of the food supply.

Northeast Area

The Northeast Area (NEA) encompasses 15 research centers and laboratories and 9 worksites located in 11 northeastern and Atlantic states from Maine to Tennessee and the District of Columbia. These include the U.S. National Arboretum in Washington D.C., the Eastern Regional Research Center in

Philadelphia, PA, the Robert C. Holey Center on Agriculture and Health in Ithaca, NY, and Beltsville Agricultural Research Center (BARC) in Maryland, the largest and most comprehensive agricultural research complex in the world. The noteworthy accomplishments of the scientists at NEA's centers and laboratories have made them international leaders in their respective scientific fields.

Southeast Area

The Southeast Area (SEA) has over 1,460 full-time personnel, including 468 scientist and engineers, working at 27 research locations and 4 worksites. The Southeast Area states include Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North and South Carolina, and Puerto Rico. Additionally, the SEA has worksites in Tennessee, Michigan and St. Croix, VI. All major agricultural commodities of the mid-south United States are researched by SEA scientists including cotton, corn, soybean, rice, sugarcane, poultry and catfish, as well as small fruits, nuts, such as blueberries and strawberries. The SEA Office is headquartered in Stoneville, MS as part of the Jamie Whitten Delta States Research Center.

National Agricultural Library

The National Agricultural Library (NAL) maintains published scientific publications and important datasets and products supporting agriculture and agricultural research. ARS long-term focus on problem solving and relevance allows it to build and support unique, specialized research equipment and facilities that enable us to do research not possible by others.

PubAg is the NAL search system for USDA-funded scholarly agricultural literature. It is the source for researchers, scientists, and the public to find scientific, peer-reviewed agriculture-related citations and publications and is available at https://pubag.nal.usda.gov/. In FY 2020, NAL created a new workflow that added more than 1,200 manuscripts from the ARS Agricultural Research Information System. PubAg now contains more than 3 million citations for peer-reviewed, agriculture-related scientific articles, an increase of more than 350,000 citations from FY 2019. NAL has increased the full-text corpus publicly accessible through PubAg by nearly 88,000 full-text articles, for a total of more than 300,000 full-text articles. NAL staff continuously adds relevant scholarly agricultural information to PubAg.

The Ag Data Commons is a Federal scientific research data catalog and repository that helps the agricultural research community share and discover research data funded by USDA. The platform is available at https://data.nal.usda.gov/. Through the Ag Data Commons, the National Agricultural Library ***(NAL) provides services to make USDA-funded research data systems and data products Findable, Accessible, Interoperable, and Reusable (FAIR)***. Ag Data Commons works closely with the USDA research community to meet Federal open-access requirements to support scientific integrity and data reuse. In FY 2020, NAL's Ag Data Commons team worked with the ARS Agricultural Collaborative Research Outcomes System (AgCROS) team to develop a workflow to create and apply Digital Object Identifiers (DOIs) for data deposited in AgCROS.

National Programs

This Strategic Plan outlines how ARS intends to invest its resources in agricultural research to address these pressing needs, connecting the vision of the Administration to the needs of our stakeholders. ARS is organized into four program areas to coordinate and empower 690 research projects across the agency. The four program areas are:

- Nutrition, Food Safety, and Quality
- Natural Resources and Sustainable Agricultural Systems
- Crop Production and Protection
- Animal Production and Protection

Prestigious Researchers

ARS's approximately 2,000 full-time scientists and engineers (including postdoctoral scholars) are recognized for their research quality and impact. Fifteen total and nine current ARS scientists are members of the National Academies of Sciences. In 2022 alone, three ARS scientists received Presidential Rank Awards, two scientists earned Samuel J. Heyman Service to America Medals, one received the Arthur S. Flemming Award, and two others were recognized by the American Association of Avian Pathologists and the Crop Science Society of America Presidential Award. Over the years, ARS researchers have earned other prestigious honors and award for their contributions to the research mission and operation of the Agency.

Chapter One: Cross-Cutting Research Priorities

ARS integrates research across its four program areas and internationally to address high-level Agency, Departmental, and National priorities. The intent of these initiatives is to tie together the work done by researchers across National Programs and locations – and in many cases with the work done by other Agencies and university scientists, to synergistically address key agricultural research challenges.

Agriculture is place-based, and solutions must be regionally or even locally specific in application. However, solutions need to be broadly applicable to be economical and effective. ARS is not in one location or one State or one region of the country. It is located in more than 90 locations across the nation and even in overseas laboratories. Our leadership and coordination of research through National Programs means we coordinate research teams housed in multiple locations as needed to develop comprehensive solutions to agricultural problems. We collaborate extensively with universities and research organizations across the country and around the world. This enables us to organize research teams rapidly to respond to urgent research needs and in a sustained way for long-term research priorities – tapping into expertise and specialized resources across the Agency and around the world.

ARS' focus on agility, innovation, and relevance is complemented by investments in long-term research sites in a variety of climates and agricultural settings including Long Term Agro-Ecosystem Research (LTAR), and Greenhouse gas Reduction through Agricultural Carbon Enhancement network (GRACEnet). ARS also co-leads the USDA Climate Hubs program, the premier model for science translation of climate information and services in agriculture and forestry. Additionally, ARS maintains the Germplasm Resources Information Network web server as part of the National Genetic Resources Program (NGRP), genebanks that conserve and deliver plant germplasm via the USDA/ARS National Plant Germplasm System, the USDA/ARS National Animal Germplasm Program, and several microbial germplasm collections. This effort acquires, characterizes, preserves, documents, and distributes germplasms for all lifeforms important for food and agricultural production. ARS develops and keeps numerous, agriculturally important, long-term datasets, such as crop genome databases, and models that are available for use by scientists around the world.

Agility

ARS's mission is to deliver scientific solutions to national and global agricultural challenges. To fulfill our mission, ***ARS must continue to be agile in responding to these challenges***. We must become even more agile to quickly adapt to modern technologies, changing environments, or unexpected challenges in our research process. This can involve a variety of different skills, such as the ability to pivot to new research questions or methods, to effectively collaborate with colleagues or stakeholders, to quickly learn new techniques or technologies, or to effectively communicate findings and progress.

Addressing Climate Change

USDA can position the agriculture and forestry sectors and rural and Tribal communities to be leaders in conducting research to adapt agriculture to climate change and to mitigate climate change's effect. Acting on this will require investments in the research and development of climate-smart solutions that improve soil and forest health, make production more profitable, resilient, and adaptable while creating new income opportunities and generational wealth and contributing to National greenhouse gas emission reduction goals.

ARS climate research and development efforts are working to better understand the full range of climate change effects on working lands, accelerate development of science-based solutions, inform the deployment of adaptation and mitigation strategies, and remove barriers to access. ARS researchers are innovating new practices that enable climate-smart production systems, new models and data-driven decision support tools to empower managers, and inventing new instrument and sensor technologies that improve the accuracy, timeliness and cost effectiveness of greenhouse gas (GHG) monitoring and measurement. Additionally, ARS developed cultivars, enhanced germplasm, innovative biocontrol tools and knowledge, paired with new production systems provide land managers with a menu of options to help them adapt to a changing climate.

ARS experts contribute to regional, national and global understanding of climate change through collaboration on things such as the National Climate Assessment, input to design criteria for the Landsat NEXT mission, improving the National GHG Inventory, and many others. ARS provides leadership through the USDA Climate Hubs network, funding half of the locations, helping them to serve as a framework to support the delivery of climate change mitigation and adaptation science, technology, and tools. ARS has recently implemented a new Climate Hub Fellows initiative that is strategically placing key expertise at regional Hubs to ensure that regionally relevant agricultural science is being turned into impactful information and tools for producers. This includes recruiting a Fellow with a specific focus on the needs of Alaska and another with a focus on Hawaii and the Affiliated Pacific Islands. ARS also maintains the Long-Term Agroecosystem Research (LTAR) network of 18 established, long-term research sites focused on developing national strategies for more efficient agricultural production while improving the quality of the environment and the well-being of America's farming communities.

Specialized Infrastructure and Capabilities

More than 90 research locations, featuring state-of-the-art facilities and resources such as:

- Four Overseas Biological Control Laboratories
- U.S. National Arboretum
- National Agricultural Library
- National Bio and Agro-Defense Facility

Scientific Collections and Genebanks, including:

- ARS National Plant Germplasm System
- ARS Culture Collection
- ARS National Rhizobium Germplasm Resource Collection
- National Animal Germplasm Program
- National Invertebrate Genetic Resources
- USDA Nematode Collection
- U.S. National Arboretum Herbarium
- U.S. National Fungus Collections

Premier Networks of Scientific Expertise, including:

- Long-Term Agroecosystem Research (LTAR) network to develop national strategies for the sustainable intensification of agriculture
- USDA Climate Hubs, for providing region-specific, climate-informed assistance to agricultural and natural resource managers
- Greenhouse gas Reduction through Agricultural Carbon Enhancement Network (GRACEnet), for promoting sustainability by reducing greenhouse gas emissions from soil
- Resilient Economic Agricultural Practices (REAP), for improving soil health and resiliency through improved management practices
- Partnerships for Data Innovation, for developing precision field monitoring systems, automated data capture, streamlined data integration, and big data tools for agriculture
- Breeding Insight, for accelerating small breeding programs through the combination of modern breeding approaches, genomics, and informatics
- Federal LCA Commons, for publishing life cycle assessment models and developing federal standards in life cycle assessment modeling
- Ag100Pest, for sequencing the genomes of 100 significant agricultural pests, part of the Earth Biogenome Initiative
- Areawide Pest Management Program, for implementing fundamental and cutting-edge approaches at a regional scale in helping farmers and practitioners manage pests.
- SCINet and AI Center of Excellence, for growing USDA's research capacity by providing scientists with access to high-performance computing clusters, high-speed networking for data transfer, and training in scientific computing.

Innovation

Our shared vision here at ARS is to serve as a global leader in agricultural discoveries through scientific excellence. Innovation is the key to scientific excellence leading to agricultural discoveries. To realize our vision, ARS must ***expand our innovation culture and make innovation a part of our DNA***. Innovative research can take a variety of forms, such as the development of new theories or models, the use of novel techniques or methods, or the application of existing ideas or approaches in new contexts or to new challenges. ARS staff can also foster innovation by staying current on new developments in their fields, seeking out diverse perspectives and experiences, and collaborating with others who have

ARSX – High-Risk, High-Reward Research Competition

ARSX is an annual high-risk, high-reward research funding competition that encourages ARS scientists to put forward their breakthrough ideas for a transformative solution to a serious agricultural problem. The purpose of the program is to provide an opportunity for very novel and emerging research ideas to have access to seed funding. These projects are evaluated for novelty and impact and researchers can nimbly develop their project in teams or independently.

Grand Challenge Synergies

ARS "Grand Challenge Synergies" (GCS) projects seek to unlock greater impact from conventional ARS projects by facilitating and incentivizing synergistic interactions between scientists across locations, National Programs and research systems. GCS encourages scientists to broaden their research experience by joining projects that utilize their expertise and the general direction of the five-year plan but may be beyond specific stated objectives. These synergistic projects harness the energy of diverse scientific teams to address complex problems of high national importance that may not be solved within the boundaries of a single discipline. Examples of these projects include:

- Predictive analytics of animal disease epidemiology
- Re-establish/reinvent and maintain economically viable and environmentally sustainable production of citrus in the presence of citrus greening disease
- Enhance protected horticulture while reducing environmental impact

Relevance

As a part of our mission, ARS's job is finding solutions to agricultural problems that affect Americans every day from field to table. To fulfill our duties, ARS's research must be relevant. ***Research relevance is crucial for ensuring that our research has the potential to make meaningful contributions to the industry, society, or world***. Factors that can contribute to the relevance of our research include the timeliness of the research, the importance of the research question or problem, the potential practical or societal implications of the research, the potential to contribute to the existing body of knowledge in the field, and whether it would be fulfilling our public-sector responsibilities.

Creating More and Better Markets for Producers and Consumers at Home and Abroad

The COVID-19 pandemic has revealed vulnerabilities in our food system and we must create new and better markets for all producers and consumers. The food system of the future needs to be fair, competitive, distributed, and resilient. New crops, new market classes of crops and food animals with new traits will be needed The success of American agriculture hinges on agile research, innovation, and the development of new markets, both at home and abroad. ARS maintains a diverse workforce committed to all its customers. This plan integrates equity in all its goals and will be executed into decision-making, operations, program delivery, and services with underserved communities in mind to ensure that all of USDA's customers have a fair shot at program access and economic opportunity.

Tackling Food and Nutrition Insecurity and Food Safety

Recognizing that food and health are inherently intertwined, USDA aims to ensure Americans have consistent access to the safe, healthy, affordable food essential to optimal health and well-being. This means keeping the food supply affordable and safe—as USDA does each day—as well as prioritizing nutrition security. USDA's nutrition programs are the most far-reaching tools available to achieve these objectives. This plan lays out our strategies to build on the innovation required by our COVID-19 response and other bold solutions that enhance food safety, improve our nutrition programs, reduce food insecurity, and prioritize nutrition security.

Strategic Planning and the National Program Cycle

Each of the more than 690 ARS projects develop five-year action plans that connect the Administration's strategic goals to stakeholder and congressionally legislated challenges to produce a research plan of action for the project. ARS researchers report on their progress toward these goals annually to ensure relevance, quality, performance, and impact. ARS' Annual Report on Science compiles the top annual accomplishments across the

Five Components of Program Management

agency. ARS is a problem-solving agency. We listen to our stakeholders, the Administration, and to Congress to identify and address critical, national and regional agricultural problems. We target those problems that are best suited to our core competencies, then we work to not just solve the problems, but to transfer the products of ARS research into use. Often that means starting with research to understand the fundamental nature of problems and biological systems and then sustaining our research focus into the development of applied solutions. ARS delivers data, research tools and reagents, key crop and animal traits, plus plant, animal, insect, and microbial germplasm and superior new cultivars and livestock lines.

ARS incorporates the USDA Strategic Plan components into program research initiatives through the National Program Management Cycle process. This process involves five components to ensure program relevance, quality, and impact throughout the five-year cycle. The five components —program planning and priority setting, peer review, project implementation, program coordination, and assessment— define the actions that the ARS undertakes to demonstrate that our research is of the highest quality. USDA Strategic Plan priorities and objectives are incorporated into the input phase and demonstrated through outputs such as program action plans, cutting-edge research and products.

The table below connects USDA Strategic Plan Goals:***1*** (***Combat Climate Change to Support America's Working Lands, Natural Resources, and Communities), 2 (Ensure America's Agricultural System is Equitable, Resilient, and Prosperous), 3 (Foster an Equitable and Competitive Marketplace for All Agricultural Producers), 4 (Make Safe, Nutritious Food Available to All Americans),*** and ***5 (Expand Opportunities for Economic Development and Improve Quality of Life in Rural and Tribal Communities*** to ARS national programs and action plans. Goal ***6 (Attract, Inspire, and Retain an Engaged and Motivated Workforce that's Proud to Represent USDA)*** is represented through the work of our Office of Outreach, Diversity, and Equal Opportunity, Human Resources Division, and the Office of Scientific Quality Review. Please note, all ARS National Programs Areas and National Programs contribute to all USDA strategic plan goals and objectives in some capacity, the crosswalk table is meant to connect programs at a high-level.

ARS National Program Area	USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan
Nutrition, Food Safety & Quality	**Strategic Goal 4:** Provide All Americans Safe, Nutritious Food	**Strategic Objective 4.2**	**Human Nutrition Program**	**National Program 107**
		Strategic Objective 4.3	**Nutrition, Food Safety, and Quality**	**National Program 108**
	Strategic Goal 3: Foster an Equitable and Competitive Marketplace for All Agricultural Producers	**Strategic Objective 3.2**	**Product Quality and New Uses**	**National Program 306**

ARS National Program Area	USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan
	Strategic Goal 2: Ensure America's Agricultural System is Equitable, Resilient, and Prosperous	**Strategic Objective 2.3**		
	Strategic Goal 1: Combat Climate Change to Support America's Working Lands, Natural Resources and Communities	**Strategic Objective 1.4**		
Animal Production & Protection	**Strategic Goal 3:** Foster an Equitable and Competitive Marketplace for All Agricultural Producers			
	Strategic Goal 4: Provide All Americans Safe, Nutritious Food	**Strategic Objective 4.1**	Food Animal Production	National Program 101
			Aquaculture	National Program 106
	Strategic Goal 2: Ensure America's Agricultural System is Equitable, Resilient, and Prosperous	**Strategic Objective 2.2**	Aquaculture	National Program 106
			Animal Health	National Program 103
			Veterinary, Medical, and Urban Entomology	National Program 104
Crop Production & Protection	**Strategic Goal 1:** Combat Climate Change to Support America's Working Lands, Natural Resources and Communities	**Strategic Objective 1.2**	Plant Genetic Resources, Genomics and Genetic Improvement	National Program 301
	Strategic Goal 2: Ensure America's Agricultural System is	**Strategic Objective 2.1**	Plant Genetic Resources, Genomics and Genetic Improvement	National Program 301
			Plant Diseases	National Program 303

ARS National Program Area	USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan
	Equitable, Resilient, and Prosperous	**Strategic Objective 2.1**	Crop Protection and Quarantine	National Program 304
		Strategic Objective 2.2	Plant Genetic Resources, Genomics and Genetic Improvement	National Program 301
		Strategic Objective 2.3	Crop Production	National Program 301 National Program 303 National Program 304 National Program 305
	Strategic Goal 3: Foster an Equitable and Competitive Marketplace for All Agricultural Producers	**Strategic Objective 3.2**	Plant Genetic Resources, Genomics and Genetic Improvement	National Program 301
	Strategic Goal 4: Provide All Americans Safe, Nutritious Food	**Strategic Objective 4.1**	Plant Genetic Resources, Genomics and Genetic Improvement	National Program 301
Natural Resources & Sustainable Agricultural Systems	**Strategic Goal 1:** Combat Climate Change to Support America's Working Lands, Natural Resources and Communities	**Strategic Objective 1.3**	Water Availability and Watershed Management.	National Program 211
		Strategic Objective 1.1	Soil and Air	National Program 212
		Strategic Objective 1.2	Grass, Forage, and Rangeland Agroecosystems:	National Program 215
		Strategic Objective 1.4	Sustainable Agricultural Systems Research	National Program 216

Chapter Two: ARS Science Goals

This chapter lists ARS research goals, grouped by National Program Areas with 5-year action plan research components and problem statements for each national program. The 5-year action plans for each national program are developed and aligned to support the mission of the program area, as well as ARS and USDA goals. The 5-year action plans are developed with stakeholder input to ensure the continued relevance, quality, performance, and impact of our research. The start of each National Program cycles is distributed across a five-year period and each National Program produces an Annual Report to document progress toward these research goals and performance measures.

Program Area 1: Nutrition, Food Safety, and Quality

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

USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan	5-year Action Plan Components
Nutrition, Food Safety and Quality				
Strategic Goal 4: Provide All Americans Safe, Nutritious Food	***Encourage Healthy Dietary Choices through Data-Driven, Flexible, Customer-Focused Approaches (Objective 4.2)***	**Human Nutrition Program:** to define the role of food and its components in optimizing health throughout the life cycle for all Americans by conducting high national priority research.	**National Program 107**	1. Bridging the Gap between Food Production and Human Health 2. Monitoring Food Composition and Nutrient Intake of the Nation 3. Scientific Basis for Dietary Guidance 4. Prevention of Diet-Related Chronic Diseases

USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan	5-year Action Plan Components
				5. Life Stage Nutrition and Metabolism
	Prevent Foodborne Illness and Protect Public Health (Objective 4.3)	**Nutrition, Food Safety, and Quality**: To coordinate and lead ARS research to: define the role of food and its components in optimizing health for all Americans; develop tests and processes that keep the food supply safe; reduce and control pathogens and toxins in agricultural products; and improve the economic viability and competitiveness of American agriculture by enhancing the quality and utilization of agricultural commodities for the benefit of producers and consumers.	**National Program 108**	1. Food Borne Contaminants

USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan	5-year Action Plan Components
Strategic Goal 3: Foster an Equitable and Competitive Marketplace for All Agricultural Producers	***Expand Markets for Emerging Technologies, Sustainable Products, and Novel Products (Objective 3.2)***	**Product Quality and New Uses**: To enhance the marketability of agricultural products, increase the availability of healthful foods, develop value-added food and nonfood products, and enable commercially preferred technologies for post-harvest processing.	**National Program 306**	1. Food 2. Non-Food 3. Biorefining
Strategic Goal 2: Ensure America's Agricultural System is Equitable, Resilient, and Prosperous	***Foster Agricultural Innovation (Objective 2.3)***			
Strategic Goal 1: Combat Climate Change to Support America's Working Lands, Natural Resources and Communities	***Increase Carbon Sequestration, Reduce Greenhouse Gas Emissions, and Create Economic Opportunities (and Develop Low-Carbon Energy Solutions). (Strategic Objective 1.4)***			

Strategic Goal 4: Make Safe, Nutritious Food Available to All Americans

USDA plays a critical role in preventing foodborne illness and protecting public health, while ensuring Americans have access to healthy foods and beverages, as well as nutrition education that supports American agriculture and inspires public confidence. USDA is focused on ensuring that all Americans have consistent access to the safe, healthy, affordable foods and beverages essential to optimal health and well-being. While keeping the food supply safe, the Department must also reduce food insecurity and prioritize nutrition insecurity, which emphasizes providing Americans not just calories, but calories that matter for their health and well-being, as well as taking an equity lens to the Department's efforts to make safe, nutritious food available to all Americans.

Objective 4.2: Encourage Healthy Dietary Choices through Data-Driven, Flexible, Customer-Focused Approaches

USDA shapes programs and policies and develops knowledge resources to promote healthy eating at individual, family, household, and community levels. The Department further uses these tools to promote fruit and vegetable consumption and other healthy eating behaviors through public-private partnerships and innovative technologies. The Department is also working to improve access to healthful, locally produced food in underserved communities through a multifaceted strategy focused on food production, distribution, and both traditional and non-traditional retail options. The Department is committed to working collaboratively with other Federal agencies, State partners, and other interested stakeholders on an array of strategies to reduce childhood obesity and prioritize nutrition security.

National Program 107: Human Nutrition

NP 107 contributes to the USDA Strategic Plan Goal 4, Objective 4.2. NP 107's mission is to define the role of food and its components in optimizing health throughout the life cycle for all Americans by conducting high national priority research. Nutrition research has shifted from preventing deficiency diseases to optimizing health and prevention of chronic diseases throughout the life span. ARS, through National Program 107, is well-positioned to work on this research because three of the six Human Nutrition Research centers have Congressionally mandated missions of studying nutrition and its health effects during distinct phases of the lifecycle. Moreover, the separate locations of the Human Nutrition Research Centers help focus on different segments of the population with differing demographics and access to food. To conduct this work, the NP 107 five-year Action Plan is focused on the following component and problem statements:

Component 1: Bridging the Gap between Food Production and Human Health

- Problem Statement 1A: Determine Agricultural Practices that Influence the Nutritional Quality and Composition of Food
- Problem Statement 1B: Conduct Multiple-disciplinary Research to Understand the Complex Interactions within the Food System and their Impacts on Human Health.

Component 2: Monitoring Food Composition and Nutrient Intake of the Nation

- Problem Statement 2A: Provide Food Composition Data
- Problem Statement 2B: Determine Food Consumption and Dietary Patterns of Americans
- Problem Statement 2C: Develop New and Improved Methods to Analyze Foods and Determine Food and Nutrient Intake

Component 3: Scientific Basis for Dietary Guidance

- Problem Statement 3A: Improve the Scientific Basis for Updating National Dietary Standards and Guidelines
- Problem Statement 3B: Identify Mechanisms Whereby Food, Food Components, and Physical Activity Promote Health
- Problem Statement 3C: Utilize Advanced Technology to Develop and Integrate Multiple Data Sources to More Precisely Inform Nutritional Requirements.

Component 4. Prevention of Diet-Related Chronic Diseases

- Problem Statement 4A: Identify Mechanisms Whereby Food, Food Components, and Physical Activity Help Prevent Diet-Related Chronic Diseases such as Obesity, Diabetes, Cardiovascular Disease, and Cancer

- Problem Statement 4B: Develop and Evaluate Dietary and Physical Activity Strategies to Prevent Chronic Diseases

Component 5: Life Stage Nutrition and Metabolism

- Problem Statement 5A: Identify Dietary and Related Lifestyle Impacts for Healthy Development and Function from Conception to Old Age
- Problem Statement 5B: Understand the Role of Diet and Physical Activity on Metabolic Programming

Objective 4.3: Prevent Foodborne Illness and Protect Public Health

USDA will continue to invest in innovation of its inspection strategies, policies, and scientific approaches so that fewer people in the U.S. become ill from foodborne pathogens.

National Program 108: Food Safety

NP 108 contributes to the USDA Strategic Plan Goal 4, Objective 4.3. NP 108's mission is to enhance and protect public health and agriculture through the development of technologies, strategies, and data that safeguard food from pathogens, toxins, and chemical contaminants during production, processing, and preparation, thus increasing the safety of the food supply. Food safety research seeks ways to assess, control or eliminate potentially harmful food contaminants, including both introduced and naturally occurring pathogenic bacteria, non-pathogenic bacteria, viruses and parasites; bacterial toxins, fungal toxins (mycotoxins) and plant toxins; non-biological-based chemical contaminants, and foreign materials. Food safety is a global issue; thus, the research program involves both national and international collaborations through formal and informal partnerships. Accomplishments and outcomes are utilized in national and international strategies delivering research results and advances to regulatory agencies, commodity organizations, industry, academia, other researchers, and consumers.

To conduct this work, the NP 108 five-year Action Plan is focused on the following component and problem statements:

Component 1: Food Borne Contaminants

- Problem Statement 1. Characterize the movement, structure, and dynamics of microbial populations
- Problem Statement 2. Characterize the Systems Biology of Microorganisms in the Food Continuum
- Problem Statement 3. Develop Technologies for Detecting and Characterization of Microbial Contaminants
- Problem Statement 4. Elucidating the Methodology, Toxicology, and Toxinology for Detecting and Characterizing Chemical and Biological Contaminants
- Problem Statement 5. Develop, Validate and Implement Intervention and Control Strategies to Reduce or Eliminate Pathogens in the Food System
- Problem Statement 6. Develop Predictive Microbiology Models and Informational Databases
- Problem Statement 7: Antimicrobial Resistance

Strategic Goal 3: Foster an Equitable and Competitive Marketplace for All Agricultural Producers

Expanding international marketing opportunities for U.S. farmers and exporters is critical to fostering business and income growth across rural America. It is essential for USDA to continue its efforts to promote American agricultural products and exports through promotion activities, development of international standards, removal of trade barriers by monitoring and enforcing existing trade agreements, and negotiation of trade agreements that benefit the U.S. agricultural economy. USDA will

also work with developing countries to grow their economies and facilitate trade, developing markets of the future for all our producers.

Objective 3.2: Expand Markets for Emerging Technologies, Sustainable Products, and Novel Products

External factors play a role in expanding international marketing opportunities. These factors include environmental conditions, such as variability in domestic and overseas crop production, natural disasters, disease outbreaks, pest infestations, and food contamination. Furthermore, important trading partners are considering criteria and preferences related to the greenhouse gas performance of agricultural commodities and products. USDA can help respond to this demand by preparing domestic producers to meet these new market opportunities.

Strategic Goal 2: Ensure America's Agricultural System is Equitable, Resilient, and Prosperous

A strong and prosperous agricultural sector is essential to the well-being of the U.S. economy. America's farmers and ranchers ensure a reliable food supply, support job growth, and promote economic development. To maintain an equitable and competitive agricultural sector, USDA will safeguard animal and plant health, support farmers and ranchers' ability to start and maintain profitable cooperatives and businesses and offer financial support to all producers affected by natural disasters. Additionally, USDA's research agencies will continue to introduce high-performance plants and animals and offer integrated management options to increase the efficiency of farming practices.

Objective 2.3: Foster Agricultural Innovation

The future of U.S. agriculture, which includes plant and animal agriculture, forestry, and aquaculture, depends on continued science, innovation, and process improvements supporting technological progress, production efficiencies, and environmental stewardship. Advancing areas with a focus on climate-smart agriculture will enable the creation of innovations to minimize the environmental footprint of agriculture and ensure sustainability while improving crop yields. New technologies and system designs are needed to produce higher-value end products from emerging crops, livestock, and forest feedstocks. This will enable new markets, establish new domestic supply chains, create more jobs and economic opportunities, and ensure resilient agricultural and natural ecosystems upon which we can depend. Increasing productivity has significant social and economic benefits for society.

USDA will prioritize innovation to meet the needs of our stakeholders and build infrastructure for the challenges of today and tomorrow, with emphasis on continuous improvement. USDA will take proactive steps to ensure that data, evaluation, and learning opportunities are central to agriculture and natural resource initiatives across the Department and Nation.

ARS is expanding markets for emerging technologies, sustainable products, novel products and fostering agricultural innovation through National Program 306 research.

Strategic Goal 1: Combat Climate Change to Support America's Working Lands, Natural Resources, and Communities

Climate change poses a significant risk to agriculture, forests, and grasslands across the United States and the communities that support and depend on them. Now is the time to act. Our agricultural lands, National forests, and private working lands require conservation and restoration efforts to strengthen their resilience to drought, invasive species, and wildfire. The Department must lead with investments in science, research, and climate-smart solutions. These investments will mitigate the impacts of climate change, increase adaptation to climate change, generate new income opportunities, and build generational wealth in disadvantaged communities.

Agriculture can lead the fight on climate using climate-smart agriculture, forestry, and renewable energy practices that sequester carbon, reduce emissions, improve adaptation, and increase market opportunities for all producers. USDA is working to develop and implement a comprehensive climate-smart strategy that is centered on voluntary incentives and meeting the needs of our diverse producers, landowners, and communities. Our approach includes significant investments in resources for all producers and landowners. Additionally, it provides a host of new tools to deploy important conservation practices and the research essential to inform them.

Objective 1.4: Increase Carbon Sequestration, Reduce Greenhouse Gas Emissions, and Create Economic Opportunities

USDA will leverage its partnerships with agriculture, forestry, rural communities, Tribes, cooperatives, and businesses to reduce greenhouse gas emissions in agriculture, sequester forest carbon, decarbonize rural electricity, and invest in renewable fuels production and renewable electricity generation. Based on the best available science and strategies, increasing carbon sequestration and reducing greenhouse gas emissions will contribute to a lower National emissions footprint. USDA will continue to analyze the economic costs and benefits of these conservation practices during implementation.

National Program 306: Product Quality and New Uses (including biorefining)

NP 306 contributes to USDA Strategic Plan Goal 1, Objective 1.4, Goal 2, Objective 2.3, and Goal 3, Objective 3.2. NP 306's mission is to conduct research that develops more healthful, value-added foods; results in enhanced biobased products including biofuels; and reduces loss and waste through commercially preferred technologies for postharvest processing, packaging, and storage. ARS, through National Program 306, is enhancing economic viability and competitiveness of U.S. agriculture by improving quality and marketability of harvested foods and agricultural feedstocks to meet consumer needs, develop environmentally friendly and efficient processing concepts, and expand domestic and global market opportunities in biorefining in association with the bioeconomy. To conduct this work, the NP 306 five-year Action Plan is focused on the following component and problem statements:

Component 1: Foods

- Problem Statement 1.A: Define, measure, and preserve/enhance/reduce factors that impact quality and marketability
- Problem Statement 1.B: New bioactive ingredients and health-promoting foods
- Problem Statement 1.C: New and improved food processing and packaging technologies

Component 2: Nonfood (fibers including hides)

- Problem Statement 2.A: Maintain/enhance fiber and hide quality
- Problem Statement 2.B: Enable technologies to produce new and expand marketable nonfood, nonfuel biobased products derived from agricultural feedstocks

Component 3: Biorefining

- Problem Statement 3.A: Viable technologies for producing advanced biofuels (including biodiesel), or other marketable biobased products
- Problem Statement 3.B: Technologies that reduce risks and increase profitability in existing industrial biorefineries
- Problem Statement 3.C: Accurately estimate the economic value of biochemical, thermolysis conversion technologies.

Program Area 2: Animal Production and Protection

The ARS Animal Production and Protection (APP) National Program Area supplies the scientific information and tools to help support the U.S. food animal industries to continue to compete successfully in worldwide trade, provide the supply of nutritional animal products required by the Nation, and contribute toward global food security. APP's mission is to improve the health, well-being, and efficiency of livestock, poultry, and aquatic food animals to ensure a productive and safe food supply. Emphasis is placed on germplasm characterization, improvement, and conservation; understanding the mechanisms of disease resistance, and the development of tools to prevent, control, or eradicate diseases that threaten our food supply or public health; and identifying and developing sustainable systems for production of high-quality meat, milk, and eggs.

USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan	5-year Action Plan Components
Animal Production and Protection 				
Strategic Goal 3: Strategic Goal 3: Foster an Equitable and Competitive Marketplace for All Agricultural Producers				
Strategic Goal 4: Provide All Americans Safe, Nutritious Food	***Increase Food Security Through Assistance and Access to Nutritious and Affordable Food (Objective 4.1)***	Food Animal Production: provide the scientific community and food animal industries with scientific information, biotechnologies, and best management practices that ensure consumers an abundant supply of competitively priced, high quality animal products that enhance human health, while ensuring domestic food security, and enhancing the efficiency, competitiveness and environmental sustainability of the food animal industry.	National Program 101	1. Increase Food Animal Production Efficiencies, Food Animal Well-Being, and Adaptation of Food Animals to Diverse Production Systems 2. Understanding, Improving, and Effectively Using Food Animal Genetic and Genomic Resources 3. Measuring and Enhancing Product Quality and Enhancing the Healthfulness of Meat Animal Products
		Aquaculture: to conduct research and deliver	National Program 106	

USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan	5-year Action Plan Components
Strategic Goal 2: Ensure America's Agricultural System is Equitable, Resilient, and Prosperous	***Protect Agricultural Health by Minimizing Major Disease, Pests, and Wildlife Conflicts (Objective 2.2)***	technologies that improve domestic aquaculture production efficiency and product quality while minimizing impacts on natural resources.		1. Improving the efficiency and sustainability of catfish aquaculture. 2. Improving the efficiency and sustainability of salmonid aquaculture. 3. Improving the efficiency and sustainability of hybrid striped bass aquaculture. 4. Enhancing shellfish aquaculture 5. Developing marine finfish seedstocks. Developing sustainable aquaponic production systems.
		Animal Health: to deliver scientific information and tools to detect, control, and eradicate animal diseases that impact agriculture and public health.	National Program 103	1. Biodefense 2. Antimicrobial Resistance 3. Endemic Bacterial Diseases 4. Endemic Viral Diseases 5. Parasitic Diseases 6. Transmissible Spongiform Encephalopathies
		Veterinary, Medical, and Urban Entomology to eliminate arthropod vectors and the diseases that they transmit to livestock, humans, and other animals and nullify their economic impact.	National Program 104)	1. Veterinary Entomology 2. Medical Entomology 3. Fire Ants and other Invasive Ants

Strategic Goal 3: Foster an Equitable and Competitive Marketplace for All Agricultural Producers

All APP national programs (NP 101, 103, 104, and 106) contribute to USDA Strategic Goal 3—Fostering an Equitable and Competitive Marketplace for All Agricultural Producers. NP specific linkages to Objectives are provided below.

Strategic Goal 4: Make Safe, Nutritious Food Available to All Americans

Objective 4.1: Increase Food Security Through Assistance and Access to Nutritious and Affordable Food

USDA is committed to ensuring that every American has access to nutritious and affordable foods and beverages.

National Program 101: Food Animal Production

NP 101 contributes to USDA Strategic Plan Goal 3, and Goal 4, Objective 4.1. NP 101's mission is to provide the scientific community and food animal industries with scientific information, biotechnologies, and best management practices that ensure consumers an abundant supply of competitively priced, high quality animal products that enhance human health, while ensuring domestic food security, and enhancing the efficiency, competitiveness and environmental sustainability of the food animal industry.

Component 1: Increase Food Animal Production Efficiencies, Food Animal Well-Being, and Adaptation of Food Animals to Diverse Production Systems

- Problem Statement 1A: Improve the Efficiency of Food Animal Growth and Nutrient Utilization
- Problem Statement 1B: Improve Food Animal Reproductive Efficiency
- Problem Statement 1C: Enhance Food Animal Well-Being and Reduce Stress in the Production System

Component 2: Understanding, Improving, and Effectively Using Food Animal Genetic and Genomic Resources

- Problem Statement 2A: Develop Bioinformatic and other Required Capacities for Research in Genomics and Metagenomics
- Problem Statement 2B: Characterize Functional Genomic Pathways and their Interactions
- Problem Statement 2C: Preserve, Characterize and Curate Food Animal Genetic Resources
- Problem Statement 2D: Develop and Implement Genetic Improvement Programs using Genomic Tools
- Problem Statement 2E: Develop Techniques for Genetic Modification and Genetic Engineering of Food Animals and Evaluate their Efficacy

Component 3: Measuring and Enhancing Product Quality and Enhancing the Healthfulness of Meat Animal Products

- Problem Statement 3A: Enhance Systems to Improve Product Quality and Healthfulness and Reduce Variation in Meat Animal Products

USDA Strategic Plan Alignment to Goal 2: Ensure America's Agricultural System is Equitable, Resilient, and Prosperous

A strong and prosperous agricultural sector is essential to the well-being of the U.S. economy. America's farmers, ranchers, and land managers ensure a reliable food supply and natural resource base, support job growth, and promote economic development. To maintain an equitable and competitive agricultural and natural resource sector, USDA will safeguard animal and plant health, support farmers and ranchers' ability to start and maintain profitable cooperatives and businesses and offer financial support to all producers affected by natural disasters. Additionally, USDA's research agencies will continue to introduce high-performance plants and animals and offer integrated management options to increase the efficiency of farming and land management practices.

Objective 2.2: Protect Agricultural Health by Minimizing Major Disease, Pests, and Wildlife Conflicts

USDA works tirelessly to ensure that the food system is fair, resilient, competitive, and distributed and natural resources continue to be protected and enhanced to sustain current and future generations. USDA will continue to employ innovation and develop new markets, both at home and abroad, to ensure that these goals are met. The Department supports efforts that bolster the economic growth of U.S. growers, producers and managers, local and regional food systems, innovative production methodologies, and marketing strategies. USDA will continue to advance opportunities in new markets abroad to better enable U.S. agriculture to access and sustain market growth. By transforming the food system's infrastructure and strengthening critical supply chains and natural resource bases, USDA will ensure resilience against threats and disturbances and provide local and regional food systems with economic opportunities and security.

National Program 106: Aquaculture

NP 106 contributes to USDA Strategic Plan Goal 2, Objective 2.2, Goal 3, and Goal 4, Objective 4.1. NP106's mission is to conduct research and deliver technologies that improve domestic aquaculture production efficiency and product quality while minimizing impacts on natural resources. The program will accomplish this through its six research components and accompanying problem statements.

Component 1: Improving the efficiency and sustainability of catfish aquaculture

- Problem Statement 1A: Improve Catfish Aquaculture Production Efficiency
- Problem Statement 1B: Reduce the Impacts of Disease in Catfish Aquaculture
- Problem Statement 1C: Improve Catfish Product Quality

Component 2: Improving the efficiency and sustainability of salmonid aquaculture

- Problem Statement 2A: Improve Salmonid Aquaculture Production Efficiency and Ensure Product Quality
- Problem Statement 2B: Reduce the Impacts of Disease in Salmonid Aquaculture

Component 3: Improving the efficiency and sustainability of hybrid striped bass aquaculture

- Problem Statement 3A: Enhance Hybrid Striped Bass Aquaculture Production Problem Statement 2B: Reduce the Impacts of Disease in Salmonid Aquaculture

Component 4: Enhancing shellfish aquaculture

- Problem Statement 4A: Enhance Shellfish Aquaculture Production

Component 5: Developing marine finfish seedstocks

- Problem Statement 5A: Develop Warmwater Marine Finfish Seedstocks Optimized for Aquaculture Production Efficiency

Component 6: Developing sustainable aquaponic production systems

- Problem Statement 6A: Optimize Aquatic Animal Species Production Systems for Aquaponics
- Problem Statement 6B: Optimize Plant Production Systems for Aquaponics
- Problem Statement 6C: Optimize the Integration of Fish and Plant Production Systems

National Program 103: Animal Health

NP 103 contributes to USDA Strategic Plan Goal 3, and Goal 2, Objective 2.2. NP 103's mission is to deliver scientific information and tools to detect, control, and eradicate animal diseases that impact agriculture and public health. Further, the program seeks to protect and ensure the safety of the

Nation's agriculture and food supply through improved disease detection, prevention, and control. Basic and applied research approaches will be applied to solve animal health problems of high national priority. Emphasis will be given to methods and procedures to control animal diseases through the discovery and development of:

- Diagnostics
- Vaccines and vaccine platforms
- Biotherapeutics
- Alternatives to antibiotics
- Disease management systems
- Disinfectants
- Farm Biosecurity measures

The 5-year action plan components and problem statements to accomplish this include:

Component 1: Biodefense

- Problem Statement 1A: Control and eradicate foreign animal diseases
- Problem Statement 1B: Predict and prevent emerging diseases

Component 2: Antimicrobial Resistance

- Problem Statement 2A: Combat antimicrobial resistance through the development of Alternatives to Antibiotics

Component 3: Endemic Bacterial Diseases

- Problem Statement 3A: Mitigate the consequences of zoonotic bacterial diseases
- Problem Statement 3B: Mitigate respiratory bacterial diseases of livestock species
- Problem Statement 3C: Diagnose and mitigate strategies for production related bacterial diseases

Component 4: Endemic Viral Diseases

- Problem Statement 4A: Prevent respiratory viral diseases of livestock and poultry
- Problem Statement 4B: Enhance the control of viral diseases in intensive production systems

Component 5: Parasitic Diseases

- Problem Statement 5A: Improve diagnostic and mitigation strategies for gastrointestinal (GI) parasitic diseases
- Problem Statement 5B: Prevent spread of Hemoparasitic diseases of livestock

Component 6: Transmissible Spongiform Encephalopathies (TSEs)

- Problem Statement 6A: Determine pathobiology of prion strains
- Problem Statement 6B: Reveal genetics of prion disease susceptibility
- Problem Statement 6C: Diagnose, detect, and prevent prion diseases

National Program 104: Veterinary, Medical, and Urban Entomology

NP 104 contributes to USDA Strategic Plan Goal 3, and Goal 2, Objective 2.2. Goal NP 104’s mission is to eliminate arthropod vectors and the diseases that they transmit to livestock, humans, and other animals and to nullify their economic impact. The program will accomplish this through research to develop novel and/or improved risk assessment, surveillance, control, and monitoring tools for arthropods and arthropod-borne diseases of veterinary, medical, and urban importance.

NP 104's 5-year action plan includes the following components and problem statements:

Component 1: Veterinary Entomology

- Problem Statement 1A: Improved Integrated Pest Management of Ticks of Veterinary Importance.
- Problem Statement 1B: Improved Integrated Pest Management of Stable Flies that Feed on Livestock.
- Problem Statement 1C: Improved Integrated Pest Management of House Flies that Harm Livestock.
- Problem Statement 1D: Improved Risk Assessment, Biology, and Control of Horn Flies.
- Problem Statement 1E: Improved Integrated Pest Management of the New World Screwworm.
- Problem Statement 1F: Improved Integrated Pest Management of Mosquitoes of Veterinary Importance.
- Problem Statement 1G: Improved Risk Assessment, Biology, and Control of Biting Midges of Veterinary Importance.

Component 2: Medical Entomology

- Problem Statement 2A: Improved Integrated Pest Management of Mosquitoes of Medical Importance.
- Problem Statement 2B: Improved Integrated Pest Management of House Flies of Medical Importance.
- Problem Statement 2C: Improved Integrated Pest Management of Sand Flies of Medical Importance.
- Problem Statement 2D: Improved Surveillance and Control of Ticks of Medical Importance

Component 3: Fire Ants and other Invasive Ants

- Problem Statement 3A: Improved Risk Assessment, Biology, and Control of Invasive Fire Ants.
- Problem Statement 3B: Improved Integrated Pest Management of Invasive Crazy Ants.
- Problem Statement 3C: Improved Integrated Pest Management of Other Invasive Pest Ants.

Program Area 3 : Crop Production and Protection

Research conducted by ARS' Crop Production and Protection Program (CPP) National Programs will deliver science-based information and technologies to meet:

- Producers' needs for increased crop productivity and quality, protection from diseases and pests, and economically and environmentally sustainable methods of crop production;
- Consumers' demands for a ready supply of high quality, safe, affordable, and nutritious food;
- Workers' needs for a safe working environment;
- The public's desire to protect the environment; and
- The global community's needs for food security.

To meet these needs, ARS will conduct research that addresses the national priorities of genetic resource conservation, genomics, and genetic improvement; prevention and treatment of plant diseases; identification and management of arthropod and weed pests, including quarantine pests; improved crop management strategies; and the development of methyl bromide alternatives. The research of the Crop Production and Protection National Programs is well integrated with other ARS research in Animal Protection and Production; Natural Resources and Sustainable Agricultural Systems; and Nutrition, Food Safety and Quality. Through the National Invasive Species Information Center and

Alternative Farming Systems Center of the National Agricultural Library, key information will be disseminated to agricultural producers, the research and education community, and the general public.

USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan	5-year Action Plan Components
Crop Production and Protection 				
Strategic Goal 1: Combat Climate Change to Support America's Working Lands, Natural Resources, and Communities				
Strategic Goal 1: Combat Climate Change to Support America's Working Lands, Natural Resources and Communities	***Lead Efforts to Adapt to the Consequences of Climate Change in Agriculture and Forestry* (Objective 1.2)**	**Plant Genetic Resources, Genomics and Genetic Improvement**: Furnishing genetic, genomic, and bioinformatic tools, information, and genetic resources to enhance American agricultural productivity and ensure a high quality, safe supply of food, fiber, feed, ornamentals, and industrial products	**National Program 301**	1. Crop Genetic Improvement 2. Plant and Microbial Genetic Resource and Information Management 3. Crop Biological and Molecular Processes 4. Information Resources and Tools for Crop Genetics, Genomics, and Genetic Improvement.
Strategic Goal 2: Ensure America's Agricultural System is Equitable, Resilient, and Prosperous	***Protect Agricultural Health by Minimizing Major Diseases, Pests, and Wildlife Conflicts (Objective 2.1)***	**Plant Diseases**: Develop control strategies to reduce losses caused by plant diseases that are effective and affordable while maintaining environmental quality.	**National Program 303**	1. Etiology, Identification, Genomics and Systematics 2. Biology, Ecology, and Genetics of Plant Pathogens and Plant-Associated Microbes 3. Plant Health Management

USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan	5-year Action Plan Components
		Crop Protection and Quarantine: To provide technology to manage pest populations below economic damage thresholds by the integration of environmentally compatible strategies that are based on increased understanding of the biology and ecology of insect, mite, and weed pests.	**National Program 304**	1. Systematics and Identification 2. Weeds 3. Insects and Mites 4. Protection of Post-Harvest Commodities, Quarantine, and Methyl Bromide Alternatives
	Build Resilient Food Systems, Infrastructure, and Supply Chain (Objective 2.2) ***Foster Agricultural Innovation (Objective 2.3)***	**Plant Genetic Resources, Genomics and Genetic Improvement**: Furnishing genetic, genomic, and bioinformatic tools, information, and genetic resources to enhance American agricultural productivity and ensure a high quality, safe supply of food, fiber, feed, ornamentals, and industrial products	**National Program 301**	1. Crop Genetic Improvement 2. Plant and Microbial Genetic Resource and Information Management 3. Crop Biological and Molecular Processes 4. Information Resources and Tools for Crop Genetics, Genomics, and Genetic Improvement.
		Crop Production: Develop and transfer sound, science-based information and technologies for productive and profitable food, fiber, and floral/ornamental crop production	**National Program 305**	1. Integrated Sustainable Crop Production Systems 2. Bees and Pollination

USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan	5-year Action Plan Components
		systems that meet consumer demands for high quality, affordable products, grower needs for a stable income and competitiveness in the global marketplace, worker needs for a safe working environment, and the public's desire for maintaining or improving environmental quality.		
		(See previous National Program Area Descriptions)	National Program 301 National Program 303 National Program 304 National Program 305	*(See previous 5-year Action Plan Components)*
Strategic Goal 3: Foster an Equitable and Competitive Marketplace for All Agricultural Producers	***Expand Markets for Emerging Technologies, Sustainable Products, and Novel Products (Objective 3.2)***	Plant Genetic Resources, Genomics and Genetic Improvement: Furnishing genetic, genomic, and bioinformatic tools, information, and genetic resources to enhance American agricultural productivity and ensure a high quality, safe supply of food, fiber, feed, ornamentals, and industrial products	National Program 301	1. Crop Genetic Improvement 2. Plant and Microbial Genetic Resource and Information Management 3. Crop Biological and Molecular Processes 4. Information Resources and Tools for Crop Genetics, Genomics, and Genetic Improvement.
Strategic Goal 4: Provide All Americans Safe, Nutritious Food	***Increase Food Security Through Assistance and Access to Nutritious and Affordable Food (Objective 4.1)***			

Strategic Goal 1: Combat Climate Change to Support America's Working Lands, Natural Resources, and Communities

All CPP national programs (NP 301, 303, 304 and 305) contribute to USDA Strategic Goal 1—Combat Climate Change to Support America's Working Lands, Natural Resources, and Communities. NP specific

linkages to Objectives are provided below.

Objective 1.2: Lead Efforts to Adapt to the Consequences of Climate Change in Agriculture and Forestry

All farmers, ranchers, and forest landowners are on the front lines of climate change, facing changes in temperature and precipitation patterns and more frequent and intense events such as floods, drought, hurricanes, and wildfires. More than ever, their planning efforts and decision-making need to account for the impacts of climate change. Climate adaptation on the part of USDA will ensure that climate change thinking is integrated throughout USDA's mission, programs, operations, and management. USDA will continue to be a leader in the delivery of climate-smart science, research, and conservation practices.

Strategic Goal 2: Ensure America's Agricultural System is Equitable, Resilient, and Prosperous

Objective 2.1: Protect Agricultural Health by Minimizing Major Diseases, Pests, and Wildlife Conflicts

The impacts of pests, diseases, and wildlife conflicts on agricultural production, commerce, and trade can be immense. USDA must balance keeping American agriculture safe while expanding access to new agricultural markets all across the globe. Domestically, USDA conducts emergency response activities that minimize threats and their impacts on agricultural industries, adapting to changes in agricultural risk by adjusting available resources to address these threats. Concurrently, the Department embarks on collaborative research to develop pest-resistant strains of crops and new animal-disease vaccines, expedites the approval of new treatments, overcome wildfire by utilizing new fuel load reduction techniques, establish desirable plants to restore degraded range and grasslands, test new tactics in the battle against herbicide resistant Palmer amaranth and other crop weeds, and develops strategies to prevent and mitigate damage related to conflicts with wildlife. To reduce the risk of unsafe agricultural products entering the U.S., USDA incorporates mitigation strategies into international agreements and movement protocols. USDA works with its partners to conduct monitoring and surveillance efforts throughout the country to quickly detect and implement response efforts to foreign pests and diseases that may have evaded prevention measures. This rapid response to foreign pest and disease incursions results in minimal impact to U.S. producers and disruptions to trade and contributes to the protection of American agriculture. By employing effective prevention and mitigation tactics, USDA will reduce the impact of agricultural pests and diseases, as well as wildlife damage, to ensure that U.S. farms and ranches remain healthy and productive.

Objective 2.2: Build Resilient Food Systems, Infrastructure, and Supply Chain

USDA will continue to advance opportunities in new markets abroad to better enable U.S. agriculture to access and sustain market growth. By transforming the food system's infrastructure and strengthening critical supply chains, USDA will ensure resilience against threats and disturbances and provide local and regional food systems with economic opportunities and security.

Objective 2.3: Foster Agricultural Innovation

The future of U.S. agriculture, which includes plant and animal agriculture, forestry, and aquaculture, depends on continued science, innovation, and process improvements supporting technological progress, production efficiencies, and environmental stewardship.

Strategic Goal 3: Foster an Equitable and Competitive Marketplace for All Agricultural Producers

Objective 3.2: Expand Markets for Emerging Technologies, Sustainable Products, and Novel Products

Strategic Goal 4: Make Safe, Nutritious Food Available to All Americans

Objective 4.1: Increase Food Security Through Assistance and Access to Nutritious and Affordable Food

National Program 301: Plant Genetic Resources, Genomics, and Genetic Improvement

NP 301 contributes to the USDA Strategic Plan Goal 1, Objective 1.2, Goal 2, Objectives 2.1, 2.2, and 2.3, Goal 3, Objective 3.2, and Goal 4, Objective 4.1 The mission of NP 301 is to safeguard and use plant genetic resources (genetic raw material), associated genetic and genomic databases, and bioinformatic tools to ensure an abundant, safe, and inexpensive supply of food, feed, fiber, ornamentals, and industrial products for the United States and other nations. The program will accomplish this through the following research components and problem statements.

Component 1: Crop Genetic Improvement

- Problem Statement 1A. Trait discovery, analysis, and superior breeding methods.
- Problem Statement 1B. Develop new crops, cultivars, and germplasm with improved traits.

Component 2: Plant and Microbial Genetic Resource and Information Management

- Problem Statement 2A. Plant genetic resource and information management.
- Problem Statement 2B. Microbial genetic resource and information management.

Component 3: Crop Biological and Molecular Processes

- Problem Statement 3A. Fundamental knowledge of plant biological and molecular processes.
- Problem Statement 3B. Crop biotechnology development, implementation, and evaluation.

Component 4: Information Resources and Tools for Crop Genetics, Genomics, and Genetic Improvement

- Problem Statement 4A. Information resources and tools for crop genetics, genomics, and genetic improvement.

Objective 2.1: Protect Agricultural Health by Minimizing Major Diseases, Pests, and Wildlife Conflicts

Objective 2.3: Foster Agricultural Innovation

National Program 303: Plant Diseases

NP 303 contributes to the USDA Strategic Plan Goal 2, Objective 2.1 and 203. NP 303's mission is to develop control strategies to reduce losses caused by plant diseases that are effective and affordable while supporting environmental quality. To do this, NP 303 relies on the following research components and problem statements.

Component 1: Etiology, Identification, Genomics and Systematics

- Problem Statement 1A: Characterize and Integrate Computational and Culture Resources, Genomics, and Systematics of Plant Pathogens.
- Problem Statement 1B: Develop and Improve Plant Pathogen Diagnostics, Detection and Identification.

Component 2: Biology, Ecology, and Genetics of Plant Pathogens and Plant-Associated Microbes

- Problem Statement 2A: Advance an Understanding of Fundamental Pathogen Biology.
- Problem Statement 2B: Understanding and Integrating Systems-Based Approaches to Disease Biology.

- Problem Statement 2C: Characterize Microbial Ecology and Epidemiology of Plant Diseases.
- Problem Statement 2D: Identify the Biological and Ecological Factors of Pathogen Vector Efficiency.

Component 3: Plant Health Management

- Problem Statement 3A: Develop and Deploy Host Resistance.
- Problem statement 3B: Advance Biologically based and Integrated Disease Management Strategies.
- Problem Statement 3C: Develop Pre-plant Approaches to Reduce Pathogen Pressure for Commercial Crop Production Systems.

National Program 304: Crop Protection and Quarantine

NP 304 contributes to the USDA Strategic Plan Goal 2, Objective 2.1 and 2.3. NP 304's mission is to provide technology to manage pest populations below economic damage thresholds by the integration of environmentally compatible strategies that are based on increased understanding of the biology and ecology of insect, mite, and weed pests. To accomplish this, NP 304, will undertake the following research components and problem statements.

Component 1: Systematics and Identification

- Problem Statement 1: Systematics and Identification of Insects and Mites, Non-crop Plants, and Microorganisms in Agriculture
- Problem Statement 1A: Insects and Mites
- Problem Statement 1B: Non-crop plants
- Problem Statement 1C: Microorganisms

Component 2: Weeds

- Problem Statement 2A: New weed management technology discovery and development
- Problem Statement 2B: Biological control and ecosystem research
- Problem Statement 2C: Integrated approaches to weed management

Component 3: Insects and Mites

- Problem Statement 3A. Early detection, prediction, and monitoring of beneficial and pest arthropods
- Problem Statement 3B. Develop new or improved management tools and knowledge to control arthropod pests
- Problem Statement 3C. Integrate management strategies to control arthropod pests

Component 4: Protection of Post-Harvest Commodities, Quarantine, and Methyl Bromide Alternatives

- Problem Statement 4A: Manage Pests Affecting Fresh and Durable Commodities
- Problem Statement 4B: Improve and Develop Postharvest and Quarantine Treatments

Objective 2.3: Foster Agricultural Innovation

National Program 305: Crop Production

NP 305 contributes to USDA Strategic Plan Goal 2, Objective 2.3. NP 305's mission is develop and transfer sound, science-based information and technologies for productive and profitable food, fiber, and floral/ornamental crop production systems that meet consumer demands for high quality, affordable products, grower needs for a stable income and competitiveness in the global marketplace, worker needs for a safe working environment, and the public's desire for maintaining or improving

environmental quality. To accomplish this mission, the program's 5-year action plan includes the following components and problem statements.

Component 1: Integrated Sustainable Crop Production Systems

- Problem Statement 1A: Productive and Profitable Systems for Sustainable Production of Agronomic Crops.
- Problem Statement 1B: Productive and Profitable Systems for Sustainable Production of Fruit and Nut Crops.
- Problem Statement 1C: Productive and Profitable Systems for Sustainable Production of Ornamental, Nursery, and Protected Culture Crops.
- Problem Statement 1D: New and Improved Automation and Spray Application Systems for Sustainable Crop Production

Component 2: Bees and Pollination

- Problem Statement 2A: Bee Management—Improving Bee Nutrition and Performance
- Problem Statement 2B: Bee Health—Mitigating the Impacts of Pathogens, Pests, and Pesticides
- Problem Statement 2C: Conserving Bee Diversity and Improving Bee Taxonomy

Program Area 4: Natural Resources and Sustainable Agricultural Systems

Natural Resources and Sustainable Agricultural Systems (NRSAS) support researchers at seventy locations developing the technologies and strategies needed to help farmers, ranchers, and other managers effectively steward the diverse agricultural mosaic spread across the Nation. These diverse landscapes generate more than $200 billion in goods and services that are the basis of a strong rural economy. NRSAS prioritizes developing technologies that are economical to use and systems that support profitable production and enhance the Nation's vast renewable natural resource base. NRSAS identifies research priorities through a continual dialogue with a wide range of customers and stakeholders to ensure that our science is relevant and provides effective solutions to their concerns. We address issues affecting both private and public lands, because together these are the foundation of a healthy and vibrant agricultural industry that not only supplies food, feed, fiber, and renewable energy to the Nation, but also abundant and high-quality supplies of fresh water and clean air, as well as healthy ecosystems.

USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan	5-year Action Plan Components
Natural Resources and Sustainable Agricultural Systems 				
Strategic Goal 1: Combat Climate Change to Support America's Working Lands, Natural	***Restore, Protect, and Conserve Watersheds to ensure Clean, Abundant, and Continuous Provision of***	**Water Availability and Watershed Management**: To: effectively and safely manage water resources to sustain and increase agricultural production and crop water productivity	**National Program 211**	1.) Effective Water Management in Agriculture 2.) Erosion, Sedimentation,

USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan	5-year Action Plan Components
Resources and Communities	***Water Resources (Objective 1.3)***	while protecting the environment and human and animal health.		and Water Quality Protection 3.) Conservation Practices in Agricultural Watersheds 4.) Watershed Management to Improve Agroecosystem Services
	Use Climate-Smart Management and Sound Science to Enhance the Health and Productivity of Agricultural Lands (Objective 1.1)	**Soil and Air:** To conduct scientific research that provides fundamental knowledge of soil-crop-air system dynamics and that leads to the development of technologies and practices producers can readily use to improve management of soil resources, reduce impact on air resources, efficiently use inputs, and contribute to ecosystems services.	**National Program 212**	1.) Develop fundamental knowledge of and practices for soil-based management that contribute to greater agricultural productivity, reduced reliance on inputs, resilience to disturbances, and ecosystem services. 2.) Advance the understanding and monitoring of atmospheric emission, transport, and deposition processes, and develop management strategies and support tools

USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan	5-year Action Plan Components
				to reduce the release or mitigate the effects of gases, chemical emissions, particulate matter, and odorants while ensuring productivity and ecosystem health. 3.) Develop management practices and technologies to enhance the efficient use of manure, byproducts, and agricultural chemicals such as pesticides and fertilizers, and minimize their losses to the environment. 4.) At a systems level, develop soil-crop-air strategies, technologies, and practices that ensure producers can adapt to climate change and extremes,

USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan	5-year Action Plan Components
				remain resilient and profitable, and provide abundant food, feed, fiber, renewable energy, and ecosystems services.
	Lead Efforts to Adapt to the Consequences of Climate Change in Agriculture and Forestry (Objective 1.2)	**Grass, Forage, and Rangeland Agroecosystems**: develop and promote use of improved plant germplasm, novel crops and production approaches, decision support tools, and ecological land management practices in enterprises and production systems that use turfgrass and forages.	**National Program 215**	1.) Provide basic and applied research at the plant and soil scale to improve utility of crops for turfgrass; harvested forage, fiber, and bioenergy; pasture; and rangeland systems 2.) Improve field-scale management strategies and production tools for harvested forage and fiber systems for livestock, bioenergy, and bioproducts 3.) Improve pasture and grazing management systems and

USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan	5-year Action Plan Components
				technologies for agricultural productivity and ecosystem services. 4.) Develop systems-based approaches for rangeland management to enhance forage and livestock productivity, land restoration, and ecological services.
	Increase Carbon Sequestration, Reduce Greenhouse Gas Emissions, and Create Economic Opportunities (Objective 1.4)	**Sustainable Agricultural Systems Research**: to deliver scientific solutions that improve the holistic sustainability of U.S. agricultural and food systems and to design new systems that will be sustainable well into the future. Holistic sustainability includes food and nutrition security for all people, profitability for people employed in the agricultural sector, environmental health of agricultural landscapes, and quality of life for rural populations and society.	**National Program 216**	1.) Improve agricultural system resilience 2.) Optimize agricultural systems to increase ecosystem service value to farmers and society 3.) Design creative solutions for enhancing the sustainability of targeted and often small-scale agriculture and food systems 4.) Enable assessment of holistic

USDA Strategic Plan Goal	USDA Strategic Plan Objective	ARS National Program Area	ARS National Program Action Plan	5-year Action Plan Components
				sustainability outcomes of U.S. agricultural systems

Strategic Goal 1: Combat Climate Change to Support America's Working Lands, Natural Resources, and Communities

Objective 1.3: Restore, Protect, and Conserve Watersheds to Ensure Clean, Abundant, and Continuous Provision of Water Resources

The Nation's forests and grasslands that provide clean and available water are a fundamental part of the American landscape. These lands, along with the millions of acres of well-managed, privately held forests and grasslands, provide clean air and water, forest and rangeland products, mineral and energy resources, jobs, and quality habitat for fish and wildlife. Productive agricultural landscapes, including clean and available water, healthy wetlands, streams and rivers, and abundant fish and wildlife, underlie robust tourism and recreational activities.

National Program 211: Water Availability and Watershed Management

NP 211 supports the USDA Strategic Plan Goal 1, Objective 1.3. The mission of NP 211 is to effectively and safely manage water resources to sustain and increase agricultural production and crop water productivity while protecting the environment and human and animal health. These advances in knowledge and technologies will provide producers, action agencies, local communities, and resource advisors with the practices, tools, models, and decision support systems they need to improve water conservation and water use efficiency in agriculture, enhance water quality, protect rural and urban communities from the ravages of droughts and floods, improve agricultural and urban watersheds, and prevent the degradation of riparian areas, wetlands, and stream corridors. The rationale for this program is that 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 the natural environment. To accomplish this mission, the NP 211, five-year action plan includes the following components and problem statements.

Component 1: Effective Water Management in Agriculture

- Problem Statement 1-A: Develop Multi-scale Irrigation Management Technologies for Sustainability
- Problem Statement 1-B: Develop and Test Irrigation Application Methods, Components, and Management
- Problem Statement 1-C: Improve Management of Rainfed, Dryland, and Limited-Irrigation Water Use
- Problem Statement 1-D: Develop Alternative Water Resources for Agriculture and Aquifer Management
- Problem Statement 1-E: Develop and Improve Simulation Modeling, Data, and Decision Support Tools for Water Management

Component 2 : Erosion, Sedimentation, and Water Quality Protection

- Problem Statement 2-A: Elucidate In-Field Processes Controlling Soil Erosion and Fate of Sediment and Contaminants
- Problem Statement 2-B: Determine In-Stream Processes Affecting Contaminant Fate, Transport, and Biological Elements
- Problem Statement 2-C: Develop Practices to Control the Transport and Fate of Soil, Water, and Air Contaminants
- Problem Statement 2-D: Develop Tools to Improve Water Quality Management in the Landscape

Component 3: Conservation Practices in Agricultural Watersheds

- Problem Statement 3-A. Understanding Chemical, Physical, and Biological Processes That Affect Implementation of Conservation Practices
- Problem Statement 3-B: Assess and Implement Conservation Practices in Agricultural Landscapes
- Problem Statement 3-C: Forecast the Impacts of Conservation Practices Within Changing Environments

Component 4: Watershed Management to Improve Agroecosystem Services

- Problem Statement 4-A: Enable Data-Driven Agroecosystem Management Through Collection of Long-Term Observations, Data Interpretation, and Data Dissemination
- Problem Statement 4-B: Develop and Improve Tools for Watershed Management
- Problem Statement 4-C: Quantify Agroecosystem Performance and Tradeoffs

Objective 1.1: Use Climate-Smart Management and Sound Science to Enhance the Health and Productivity of Agricultural Lands

USDA is developing and implementing a comprehensive strategy to incentivize climate-smart decision-making by all agricultural and forest producers, landowners, and communities. The Department will build on its progress to integrate climate change adaptation and mitigation into programs and services as we work to support farmers; ranchers; forest landowners; partners; and urban, rural, and Tribal communities in tackling climate change. By increasing the sustainability of our forests, rangelands, and crop and livestock systems through the deployment of climate-smart and environmentally smart management, we will see improvements in the condition of these resources, the development of healthy ecosystems, and vibrant, resilient communities.

National Program 212 – Soil and Air

NP212 supports USDA Strategic Plan Goal 1, Objective 1.1. NP 212 has as its mission: to conduct scientific research that provides fundamental knowledge of soil-crop-air system dynamics and that leads to the development of technologies and practices producers can readily use to improve management of soil resources, reduce impact on air resources, efficiently use inputs, and contribute to ecosystems services. N 212 program priorities include:

- Enable improvements of air quality via management and mitigation of emissions from agricultural operations
- Develop knowledge and technologies for reducing atmospheric greenhouse gas concentrations through management of agricultural emissions and carbon sequestration
- Enable agriculture to adapt to climate change
- Maintain and enhance soil resources

To carry out this mission, NP 212, has identified the following components and problem statements in their 5-year action plan.

Component 1: Develop fundamental knowledge of and practices for soil-based management that contribute to greater agricultural productivity, reduced reliance on inputs, resilience to disturbances, and ecosystem services.

- Problem Statement 1A: Quantify driving factors in soil carbon cycling, including organic matter dynamics, carbon sequestration, and CO2 and CH4 emissions
- Problem Statement 1B: Advance the understanding of soil ecosystems that drive agricultural outcomes
- Problem Statement 1C:Advance our understanding of innovative, nontraditional soil amendment research, including biostimulants and biochars
- Problem Statement 1D: Establish metrics to reliably quantify the impact of management practices on soil health and function.

Component 2: Advance the understanding and monitoring of atmospheric emission, transport, and deposition processes, and develop management strategies and support tools to reduce the release or mitigate the effects of gases, chemical emissions, particulate matter, and odorants while ensuring productivity and ecosystem health.

- Problem Statement 2A: Quantify and reduce atmospheric gas emissions from animal production facilities
- Problem Statement 2B: Quantify and reduce atmospheric gas emissions from soils
- Problem Statement 2C: Quantify and reduce atmospheric emissions of agricultural chemicals, particulate matter, and odorants

Component 3: Develop management practices and technologies to enhance the efficient use of manure, byproducts, and agricultural chemicals such as pesticides and fertilizers, and minimize their losses to the environment.

- Problem Statement 3A: Improve use of manure as a soil amendment; develop manure processing, treatment, and value-added technologies; and reduce manure constituent loss to the environment
- Problem Statement 3B: Effectively use nonagricultural and agricultural byproducts in agricultural settings
- Problem Statement 3C: Efficiently use chemical inputs, such as fertilizers and pesticides, for crop production and reduce their environmental losses
- Problem Statement 3D: Assess and reduce the risk of off-farm transport of agricultural pathogens and pharmaceuticals and develop methods for measuring antimicrobial resistance and potential impact of these on public health

Component 4: At a systems level, develop soil-crop-air strategies, technologies, and practices that ensure producers can adapt to climate change and extremes, remain resilient and profitable, and provide abundant food, feed, fiber, renewable energy, and ecosystems services.

- Problem Statement 4A: Develop cropping systems that enhance agroecosystems and promote resilience to climate change
- Problem Statement 4B: Use innovative precision agriculture, remote sensing, and/or modeling strategies for farming systems development and assessment

Objective 1.2: Lead Efforts to Adapt to the Consequences of Climate Change in Agriculture and Forestry

ARS is committed to investing in long-term climate change research, education, and extension through the Long-Term Agroecosystem Research Network and the USDA Climate Hubs to advance innovation on new crop and soil management systems, environmental monitoring, and breeding.

National Program 215 - Pasture, Forage, and Rangeland Ecosystems

NP215 supports USDA Strategic Plan Goal 1, Objective 1.2.The mission of NP 215 is to develop and promote use of improved plant germplasm, novel crops and production approaches, decision support tools, and ecological land management practices in enterprises and production systems that use turfgrass and forages. To accomplish this mission, the NP215 action plan has the following components and problem statements.

Component 1: Provide basic and applied research at the plant and soil scale to improve utility of crops for turfgrass; harvested forage, fiber, and bioenergy; pasture; and rangeland systems.

- Problem Statement 1A: Enhance plant genetic resources with improved traits and uses.
- Problem Statement 1B: Enhance beneficial microbial, plant interactions, and reduce impact of pests, pathogens, and microbial toxicity to crops and livestock.
- Problem Statement 1C: Advance the understanding of plant metabolites and metabolic pathways to improve quality and value of plants used for harvested forage, fiber, bioenergy, pasture, and rangeland.
- Problem Statement 1D: Enhance genetic selection efficiency and quantify ecosystem services of turfgrass systems.

Component 2: Improve field-scale management strategies and production tools for harvested forage and fiber systems for livestock, bioenergy, and bioproducts

- Problem Statement 2A: Develop harvested forage systems that optimize productivity, resilience to climate change, and environmental benefits.
- Problem Statement 2B: Develop cover crop systems that provide agroecosystem services and forage resources.
- Problem Statement 2C: Promote novel crops and value-added end uses for harvested forage and fiber systems.

Component 3: Improve pasture and grazing management systems and technologies for agricultural productivity and ecosystem services.

- Problem Statement 3A: Grazing system management to improve soil, forage, and animal health and productivity.
- Problem Statement 3B: Technologies for precision management and diversification of forage-livestock systems. .
- Problem Statement 3C: Grazing systems for improved environmental outcomes and ecosystem services.

Component 4: Develop systems-based approaches for rangeland management to enhance forage and livestock productivity, land restoration, and ecological services.

- Problem Statement 4A: Fuels management to mitigate wildfire.
- Problem Statement 4B: Ecological management strategies for forage and livestock productivity, invasive species mitigation, and land restoration.
- Problem Statement 4C: Rangeland systems management for multiple ecosystem services and

socioeconomic outcomes.
- Problem Statement 4D: Rangeland and animal management strategies that reduce the negative impacts of poisonous plants in the landscape.

Objective 1.4: Increase Carbon Sequestration, Reduce Greenhouse Gas Emissions, and Create Economic Opportunities

National Program 216 - Sustainable Agricultural Systems Research

NP 216 supports the USDA Strategic Plan Goal 1, Objective 1.4. The mission of NP216, Sustainable Agricultural Systems, is to deliver scientific solutions that improve the holistic sustainability of U.S. agricultural and food systems and to design new systems that will be sustainable well into the future. Holistic sustainability includes food and nutrition security for all people, profitability for people employed in the agricultural sector, environmental health of agricultural landscapes, and quality of life for rural populations and society. By implementing the following components and problems statements, NP216 will accomplish its vision of diversified agricultural systems that sustain and improve productivity, profitability, ecosystem health, and human well-being.

Component 1: Improve agricultural system resilience

- Problem Statement 1A: Resilience to changing climate trends and extreme weather
- Problem Statement 1B: Resilience to supply chain shocks
- Problem Statement 1C: Resilience to emerging and persistent challenges

Component 2: Optimize agricultural systems to increase ecosystem service value to farmers and society

- Problem Statement 2A: Greenhouse-gas (GHG) neutral agricultural systems
- Problem Statement 2B: Biodiversity
- Problem Statement 2C: Water availability and quality
- Problem Statement 2D: Agriculture-environment-society nexus

Component 3: Design creative solutions for enhancing the sustainability of targeted and often small-scale agriculture and food systems

- Problem Statement 3A: Organic systems
- Problem Statement 3B: Bioenergy systems
- Problem Statement 3C: Agroforestry systems
- Problem Statement 3D: Local and urban food systems
- Problem Statement 3E: Other systems of interest

Component 4: Enable assessment of holistic sustainability outcomes of U.S. agricultural systems

- Problem Statement 4A: Enable system comparison using core indicators
- Problem Statement 4B: Enable agricultural process and product evaluation
- Problem Statement 4C: Enable assessment of agriculture and natural resource sustainability programs

Chapter Three: Program Management Goals

USDA Strategic Plan Alignment to Goal 6: Attract, Inspire, and Retain an Engaged and Motivated Workforce that's Proud to Represent USDA

At USDA, we are committed to reaching new heights by recruiting, onboarding, supporting, and retaining a diverse and talented workforce and cultivating a workplace environment that is collaborative, service oriented, mission-centered, healthy, inclusive, and welcoming. This includes leaders and staff who work together to build a culture that welcomes, respects, and supports everyone in reaching their highest potential by ensuring equal opportunity compliance, providing proactive civil rights, and championing USDA's zero tolerance policy for unlawful discrimination and sexual harassment for all employees. We believe this focus on organizational culture will enable us to build the USDA back better as a premier organization and model employer that lives by its values.

As the landscape of talent continues to evolve, it is imperative that USDA seek to continuously find ways to attract talent that represents the diversity of America. The COVID-19 pandemic has also catapulted leaders to rethink and reimagine where and how we work. In the coming years, we will build on best practices for a hybrid work environment and continue to evaluate the future of work at USDA. As such, we are committed to being a learning organization that tolerates risk-taking, explores the untested and unknown, and nurtures innovative ideas at all levels of the organization. We will prioritize learning and training throughout the employee experience at USDA. USDA's strategies to make the Department a wonderful place for everyone to work and an employer of choice include:

- **Employee Health, Wellness, and Safety**: Prioritize employee health and safety and take concrete steps to support employee wellness and mental health.
- **Modern Workplace**: Reimagine how we work using new tools such as data dashboards to make data driven decisions and create sustainable efficiencies around process and business operations.
- **Diversity, Equity, Inclusion and Accessibility:** Uphold civil rights; advance diversity, equity, inclusion, and accessibility; and create a culture that respects, welcomes, and supports all employees, including LGBTQ+ individuals and people with disabilities.
- **Time Management and Process** Improvement: Encourage all employees to be creative and innovative with an eye towards improving existing processes and systems to reduce processing times and paperwork, build trust in government, and ensure time is well spent.
- **Science, Data, Evaluation and Continual Learning**: Strive to be a data-driven, customer experience centered, learning organization that embraces innovation, makes smart and equitable decisions about technology and procurement, builds an infrastructure for the challenges of today and tomorrow, insists on continuous improvement, and listens to feedback.

Civil Rights and Diversity are a Priority

The creative process that drives research demands a diverse people and the ideas they generate. It is also important to have research stakeholders inclusive of all agricultural communities and tribal nations; and consequently, ensure the ARS workforce is also reflective of today's society including various races, genders, sexual orientation, varying physical ability, and veterans. Ensuring all employees feel safe and encouraged to fully embrace the uniqueness and rareness each of us brings to work while respecting and valuing those different from our own, is paramount in fostering a creative and highly productive workforce.

ARS strives to become the model workforce and the most respected agricultural research institution in the country. Doing so requires the Agency to reinforce and uphold a zero tolerance for discrimination and harassment in our workforce, recruitment practices, research activities, and other services provided by the Agency and our partners. The Agency is also committed to ensuring equal access to our research products, information, and resources.

Objective 6.1: Foster a Culture of Civil Rights, Diversity, Equity, Inclusion, Accessibility, Transparency, and Accountability

USDA is committed to the values of equity and inclusion, rooted in justice and equal opportunity for our employees and those we serve. The Department is taking bold, historic action to root out generations of systemic racism, deeply integrate equity into decision making and policymaking, and build equitable systems and programming for all Americans, and ARS is committed to reinforcing the Department's stance to ensuring a workforce free of discrimination. USDA is standing up an independent Equity Commission to examine USDA programs and services and make recommendations as to how the Department can advance equity by reducing barriers to access for historically undeserved communities.

The Department also launched its inaugural Racial Justice and Equity Internal Working Group to review internal systems and processes and identify inequities, challenges, and opportunities for improvement. Understanding how USDA both advances and inhibits equity and opportunity for our existing and potential customers requires employees at every level to listen carefully to and meaningfully engage customers; build relationships with a diverse set of stakeholders and partners; take a critical look at our data; and examine the design, implementation, and impact of programs and systems throughout the Department. From equitable contracting and procurement decisions to the implementation of staffing plans including diverse recruiting, hiring, training, rewarding, and promoting, there are opportunities for equity throughout.

As we strengthen the culture and support for our workforce, USDA has a responsibility to attract and invest in the next generation of agricultural leaders through a premier internship experience. USDA leaders will make time and space for internal review and reflection so that we can build an organization, culture, and workforce with the necessary skills and tools to ensure knowledge management, efficiency, and inclusion.

Office of Outreach, Diversity, and Equal Opportunity (ODEO)

The Office of Outreach, Diversity, and Equal Opportunity (ODEO) has oversight responsibility for the Equal Employment Opportunity (EEO) Program to ensure compliance with all applicable civil rights laws, regulations, policies, and procedures, and to ensure a workforce free of discrimination and harassment. Timely and effective processing of issues and complaints as they arise are critical to the success and long-term viability of the Agency's workforce and accomplishment of research priorities. Equally as is important to ensure allegations of discrimination are handled appropriately and timely, is the Agency's commitment to proactive preventing discrimination from occurring. The Agency's approach to proactive prevention of discrimination is twofold: expanding diversity and equity initiatives to include special emphasis programs; and as well as, to help mitigate and improve communication in the workforce through a myriad of techniques including but not limited to ensuring a robust Cooperative Resolution Program.

Diversity, Equity, Inclusion, and Accessibility

The Agency has an obligation to ensure that our workforce is reflective of the population we serve, and to work to eliminate barriers to employment of individuals from traditionally underserved and underrepresented communities including Tribal Nations. For ARS, a top priority to reducing barriers to

employment and to recruiting and retaining a highly competitive workforce is by educating our employees through special emphasis programs such as training. Further, ARS is committed to ensuring the appropriate resources are allocated to EEO compliance activities and programs to ensure accessibility of our physical worksite, information, and research products and services. It is paramount the Agency foster an environment for employees of various racial and religious backgrounds, genders, physical ability, and sexual orientation. We also want to ensure that our recruitment practices and workforce is inclusive of the veteran community. Ensuring the proper processes and resources are accessible to all employees is also important to meet the needs of our ever changing and aging workforce.

Cooperative Resolution Program

The function of the ARS, ODEO, Cooperative Resolution Program (CRP) is to improve communication, cultivate understanding and foster cooperation. CRP offers a variety of Alternative Dispute Resolution (ADR) services for all REE Mission Area employees to address workplace conflict in its earliest stage.

Our program is the primary ADR Resource for all REE Mission Area agency employees. Services offered include conflict coaching, consultation, facilitated dialogue, group facilitation/group intervention, mediation and training.

EEO Compliance

Although the Agency is committed to a workforce free from discrimination and retaliation, it is important the Agency have processes in place to timely and appropriately address any allegations. One primary function of ODEO is to provide resources and to oversee the compliant process. The Agency is committed to strengthening the EEO compliance of the Agency and fostering a diverse and safe workforce for all.

Objective 6.2: Establish a Customer-Centric, Inclusive, High-Performing Workforce that is Representative of America and the Communities We Serve

The Department strives to make USDA a great place to work for everyone, with a focus on restoring the confidence and morale of the workforce following the COVID-19 pandemic. Through their mission delivery, engaged and empowered employees will find creative solutions to unexpected challenges; they will bring innovation to their customer service delivery; they will display curiosity and collaboration across Agency and Mission Area lines; they will celebrate each other's thoughts and experiences; and they will serve as ambassadors to recruit and retain a talented workforce that will ensure USDA's continued future success and evolution. To maintain a high-performing, customer-centric workforce, USDA will continue to foster a work environment that maximizes employee performance, which is directly tied to an individual's level of empowerment and engagement. Through mutual respect and collaboration, USDA leadership will make the Department a safe, fair, and rewarding workplace for all employees. We want USDA staff to be passionate and engaged, carrying out the important work every day that will help move our Nation forward.

ARS Human Resources Division

The Human Resources Division (HRD) is dedicated to meeting the Research, Education, and Economics (REE) mission area human resource needs in a manner that is customer driven and cost effective. HRD values the diversity of our employees and works collectively to make HRD the employer of choice in the human resources community. HRD continually seeks and uses innovative approaches that are models for the Department and the Government as a whole.

Objective 6.3: Promote USDA Operational Excellence Through Better Use of Technology and Shared Solutions

The Department strives to fully leverage modern human-centered design, data, technology, and digital services to provide our internal and external customers with easy-to-navigate online tools to increase access to our critical programs and services. Enterprise-wide shared technology and data services will help increase the Department's capacity to make data-driven policy decisions, track progress, and support evidence-building within USDA's research and statistical agencies, while also increasing data shared with external researchers. Increasing shared services and modernizing legacy IT systems will move the Department towards a future where customer-facing programs are seamlessly integrated with back-end IT that can be continually modified in response to changing customer needs. USDA is making better use of data and enabling advanced analytics, such as geospatial modeling, to improve the delivery of services and programs. The Department's enterprise data and analytics platform is bringing data together from across different parts of the organization to support cross-cutting analytics. The capabilities of data scientists and analysts have been expanded with the development of a data science workbench, which enables advanced analytics needed for more sophisticated insights. Cybersecurity is a foundational shared service and represents a core component of improving digital service delivery and internal systems by ensuring secure, reliable access to USDA products and services.

ARS AFM Information Technology Services Division

ARS's Administrative and Financial Management (AFM) is a centralized Business Center that supports mission-critical operation, streamlines key business functions, and reduces costs through team-based and cross-functional approaches. Within AFM, the Information Technology Services Division (ITSD) provides information technology support to carry out the ARS mission in alignment with USDA Strategic Plan Goal 6, Objective 6.3.