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PREFACE

This publication summarizes the fiscal year (FY) 2024 Budget for the U.S. Department of Agriculture (USDA). Throughout this publication any reference to the "Budget" is in regard to the 2024 Budget, unless otherwise noted. All references to years refer to fiscal year, except where specifically noted. The budgetary tables throughout this document show actual amounts for 2021 and 2022, enacted levels for 2023, and the President's Budget request for 2024. Amounts for 2023 estimated levels include: non-enacted amounts such as Full-Time Equivalent levels, fleet levels, information technology investment levels, recovery levels, transfers in and out, balances available end of year, and obligation levels.

Throughout this publication, the "2018 Farm Bill" is used to refer to the Agriculture Improvement Act of 2018. Most programs funded by the 2018 Farm Bill are funded through 2023. Amounts shown in 2024 for most Farm Bill programs reflect those confirmed in the baseline.

Pursuant to the Balanced Budget and Emergency Deficit Control Act of 1985, sequestration is included in the numbers for mandatory programs in 2021, 2022, 2023 and 2024.

AGENCY-WIDE

PURPOSE STATEMENT

The Agricultural Research Service (ARS) was established on November 2, 1953, pursuant to authority vested in the Secretary of Agriculture by 5 U.S.C. 301 and Reorganization Plan No. 2 of 1953, and other authorities.

ARS is the principal in-house research agency of the U.S. Department of Agriculture (USDA). Congress first authorized Federally supported agricultural research in the Organic Act of 1862, which established what is now USDA. That statute directed the Commissioner of Agriculture "to acquire and preserve in his department all information he can obtain by means of books and correspondence, and by practical and scientific experiments." The scope of USDA's agricultural research programs has been expanded and extended more than 60 times since the Department was created.

ARS research is authorized by the Department of Agriculture Organic Act of 1862 (7 U.S.C. 2201 note); Act of June 29, 1935 (7 U.S.C. 427); Agricultural Marketing Act of 1946, as amended (7 U.S.C. 1621 note); Food and Agriculture Act of 1977 (P.L. 95-113), as amended (7 U.S.C. 1281 note); Food Security Act of 1985 (P.L. 99-198) (7 U.S.C. 1281 note); Food, Agriculture, Conservation, and Trade Act of 1990 (P.L. 101-624) (7 U.S.C. 1421 note); Federal Agriculture Improvement and Reform Act of 1996 (FAIR) (P.L. 104-127); and Agricultural Research, Extension, and Education Reform Act of 1998 (P.L. 105-185). ARS derived most of its objectives from statutory language, specifically the "Purposes of Agricultural Research, Extension, and Education" set forth in Section 801 of FAIR.

The ARS mission is to conduct research to develop and transfer solutions to agricultural problems of high national priority and to provide information access and dissemination to: ensure high-quality, safe food, and other agricultural products; assess the nutritional needs of Americans; sustain a competitive agricultural economy; enhance the natural resource base and the environment; and provide economic opportunities for rural citizens, communities, and society as a whole.

The agency's research programs – New Products/Product Quality/Value Added; Livestock Production, Crop Production; Food Safety; Livestock Protection, Crop Protection; Human Nutrition; and Environmental Stewardship – are described under the "Status of Program" section.

ARS' Headquarters Offices are located in the Washington, D.C. metropolitan area. The agency's research is organized under 15 national programs. Field activities are managed through five area offices. Research is conducted at field locations in the United States, Puerto Rico, the Virgin Islands, and several foreign countries. Much of the work is conducted in direct cooperation with State Agricultural Experiment Stations, other State and Federal agencies, and private organizations.

As of September 30, 2022, there were 5,311 permanent, full-time employees including 530 in the Headquarters offices and 4,781 in field offices.

OIG AND GAO REPORTS

Table ARS-1. Completed OIG Reports

ID	Date	Title	Result
50601-0006-31	3/5/2018	Reviewing the Integrity of USDA's Scientific Research Program	The Office of the Chief Scientist (OCS) should strengthen communication with Department agencies about scientific integrity and work with the agencies to identify non-confrontational approaches to understand the perceptions identified in the survey. In addition, OCS should ensure appropriate personnel receive updated training materials and make them available in multiple formats.
50024-0001-22	3/14/2018	CIGIE Purchase Card Initiative - USDA Controls over Purchase Card Use	We recommend establishing requirements for documenting the use of non-required sources, issuing guidance for identifying split purchases, and creating guidelines for documenting the recovery of sales tax.
50701-0001-21	9/12/2018	USDA Agency Activities for Agroterrorism Prevention, Detection, and Response	All three agencies need to compile agroterrorism preparedness actions during the year. APHIS and ARS need to identify actions to report as vulnerability assessments, and all three agencies need to regularly assess and update the status of efforts to mitigate vulnerabilities. Finally, the agencies need to document processes to annually track and report on corrective actions from exercises or incident responses.
50501-0020-12	7/3/2019	Improper Usage of USDA's Information Technology Resources	The Office of Human Resources Management and OCIO need to define improper usage and develop and implement a documented process for ensuring all parties are notified of incidents, agencies and staff offices need to track and monitor incidents, and OCIO and Departmental Administration need to ensure contractors and other non-Government employees are held accountable to the same improper usage standards as employees.
02026-0001-23	7/23/2019	ARS/Final Action Verification/U.S. Meat Animal Research Center Review	OIG determined that ARS provided sufficient documentation to OCFO to close the five recommendations we made in our September 30, 2016, audit report on U.S. Meat Animal Research Center Review.

ID	Date	Title	Result
02601-0001-24	10/03/2019	ARS' Animal Welfare Act Controls to Prevent Mistreatment of Animals Used For Researching Parasitic Diseases	OIG did not make any recommendations.
11601-0001-12	11/12/2019	USDA's Fiscal Year 2019, First Quarter DATA Act Submission	OIG recommended that the Office of Chief Financial Officer (OCFO) to strengthen USDA's DATA Act compliance through the establishment of new oversight processes. Additionally, the OIG recommended that agencies and offices coordinate with OCFO to establish procedures to identify their DATA Act reportable data and made other recommendations to specific USDA agencies to improve the agencies' DATA Act Compliance.
50401-0018-11	11/27/2019	USDA's Consolidated Financial Statements for Fiscal Years 2019 and 2018	OIG did not make any recommendations.
50701-0002-21	04/03/2020	USDA's Controls to Prevent the Unauthorized Access and Transfer of Research Technology	Due to the nature of OIG findings and the agency's responses, the report contained sensitive content. OIG withheld their recommendations from public release due to concerns about the risk of circumvention of law.
50601-0009-31	05/15/2020	USDA's 2018 and 2019 Trade Mitigation Packages	OIG did not make any recommendations.
50024-0015-11	05/18/2020	U.S. Department of Agriculture's Fiscal Year 2019 Compliance with Improper Payment Requirements	OIG recommended USDA and its component agencies take steps to ensure its mandated actions are completed to meet improper payment requirements.
50501-0022-12	09/30/2020	Security Over Select USDA Agencies' Networks and Systems	Due to the nature of OIG findings and the agency's responses, the report contained sensitive content. OIG withheld their recommendations from public release due to concerns about the risk of circumvention of law.

ID	Date	Title	Result
50503-0003-12	10/29/2020	Fiscal Year 2020 Federal Information Security Modernization Act Audit	We recommend the Department mitigate existing security weaknesses by developing policy and implementing procedures; implementing a centrally managed software license program; prioritizing the remediation of outstanding vulnerabilities; removing unsupported software; revising regulations; implementing an improved patch and upgraded process; and implementing mechanisms and controls to ensure system contingency plans are tested annually, among other recommendations.
84801-0001-22	12/8/2020	USDA Research Integrity and Capacity	OIG recommend that REE identify and implement a standard mechanism across all REE agencies to enhance both USDA's and the public's ability to identify REE agencies' publications from USDA-funded research by subject areas.
50401-0019-11	12/14/2020	FY 2020 USDA Consolidated Financial Statements Audit	OIG did not make any recommendations.
50501-0024-12	2/25/2021	USDA's Security Controls Over the Prevention and Mitigation of Ransomware	This report contains sensitive content. It is being withheld from public release due to concerns about the risk of circumvention of law.
11601-0002-12	11/3/2021	USDA's Digital Accountability and Transparency Act Compliance Efforts for Fiscal Years 2020 and 2021	There were no OIG recommendations specific to ARS.
50401-0020-11	11/15/2021	USDA's Consolidated Financial Statements for Fiscal Years 2021 and 2020	OIG recommended that USDA ensure appropriate agency officials obtain training pertaining to Departmental Regulation 2230-001 to include review and monitoring of valid obligations and acceptable support for valid obligations.
50801-0002-12	10/27/2021	Security Over USDA Web Applications Inspection	USDA are addressing OIG recommendations.

ID	Date	Title	Result
50503-0005-12	10/29/2021	U.S. Department of Agriculture, Office of the Chief Information Officer, Fiscal Year 2021 Federal Information Security Modernization Act Audit Report	ARS is addressing OIG recommendations.
50503-0009-12	9/27/2022	U.S. Department of Agriculture, Office of Chief Information Officer, Fiscal Year 2022 Federal Information Security Modernization Act	OCIO is addressing the OIG comments
14801-0001-24	9/28/2022	Economic Research Service's Data Product Review Council Review Process	ERS is addressing the OIG comments.

Table ARS-2. In-Progress OIG Reports

ID	Title
13601-0002-22	Agriculture and Food Research Initiative
50401-0021-11	U.S. Department of Agriculture's Consolidated Balance Sheet for Fiscal Year 2022

Table ARS-3. Completed GAO Reports

ID	Date	Title	Result
GAO-18-307	3/12/2018	Chemical Innovation: Technologies to Make Processes and Products More Sustainable	GAO made no recommendations.
GAO-18-199	4/16/2018	Food Safety: Federal Efforts to Manage the Risk of Arsenic in Rice	The GAO recommendation has been closed and implemented.
GAO-19-103	3/12/2019	Foot-and-Mouth Disease: USDA's Efforts to Prepare for a Potential Outbreak Could Be Strengthened	As of June 2020, GAO is evaluating the agency's response to this recommendation.
GAO-19-47	6/3/2019	Renewable Fuel Standard: Information on Likely Program Effects on Gasoline Prices and Greenhouse Gas Emissions	GAO made no recommendations.
GAO-19-466	7/31/2019	Foreign Assistance: Federal Monitoring and Evaluation Guidelines Incorporate Most but Not All Leading Practices	The GAO recommendation has been closed and implemented.

ID	Date	Title	Result
GAO-19-407	9/9/2019	Date Labels on Packaged Foods: USDA and FDA Could Take Additional Steps to Reduce Consumer Confusion	USDA agreed with GAO recommendation and is planning actions to implement the recommendation.
GAO-20-128SP	11/12/2019	Irrigated Agriculture: Technologies, Practices, and Implications for Water Scarcity	ARS is evaluating GAO recommendations.
GAO-20-81	11/21/2019	Federal Research: Additional Actions Needed to Improve Public Access to Research Results	GAO recommended that the Secretary of Agriculture should develop and implement a mechanism to ensure researcher compliance with the public access plan and associated requirements. The Secretary of Agriculture should complete development of guidance and provide training to agency officials or others involved in reviewing the merits of researchers' data management plans
GAO-20-101	12/20/2019	Federal Property: Improved Monitoring, Oversight, and Data Would Help Understand Effects of Providing Property to Non-Federal Recipients	ARS is evaluating GAO recommendations.
GAO 20-243	02/19/2020	USDA Administrative Services: More Could Be Done to Assess Effectiveness and Impact of Business Centers	ARS is evaluating GAO recommendations.
GAO 20-273	02/19/2020	National Biodefense Strategy: Additional Efforts Would Enhance Likelihood of Effective Implementation	GAO had no recommendations for USDA.
GAO-20-187	03/19/2020	Sexual Harassment in Stem Research: Agencies Have Taken Actions, but Need Complaint Procedures, Overall Plans, and Better Collaboration	ARS is evaluating GAO recommendations.
GAO-20-382	05/07/2020	POVERTY REDUCTION: HHS Can Improve Information to Assist States and Localities in Adopting Approaches That Serve Whole Families	GAO had no recommendations for USDA in the report.
GAO-20-693	09/30/2020	Small Business Research Programs: Many Agencies' Award Issuances Are Not Timely; Some Practices May Improve Timeliness	ARS is evaluating GAO recommendations.

ID	Date	Title	Result
GAO-21-223R	1/29/2021	Small Business Innovation Research: Three Agencies Made Awards to Businesses Majority-Owned by Investment Companies and Funds	There were no GAO recommendations.
GAO-21-413	6/30/2021	Small Business Innovation Research: Agencies Need to Fully Implement Requirements for Managing Fraud, Waste, and Abuse	NIFA is addressing the GAO recommendations (Rec #1).
GAO-21-593	9/16/2021	Chronic Health Conditions: Federal Strategy Needed to Coordinate Diet-Related Efforts	There were no GAO recommendations.
GAO-22-104677	10/14/2021	Small Business Research Programs: Agencies Should Further Improve Award Timeliness	NIFA is addressing the GAO recommendations (Rec #3).
GAO-22-104436	2/14/2022	Compacts of Free Association: Implications of Planned Ending of Some U.S. Economic Assistance	There were no USDA recommendations.
GAO-22-104740	3/24/2022	Nutrition Assistance Programs: Federal Agencies Should Improve Oversight and Better Collaborate on Efforts to Support Veterans with Food Insecurity	USDA agreed with recommendations #3 & #4.
GAO-22-103949	3/24/2022	Food Program: DOD Should Formalize Its Process for Revising Food Ingredients and Better Track Dining Facility Use and Costs	There were no USDA recommendations.
GAO-22-104540	4/19/2022	Evidence-Based Policy Making: USDA's Decision to Relocate Research Agencies to Kansas City Was Not Fully Consistent with an Evidence-Based Approach	There were no USDA recommendations.
GAO-22-104602	5/19/2022	Tribal Funding: Actions Needed to Improve Information on Federal Funds That Benefit Native Americans	USDA neither agreed nor disagreed with this recommendation.
GAO-22-104449	6/15/2022	Water Quality: Agencies Should Take More Actions to Manage Risks from Harmful Algal Blooms and Hypoxia	There were no USDA recommendations.

ID	Date	Title	Result
GAO-22-105088	9/30/2022	Persistent Chemicals: EPA Should Use New Data to Analyze the Demographics of Communities with PFAS in Their Drinking Water	There were no USDA recommendations.

Table ARS-4. In-Progress GAO Reports

ID	Title
104709	USDA's Planning for and Relocation of Research Agencies
105470	Managing Fraud Risks in Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR)
105525	International Life Sciences Research and National Security
105538	U.S. Funding to Chinese Entities
105846	Changes in U.S. Food Prices
105962	Precision Agriculture
105980	GAO Review of the Implementation of Artificial Intelligence at Federal Agencies
106000	College Student Food Insecurity
106042	Commercial Satellite Imagery
106086	Federal Crop Insurance Program - Distribution of Premium Subsidies & Equity of Private Delivery
106130	Dietary Guidelines for Americans
106144	U.S. Sugar Program

AVAILABLE FUNDS AND FTES

Table ARS-5. Available Funds and FTEs (thousands of dollars, FTEs)

Item	2021 Actual	FTE	2022 Actual	FTE	2023 Estimated	FTE	2024 Estimated	FTE
Salaries and Expenses:								
Discretionary Appropriations	$1,491,784	5,462	$1,633,496	5,698	$1,744,279	5,698	$1,938,303	6,407
Mandatory Appropriations	20,000	-	20,000	-	-	-	-	-
Supplemental Appropriations	1,000	-	500	-	500	-	-	-
Buildings and Facilities:								
Discretionary Appropriations	35,700	-	127,805	-	132,297	-	41,405	-
Total Discretionary Appropriations	1,527,484	5,462	1,761,301	5,698	1,876,576	5,698	1,979,708	6,407
Total Mandatory Appropriations	20,000	-	20,000	-	-	-	-	-
Total Supplemental Appropriations	1,000	-	500	-	500	-	-	-
Transfers Out	-	-	-374	-	-	-	-	-
Sequestration	-	-	-1,140	-	-	-	-	-
Total Adjusted Appropriation	1,548,484	5,462	1,780,287	5,698	1,877,076	5,698	1,979,708	6,407
Balance Available, SOY	183,786	-	188,855	-	174,390	-	151,376	-
Recoveries, Other	16,043	-	29,095	-	-	-	-	-
Total Available	1,748,313	5,462	1,998,237	5,698	2,051,466	5,698	2,131,084	6,407
Lapsing Balances	-3,530	-	-3,212	-	-	-	-	-
Balance Available, EOY	-188,855	-	-174,390	-	-151,376	-	-121,611	-
Total Obligations, ARS	1,555,928	5,462	1,820,635	5,698	1,900,090	5,698	2,009,473	6,407
Other USDA:								
Agricultural Marketing Service, AMS	121	1	129	-	129	-	129	-
Animal & Plant Health Inspection Service, APHIS	21,230	76	24,007	68	24,007	68	24,007	68
Commodity Credit Corporation	-	-	272	1	272	1	272	1
Economic Research Service, ERS	6,414	23	6,616	19	6,616	19	6,616	19
Food & Nutrition Services, FNS	2,085	7	-	-	-	-	-	-
Food Safety & Inspection Service, FSIS	5,090	18	5,432	15	5,432	15	5,432	15
Foreign Agricultural Services, FAS	578	2	1,017	3	1,017	3	1,017	3
Forest Service, FS	1,048	4	1,411	4	1,411	4	1,411	4
Hazardous Waste	1,230	4	-	-	-	-	-	-
National Agricultural Statistics Service, NASS	7,377	27	8,835	25	8,835	25	8,835	25
National Institute of Food and Agriculture, NIFA	41,402	149	40,634	115	40,634	115	40,634	115
Natural Resources Conservation Service, NRCS	6,423	23	8,374	24	8,374	24	8,374	24
Office of the Chief Economist, OCE	169	1	-	-	-	-	-	-
Office of the Chief Financial Officer, OCFO	8,000	29	-	-	-	-	-	-
Office of the Chief Information Officer, OCIO	446	2	400	1	400	1	400	1
Office of Civil Rights	-	-	173	1	173	1	173	1
Office of the Secretary	151	1	2,329	7	2,329	7	2,329	7
Patent Collections	-	-	143	1	143	1	143	1
Quarters and Subsistence	-	-	251	1	251	1	251	1
Revocable Permits & Easements	549	2	560	2	560	2	560	2
Sale of Animals & Personal Property (Proceeds)	9,218	33	11,944	34	11,944	34	11,944	34
Misc., Other USDA Funds	204	1	131	-	131	-	131	-
Total, Other USDA	111,735	402	112,659	320	112,659	320	112,659	320
Total, Agriculture Available	1,667,663	5,864	1,933,294	6,018	2,012,749	6,018	2,122,132	6,727
Other Federal Funds:								
Agency for International Development	1,053	4	288	1	288	1	288	1
Department of Defense, DOD	1,674	6	1,423	4	1,423	4	1,423	4
Department of Energy, DOE	1,046	4	511	1	511	1	511	1
Department of Health & Human Services, DHHS	3,191	11	2,915	8	2,915	8	2,915	8
Department of Homeland Security, DHS	193	1	543	2	543	2	543	2
Department of the Interior, DOI	3,009	11	2,291	7	2,291	7	2,291	7
Department of Treasury	-	-	147	-	147	-	147	-
Departmental Administration	-	-	225	1	225	1	225	1
Environmental Protection Agency, EPA	116	-	200	1	200	1	200	1

Item	2021 Actual	FTE	2022 Actual	FTE	2023 Estimated	FTE	2024 Estimated	FTE
Farm Production and Conservation Business Center	-	-	980	3	980	3	980	3
Federal Emergency Management Agency, FEMA	857	3	-	-	-	-	-	-
Food and Nutrition Service	-	-	4,085	12	4,085	12	4,085	12
National Aeronautics & Space Administration, NASA	576	2	602	2	602	2	602	2
United States Geological Survey, USGS	411	1	583	2	583	2	583	2
Misc., Other USDA Funds	156	1	32	-	32	-	32	-
Total, Other Federal	12,282	44	14,826	42	14,826	42	14,826	42
Non-Federal Funds:								
Alaska, State of	109	-	-	-	-	-	-	-
Arizona Board of Regents	-	-	101	-	101	-	101	-
Arkansas, University of	186	1	109	-	109	-	109	-
Binational Agricultural Research & Development (BARD)	299	1	288	1	288	1	288	1
Cal Fire	-	-	354	1	354	1	354	1
California Agriculture Export Commission	-	-	148	1	148	1	148	1
California Department of Food & Agriculture	-	-	329	1	329	1	329	1
California Department of Social Services	-	-	403	1	403	1	403	1
California State University	683	2	249	1	249	1	249	1
California, State of	2,469	9	1,223	3	1,223	3	1,223	3
California, University of	1,775	6	2,038	6	2,038	6	2,038	6
California Walnut Board & Commission	170	1	218	1	218	1	218	1
Center for Produce Safety	-	-	282	1	282	1	282	1
Citrus Research & Development Foundation	798	3	546	2	546	2	546	2
Citrus Research Board	185	1	247	1	247	1	247	1
Clemson University	326	1	373	1	373	1	373	1
Colorado State University	-	-	208	1	208	1	208	1
Commodity Credit Corporation	379	1	-	-	-	-	-	-
Connecticut, University of	130	1	342	1	342	1	342	1
Cornell University	314	1	416	1	416	1	416	1
Cotton Incorporated	1,037	4	626	2	626	2	626	2
Florida Department of Agriculture & Consumer Service	-	-	104	-	104	-	104	-
Florida Fish and Wildlife	-	-	252	1	252	1	252	1
Florida, State of	292	1	-	-	-	-	-	-
Florida, University of	949	3	914	3	914	3	914	3
Georgia, University of	181	1	444	1	444	1	444	1
Idaho, University of	100	-	-	-	-	-	-	-
Illinois, University of	949	3	769	2	769	2	769	2
Iowa State University	-	-	201	1	201	1	201	1
Maryland, University of	192	1	-	-	-	-	-	-
Massachusetts, University of	126	1	121	-	121	-	121	-
Miami Dade County	-	-	138	1	138	1	138	1
Michigan State University	774	3	292	1	292	1	292	1
Minnesota, University of	180	1	-	-	-	-	-	-
Montana State University	563	2	-	-	-	-	-	-
National Pork Board	-	-	121	-	121	-	121	-
Nebraska, University of	202	1	242	1	242	1	242	1
New Mexico Consortium	-	-	293	1	293	1	293	1
New Mexico State University	557	2	-	-	-	-	-	-
North Carolina State University	835	3	885	3	885	3	885	3
North Carolina, University of	117	-	134	-	134	-	134	-
North Dakota State University	-	-	113	-	113	-	113	-
Ohio Department of Agriculture	-	-	229	1	229	1	229	1
Ohio State University	663	2	188	1	188	1	188	1
Pennsylvania State University	355	1	524	1	524	1	524	1
Pennsylvania, University of	272	1	510	1	510	1	510	1
Smith Bucklin Corporation	2,421	9	2,337	7	2,337	7	2,337	7
South Dakota State University	166	1	-	-	-	-	-	-

Item	2021 Actual	FTE	2022 Actual	FTE	2023 Estimated	FTE	2024 Estimated	FTE
South Florida Water Management District	923	3	894	3	894	3	894	3
Southern California, University of	112	-	169	1	169	1	169	1
Southwest Florida Water Management	-	-	111	-	111	-	111	-
Tennessee State University	-	-	149	1	149	1	149	1
Tennessee, University of	-	-	120	-	120	-	120	-
Texas A&M University (TAMU)	277	1	555	2	555	2	555	2
Texas Tech University	-	-	161	1	161	1	161	1
United Soybean Board	381	1	535	2	535	2	535	2
U.S. Highbush Blueberry Council	-	-	188	1	188	1	188	1
Utah State University	156	1	-	-	-	-	-	-
Virginia Polytechnic Institute	112	-	161	1	161	1	161	1
Virginia, University of	122	-	-	-	-	-	-	-
Washington State Dept of Agriculture	201	1	302	1	302	1	302	1
Washington State University	379	1	580	2	580	2	580	2
Western Illinois University	128	1	123	-	123	-	123	-
Winrock International	-	-	113	-	113	-	113	-
Wisconsin, University of	-	-	123	-	123	-	123	-
Misc., Non-Federal Funds	2,762	10	2,830	8	2,830	8	2,830	8
Total, Non-Federal	24,306	87	24,425	69	24,425	69	24,425	69
Miscellaneous Contributed Funds	17,681	50	14,685	40	14,685	40	14,685	40
Total Available, ARS	1,721,932	6,045	1,987,230	6,169	2,066,685	6,169	2,176,068	6,878

Note: The details associated with Supplemental appropriations provided to the Office of the Secretary, but implemented in this Agency, is found in the USDA Budget Summary and is not reflected above.

PERMANENT POSITIONS BY GRADE AND FTES

Table ARS-6. Permanent Positions by Grade and FTEs

Item	2021 Actual			2022 Actual			2023 Estimated			2024 Estimated		
	D.C.	Field	Total	D.C.	Field	Total	D.C.	Field	Total	D.C.	Field	Total
SES	11	21	32	17	14	31	17	14	31	17	14	31
GS-15	51	710	761	127	632	759	127	632	759	144	719	863
GS-14	79	421	500	77	374	451	77	374	451	87	425	512
GS-13	155	333	488	142	374	516	142	374	516	161	425	586
GS-12	132	344	476	98	440	538	98	440	538	111	501	612
GS-11	66	457	523	96	401	497	96	401	497	109	456	565
GS-10	-	3	3	-	3	3	-	3	3	-	3	3
GS-9	51	937	988	88	904	992	88	904	992	100	1,028	1,128
GS-8	15	289	304	23	277	300	23	277	300	26	315	341
GS-7	49	492	541	54	470	524	54	470	524	61	535	596
GS-6	22	204	226	16	201	217	16	201	217	18	229	247
GS-5	6	108	114	6	100	106	6	100	106	7	114	121
GS-4	3	22	25	5	18	23	5	18	23	6	20	26
GS-3	1	12	13	-	10	10	-	10	10	0	11	11
GS-2	1	5	6	1	2	3	1	2	3	1	2	3
GS-1	-	4	4	-	1	1	-	1	1	-	1	1
Other Graded	5	-	5	5	-	5	5	-	5	6	-	6
Ungraded	-	486	486	-	489	489	-	489	489	-	556	556
Total Permanent	647	4,848	5,495	755	4,710	5,465	755	4,710	5,465	854	5,354	6,208
Unfilled, EOY	119	69	188	225	71	296	225	71	296	253	77	330
Total Perm. FT EOY	528	4,779	5,307	530	4,781	5,311	530	4,781	5,311	601	5,277	5,878
FTE	469	5,576	6,045	481	5,688	6,169	481	5,688	6,169	552	6,326	6,878

VEHICLE FLEET

The 2024 Budget Estimates proposes five planned replacements of owned passenger motor vehicles. Passenger motor vehicles are defined as sedans and stations wagons.

Professional research and technical personnel primarily use the ARS motor vehicle fleet in conjunction with research studies and technical assistance. To conduct daily work, research personnel travel between agricultural research sites, State agricultural experiment stations, farms, ranches, commercial firms, and others. Most of these sites are in rural locations and require a high degree of mobility. Use of common carriers is not feasible. Studies of cost requirements between private and government vehicles show that it is more economical to use government vehicles than to reimburse employees for the use of private vehicles.

It is ARS policy to pool vehicle use to keep the number of vehicles to a minimum. ARS implemented telematics to automatically capture utilization data and improve data accuracy. ARS will continue to perform periodic surveys to help identify underutilized vehicles that may no longer be needed for the mission. During the biennial physical inventory process, ARS works to ensure inactive vehicles are removed from the inventory according to Federal property management regulations. ARS program managers are responsible for managing budgets and program needs to fulfill the agency's research mission. Vehicle replacement is based on program management, vehicle mileage/age, and funding. By Federal regulation, minimum replacement standards for passenger vehicles are three-years or 60,000 miles, and light duty trucks are six years or 50,000 miles.

The composition of the ARS fleet is primarily work trucks which includes sport utility vehicles, vans, and pick-up trucks. These multi-purpose type vehicles enable research personnel to move equipment and transport personnel. Past practices have allowed ARS to decrease the number of passenger vehicles by relying on multi-purpose type vehicles. ARS will continue to review its fleet for opportunities to reduce vehicles longer required for the mission, realign vehicles where it is necessary without affecting the mission and control operating costs. The agency continues to review inventory information to accurately classify the fleet.

Note: Number of vehicles by type include vehicles owned by the agency and leased from commercial sources or GSA.

Annual Operating Costs excludes acquisition costs and gains from sale of vehicles as shown in FAST.

MOTOR VEHICLE FLEET

Table ARS-7. Size, Composition, and Annual Costs of Motor Vehicle Fleet

	Sedans and Station Wagons	Vans	SUVs	Light Trucks 4X2	Light Trucks 4X4	Medium Duty Vehicles	Buses	Heavy Duty Vehicles	Total Vehicles	Annual Operating Costs
2018 End of Year Operating Inventory	205	245	738	438	596	722	3	163	3,110	$4,628
2021 End of Year Operating Inventory	144	173	644	361	539	735	1	146	2,743	3,951
2022 Planned Acquisitions	-	-	11	-	34	19	-	2	66	-
2022 Planned Disposals	9	12	-	11	-	-	-	-	32	-
2022 End of Year Operating Inventory	135	161	655	350	573	754	1	148	2,777	4,571
2023 Planned Acquisitions	-	-	-	-	-	-	-	-	-	-
2023 Planned Disposals	-	-	3	1	-	-	-	-	4	-
2023 End of Year Operating Inventory	135	161	652	349	573	754	1	148	2,773	5,157
2024 Planned Acquisitions	-	-	-	-	-	-	-	-	-	-
2024 Planned Disposals	-	-	-	-	-	-	-	-	-	-
2024 End of Year Operating Inventory	135	161	652	349	573	754	1	148	2,773	5,828

Table ARS-8. Statement of Proposed Purchase of Passenger Motor Vehicles

Fiscal Year	Net Active Fleet, SOY	Disposals	Replacements	Additions	Total Acquisitions	Net Active Fleet, EOY
2021	157	10	2	-	2	149
2022	149	13	4	-	4	140
2023	140	5	5	-	5	140
2024	140	5	5	-	5	140

SHARED FUNDING PROJECTS

Table ARS-9. Shared Funding Projects (thousands of dollars)

Item	2021 Actual	2022 Actual	2023 Estimated	2024 Estimated
Working Capital Fund:				
Administrative Services:				
Material Management Service	$337	$405	$351	$369
Mail and Reproduction Services	648	547	646	664
Integrated Procurement Systems	1,794	2,059	2,074	2,126
AskUSDA Contact Center	-	-	214	222
Personnel and Document Security Program	-	-	300	322
Procurement Operations Services	29	25	57	84
Human Resources Enterprise Management Systems	174	148	157	178
Subtotal	2,982	3,184	3,799	3,965
Communications:				
Creative Media & Broadcast Center	126	156	379	259
Finance and Management:				
National Finance Center	2,017	2,035	2,025	2,095
Internal Control Support Services	116	114	114	122
Financial Shared Services	5,857	5,925	6,283	6,742
Subtotal	7,990	8,074	8,422	8,959
Information Technology:				
Client Experience Center	23,218	24,914	24,684	25,641
Departmental Administration Information Technology Office	584	3	2	1
Digital Infrastructure Services Center	2,704	2,933	7,739	9,247
Enterprise Cybersecurity Services	-	-	2,500	2,608
Enterprise Data and Analytics Services	-	-	1,719	821
Enterprise Network Services	6,836	5,302	7,169	6,824
Subtotal	33,342	33,152	43,813	45,142
Correspondence Management Services	26	-	-	92
Office of the Executive Secretariat	-	33	88	-
Total, Working Capital Fund	44,466	44,599	56,501	58,417
Department-Wide Shared Cost Programs:				
Advisory Committee Liaison Services	3	5	-	-
Agency Partnership Outreach	419	397	493	493
Diversity, Equity, Inclusion and Accessibility	-	-	132	132
Human Resources Priority Goals Program	-	-	250	250
Medical Services	149	145	136	136
National Capital Region Interpreting Services	17	68	187	187
Office of Customer Experience	586	548	197	197
Personnel and Document Security Program	117	116	-	-
Physical Security	260	267	279	279
Security Detail	280	283	318	318
Security Operations Program	393	390	432	432
Talent Group	-	-	222	222
TARGET Center	72	80	107	107
USDA Enterprise Data Analytics Services	330	276	-	-
Total, Department-Wide Reimbursable Programs	2,626	2,575	2,753	2,753
E-Gov:				
Budget Formulation and Execution Line of Business	7	7	6	6
E-Rulemaking	5	13	-	-
Financial Management Line of Business	6	6	6	6
Hiring Assessment Tool	-	15	-	-
Human Resources Line of Business	19	18	18	18
Integrated Acquisition Environment	154	36	55	49
Total, E-Gov	191	95	85	79
Agency Total	47,283	47,269	59,339	61,249

ADVERTISING EXPENDITURES

Table ARS-10. Advertising Expenditures (thousands of dollars)

Item	2022 Actual Number of Contracts	2022 Actual Dollars Obligated	2023 Estimated Number of Contracts	2023 Estimated Dollars Obligated	2024 Estimated Number of Contracts	2024 Estimated Dollars Obligated
Total Contracts for Advertising Services.....	2	$110	1	$80	1	$80
Contracts for Advertising Services to Socially and Economically Disadvantaged Small Businesses	-	-	-	-	-	-
Contracts for Advertising Services to Women-Owned and Minority-Owned Small Businesses.....	1	$80	1	$80	1	$80

ACCOUNT 1: SALARIES AND EXPENSES

APPROPRIATIONS LANGUAGE

For necessary expenses of the Agricultural Research Service and for acquisition of lands by donation, exchange, or purchase at a nominal cost not to exceed $100, and for land exchanges where the lands exchanged shall be of equal value or shall be equalized by a payment of money to the grantor which shall not exceed 25 percent of the total value of the land or interests transferred out of Federal ownership,[$1,744,279,000]$1,938,303,000: *Provided*, That appropriations hereunder shall be available for the operation and maintenance of aircraft and the purchase of not to exceed one for replacement only: *Provided further*, That appropriations hereunder shall be available pursuant to 7 U.S.C. 2250 for the construction, alteration, and repair of buildings and improvements, but unless otherwise provided, the cost of constructing any one building shall not exceed $500,000, except for headhouses or greenhouses which shall each be limited to $1,800,000, except for 10 buildings to be constructed or improved at a cost not to exceed $1,100,000 each, and except for four buildings to be constructed at a cost not to exceed $5,000,000 each, and the cost of altering any one building during the fiscal year shall not exceed 10 percent of the current replacement value of the building or $500,000, whichever is greater: *Provided further*, That appropriations hereunder shall be available for entering into lease agreements at any Agricultural Research Service location for the construction of a research facility by a non-Federal entity for use by the Agricultural Research Service and a condition of the lease shall be that any facility shall be owned, operated, and maintained by the non-Federal entity and shall be removed upon the expiration or termination of the lease agreement: *Provided further*, That the limitations on alterations contained in this Act shall not apply to modernization or replacement of existing facilities at Beltsville, Maryland: *Provided further*, That appropriations hereunder shall be available for granting easements at the Beltsville Agricultural Research Center: *Provided further*, That the foregoing limitations shall not apply to replacement of buildings needed to carry out the Act of April 24, 1948 (21 U.S.C. 113a): *Provided further*, That appropriations hereunder shall be available for granting easements at any Agricultural Research Service location for the construction of a research facility by a non-Federal entity for use by, and acceptable to, the Agricultural Research Service and a condition of the easements shall be that upon completion the facility shall be accepted by the Secretary, subject to the availability of funds herein, if the Secretary finds that acceptance of the facility is in the interest of the United States: *Provided further*, That funds may be received from any State, other political subdivision, organization, or individual for the purpose of establishing or operating any research facility or research project of the Agricultural Research Service, as authorized by law: *Provided further*, That appropriations hereunder shall be available for the Experienced Services Program at the Agricultural Research Service (16 U.S.C. 3851).

Change Description

The first change (line 4 of paragraph 1) deletes the 2023 appropriation amount and replaces it with the 2024 appropriation amount.

The second change (line 28 of paragraph 1) adds language included in the 2024 Budget for the Experienced Services Program.

LEAD-OFF TABULAR STATEMENT

Table ARS-11. Lead-Off Tabular Statement (In dollars)

Item	Amount
Estimate, 2023	$1,744,279,000
Change in Appropriation	+ 194,024,000
Budget Estimate, 2024	1,938,303,000

PROJECT STATEMENT APPROPRIATIONS

Table ARS-12. Project Statement on Basis of Appropriations (thousands of dollars, FTE)

Item	2021 Actual	FTE	2022 Actual	FTE	2023 Estimated	FTE	2024 Estimated	FTE	Inc. or Dec.	FTE Inc. or Dec.
Discretionary Appropriations:										
Salaries and Expenses	$1,491,784	5,462	$1,633,496	5,698	$1,744,279	5,698	$1,938,303	6,407	+$194,024	+709
Subtotal	1,491,784	5,462	1,633,496	5,698	1,744,279	5,698	1,938,303	6,407	+194,024	+709
Mandatory Appropriations:										
Human Nutrition	20,000	-	20,000	-	-	-	-	-	-	-
Subtotal	20,000	-	20,000	-	-	-	-	-	-	-
Supplemental Appropriations:										
GP Kelp and Seagrass Discretionary	1,000	-	500	-	500	-	-	-	-500	-
Subtotal	1,000	-	500	-	500	-	-	-	-	-
Offsetting Collections:										
Modernizing Government Technology Act	-	-	-374	-	-	-	-	-	-	-
Subtotal	-	-	-1,140	-	-	-	-	-	-	-
Subtotal	-	-	-1,514	-	-	-	-	-	-	-
Total Adjusted Approp.	1,512,784	5,462	1,652,482	5,698	1,744,779	5,698	1,938,303	6,407	+193,524	+709
Add back:										
Recission, Transfers In and Out	-	-	374	-	-	-	-	-	-	-
Sequestration	-	-	1,140	-	-	-	-	-	-	-
Total Appropriation	1,512,784	5,462	1,653,996	5,698	1,744,779	5,698	1,938,303	6,407	+193,524	+709
Transfers Out:										
Modernizing Government Technology Act	-	-	-374	-	-	-	-	-	-	-
Total Transfers Out	-	-	-374	-	-	-	-	-	-	-
Sequestration	-	-	-1,140	-	-	-	-	-	-	-
Recoveries, Other	15,137	-	25,847	-	-	-	-	-	-	-
Bal. Available, SOY	74,418	-	88,406	-	112,949	-	-	-	-112,949	-
Total Available[1]	1,602,339	5,462	1,766,735	5,698	1,857,728	5,698	1,938,303	6,407	+80,575	+709
Lapsing Balances	-3,530	-	-3,212	-	-	-	-	-	-	-
Rescinded Balances	-	-	-	-	-	-	-	-	-	-
Bal. Available, EOY	-88,406	-	-112,949	-	-	-	-	-	-	-
Total Obligations	1,510,403	5,462	1,650,574	5,698	1,857,728	5,698	1,938,303	6,407	+80,575	+709

Staff Years:				
Direct	5,462	5,698	5,698	6,407
Other	583	471	471	471
Total, Staff Years	6,045	6,169	6,169	6,878

[1] Discrepancy between project statement and Max schedule X is the reimbursables.

FUNDING DETAIL APPROPRIATIONS

Table ARS-13. Funding Detail (thousands of dollars)

Allocations	2021 Actual B.A.	2022 Actual B.A.	2023 Estimated B.A.[2]	2024 Budget Request B.A.	Change from 2023 Estimate
Salaries & Expenses	**$1,512,784**	**$1,653,996**	**$1,744,279**	**$1,938,303**	**+$194,024**
New Product Quality/Value Added	120,503	125,635	130,538	193,878	+63,340
Livestock Production	125,163	134,218	147,921	150,844	+2,923
Crop Production	299,882	325,014	353,470	373,400	+19,930
Food Safety	115,690	121,300	127,614	137,403	+9,789
Livestock Protection	127,376	144,230	153,407	161,970	+8,563
Crop Protection	223,267	234,815	246,967	231,112	-15,855
Human Nutrition	119,144	122,740	109,470	124,941	+15,471
Environmental Stewardship	251,675	271,917	306,301	376,255	+69,954
National Agricultural Library	28,884	29,074	29,677	36,026	+6,349
National Bio and Agro-Defense Facility	81,056	118,909	112,358	125,918	+13,560
Repair and Maintenance	20,144	26,144	26,556	26,556	-

[2] 2023 includes ARS Salaries and Expenses discretionary funding only, thereby providing direct alignment to the cluster funding represented in the justification of increases and decreases. As a result, funding may differ between "total adjusted appropriations" across exhibits and MAX.

PROJECT STATEMENT OBLIGATIONS

Table ARS-14. Project Statement on Basis of Obligations (thousands of dollars, FTE)

Item	2021 Actual	FTE	2022 Actual	FTE	2023 Estimated	FTE	2024 Estimated	FTE	Inc. or Dec.	FTE Inc. or Dec.
Discretionary Obligations:										
Salaries and Expenses	$1,490,135	5,462	$1,631,384	5,698	$1,857,228	5,698	$1,938,303	6,407	+$81,075	+709
Subtotal Disc Obligations.....	1,490,135	5,462	1,631,384	5,698	1,857,228	5,698	1,938,303	6,407	+81,075	+709
Mandatory Obligations:										
Human Nutrition.....	19,268	-	18,690	-	-	-	-	-	-	-
Subtotal Disc Obligations.....	19,268	-	18,690	-	-	-	-	-	-	-
Supplemental Obligations:										
GP Kelp and Seagrass	1,000	-	500	-	500	-	-	-	-500	-
Subtotal Supp Obligations.....	1,000	-	500	-	500	-	-	-	-500	-
Offsetting Collections:										
Total Obligations.....	1,510,403	5,462	1,650,574	5,698	1,857,728	5,698	1,938,303	6,407	+80,575	+709
Add back:										
Lapsing Balances.....	3,530	-	3,212	-	-	-	-	-	-	-
Balance Available, EOY	88,406	-	112,949	-	-		-	-	-	-
Total Bal. Available, EOY	91,936	-	116,161	-	-	-	-	-	-	-
Total Available[3]	1,602,339	5,462	1,766,735	5,698	1,857,728	5,698	1,938,303	6,407	+80,575	+709
Less:										
Total Transfers Out	-	-	374	-	-	-	-	-	-	-
Sequestration	-	-	1,140	-	-	-	-	-	-	-
Recoveries, Other.....	-15,137	-	-25,847	-	-	-	-	-	-	-
Total Bal. Available, SOY.....	-74,418	-	-88,406	-	-112,949	-	-	-	+112,949	-
Total Appropriation.....	1,512,784	5,462	1,653,996	5,698	1,744,779	5,698	1,938,303	6,407	+193,524	+709
Staff Years:										
Direct		5,462		5,698		5,698		6,407		
Other		583		471		471		471		
Total, Staff Years		6,045		6,169		6,169		6,878		

[3] Discrepancy between project statement and Max schedule X is the reimbursables.

FUNDING DETAIL OBLIGATIONS

Table ARS-15. Funding Detail (thousands of dollars)

Allocations	2021 Actual B.A.	2022 Actual B.A.	2023 Estimated B.A.	2024 Budget Request B.A.	Change from 2023 Estimate
Salaries & Expenses	**$1,510,403**	**$1,650,574**	**$1,857,728**	**$1,938,303**	**+$80,575**
New Product Quality/Value Added	120,358	124,700	142,071	193,878	+51,807
Livestock Production	124,013	133,288	160,242	150,844	-9,398
Crop Production.....	299,521	324,354	383,306	373,400	-9,906
Food Safety.....	115,690	121,300	127,614	137,403	+9,789
Livestock Protection	127,223	143,305	166,648	161,970	-4,678
Crop Protection.....	222,998	233,937	268,523	231,112	-37,411
Human Nutrition.....	119,144	121,430	109,470	124,941	+15,471
Environmental Stewardship.....	251,372	271,059	331,263	376,255	+44,992
National Agricultural Library	28,884	32,148	29,677	36,026	+6,349
National Bio and Agro-Defense Facility (O&M).....	81,056	118,909	112,358	125,918	+13,560
Repair and Maintenance	20,144	26,144	26,556	26,556	-

JUSTIFICATION OF INCREASES/DECREASES

Salaries and Expenses

ARS is requesting $1,938,303,000 in 2024 for its Salaries and Expenses account, an increase of $194,024,000 from 2023.

The 2024 Budget includes an increase of $215,500,000 for high priority program initiatives. There is also an increase of $13,000,000 for operations/maintenance required for the new National Bio and Agro-Defense Facility (NBAF),which replaces the outdated and inadequate Plum Island Animal Disease Center (PIADC). NBAF will be a state-of-the-art biocontainment facility for the study of foreign, emerging, and zoonotic animal diseases that pose a threat to U.S. animal agriculture and to public health. In addition, the Budget includes $38,911,000 for increases for pay cost. The Budget proposes to shift $73,387,000 in ongoing research to meet higher priority research demands.

New Products/Product Quality/Value Added

(1) An increase of $63,340,000 and 249 staff years for New Products/Product Quality/Value Added research ($130,538,000 and 676 staff years available in 2023).

ARS' New Products/Product Quality/Value Added research program is directed toward: Improving the efficiency and reducing the cost for the conversion of agricultural products into biobased products and biofuels; developing new and improved products for domestic and foreign markets; and providing higher quality, healthy foods that satisfy consumer needs in the United States and abroad.

Continuing New Products/Product Quality/Value Added base funding is essential for ARS to carry out its research mission and responsibilities. Base funding supports ARS' program goals of increasing the economic viability and competitiveness of U.S. agriculture by maintaining and/or enhancing the quality of harvested agricultural commodities; and expanding domestic and global market opportunities through the development of value-added food and nonfood technologies and products including energy and fuels. In addition to the activities and functions specifically described in the budget request, current year and budget year base funds will be used to carry out activities and functions consistent with the full range of authorities and activities delegated to the agency. ARS' New Products/Product Quality/Value Added research program is carried out at numerous locations where agency scientists frequently collaborate with researchers from other Federal/State governments, academia, and private industry. The research supports many of USDA's Strategic Goals.

The funding change is requested for the following items:

A) An increase of $4,617,000 for 2024 Pay. This increase will support the annualization of the 2023 4.6 percent Cost of Living pay increase and the 2024 5.2 percent Cost of Living pay increase. Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs, and carrying out ARS' mission. Elimination of the pay costs would require ARS to absorb these costs and reduce planned hiring levels, eroding USDA's ability to meet key Administration priorities.

B) The 2024 Budget includes an increase of $83,000,000 for Clean Energy of which $65,002,000 and 249 FTEs is for ARS' New Products/Product Quality/Value Added Program.
This is a crosscutting, multidisciplinary initiative which supports the following programs: New Products/Product Quality/Value Added, Crop Production, Crop Protection, Environmental Stewardship, and the Library and Information Services. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

C) A decrease of $6,279,000 from ongoing research projects to support higher priority research.

The goal of ARS' research programs is to make the most effective use of taxpayer dollars within available resources. In order to respond to priority national needs, it is often necessary to reset priorities

within the existing portfolio of projects. As a result, some projects no longer qualify for continued support.

Livestock Production

(2) An increase of $2,923,000 and 30 staff years for Livestock Production research ($147,921,000 and 421 staff years available in 2023).

ARS' Livestock Production research program is directed toward fostering an abundant, safe, nutritionally wholesome, and competitively priced supply of animal products produced in a viable,competitive, and sustainable animal agriculture sector of the U.S. economy by: safeguarding and utilizing animal genetic resources, associated genetic and genomic databases, and bioinformatic tools; developing a basic understanding of food animal physiology to address priority issues related to animal production, animal well-being, and product quality and healthfulness; and developing information, best management practices, novel and innovative tools, and technologies that improve animal production systems, enhance human health, and ensure domestic food security. The research is heavily focused on the development and application of genomics technologies to increase the efficiency and product quality of beef, dairy, swine, poultry, aquaculture, and sheep systems. Areas of emphasis include increasing the efficiency of nutrient utilization, increasing animal wellbeing and reducing stress in production systems, increasing reproductive rates and breeding animal longevity, developing and evaluating non-traditional production systems (e.g., organic and natural), and evaluating and conserving animal genetic resources.

Continuing Livestock Production base funding is essential for ARS to carry out its research missionand responsibilities. Base funding supports ARS' program goal of providing scientific information and biotechnologies which will ensure an abundant supply of competitively priced animal and aquaculture products. This includes: developing genome analysis tools; identifying economically important genetic traits; preserving agricultural animal genetic resources; improving the efficiency of nutrient utilization and conversion of feeds and forages to animal products; enhancing reproductive performance; and improving aquaculture production systems. In addition to the activities and functions specifically described in the budget request, current year and budget year base funds will be used to carry out activities and functions consistent with the full range of authorities and activities delegated to the agency.

ARS' Livestock Production research program is carried out at numerous locations where agency scientists frequently collaborate with researchers from other Federal/State governments, academia,and private industry. The research supports many of USDA's Strategic Goals.

The funding change is requested for the following items:

A) An increase of $2,875,000 for 2024 Pay.

This increase will support the annualization of the 2023 4.6 percent Cost of Living pay increase and the 2024 5.2 percent Cost of Living pay increase. Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs, and carrying out ARS' mission. Elimination of the pay costs would require ARS to absorb these costs and reduce planned hiring levels, eroding USDA's ability to meet key Administration priorities.

B) The 2024 Budget includes an increase of $88,500,000 for Climate Science of which $10,100,000 and 30 FTEs is for ARS' Livestock Production Program.

This is a crosscutting, multidisciplinary initiative which supports the following programs: Livestock Production, Crop Production, Food Safety, Livestock Protection, Crop Protection, Environmental Stewardship, and the Library and Information Services. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

C) The 2024 Budget includes an increase of $15,000,000 for Precision Nutrition of which $250,000 is for ARS' Livestock Production Program.

This is a crosscutting, multidisciplinary initiative which supports the following programs: Livestock Production, Crop Production, and Human Nutrition. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

D) A decrease of $10,301,000 from ongoing research projects to support higher priority research.

The goal of ARS' research programs is to make the most effective use of taxpayer dollars within available resources. In order to respond to priority national needs, it is often necessary to reset priorities within the existing portfolio of projects. As a result, some projects no longer qualify for continued support.

Crop Production

(3) An increase of $19,930,000 and 81 staff years for Crop Production research ($353,470,000 and 1,047 staff years available in 2023).

ARS' Crop Production research program focuses on developing and improving ways to reduce crop losses while protecting and ensuring a safe and affordable food supply. The program concentrates on production strategies that are environmentally friendly, safe to consumers, and compatible with sustainable and profitable crop production systems. Research activities are directed at safeguarding and utilizing plant genetic resources and their associated genetic, genomic, and bioinformatic databases that facilitate selection of varieties and/or germplasm with significantly improved traits. Research activities attempt to minimize the impacts of crop pests while maintaining healthy crops and safe commodities that can be sold in markets throughout theworld. The agency is conducting research to discover and exploit naturally occurring and engineered genetic mechanisms for plant pest control, develop agronomic germplasm with durable defensive traits, and transfer genetic resources for commercial use. ARS provides taxonomic information on invasive species that strengthens prevention techniques, aids in detection/identification of invasive pests, and increases control through management tactics that restore habitats and biological diversity.

Continuing Crop Production base funding is essential for ARS to carry out its research mission and responsibilities. Base funding supports ARS' program goals of protecting, expanding, and enhancing the Nation's crop genetic resources; increasing scientific knowledge of crop genes, genomes, and biological systems; and delivering technologies that improve the production efficiency, quality, health, and value of the Nation's crops. This includes: developing and maintaining genome databases and informatics tools; managing plant and microbial genetic resources; assessing systematic relationships; enhancing and releasing improved genetic resources and varieties; improving bee health; developing integrative strategies for managing pests, soil, water, nutrient and environmental factors for optimal yield; and determining the biological processes that improve crop productivity. In addition to the activities and functions specifically described in the budget request, current year and budget year base funds will be used to carry outactivities and functions consistent with the full range of authorities and activities delegated to the agency. ARS' Crop Production research program is carried out at numerous locations where agency scientists frequently collaborate with researchers from other Federal/State governments, academia,and private industry. The research supports many of USDA's Strategic Goals.

The funding change is requested for the following items:

A) An increase of $7,150,000 for 2024 Pay.

This increase will support the annualization of the 2023 4.6 percent Cost of Living pay increase and the 2024 5.2 percent Cost of Living pay increase. Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs, and carrying out ARS' mission. Elimination of the pay costs would require ARS to absorb these costs and reduce planned hiring levels, eroding USDA's ability to meet key Administration priorities.

B) The 2024 Budget includes an increase of $83,000,000 for Clean Energy of which $9,000,000 and 39 FTEs is for ARS' Crop Production Program.

This is a crosscutting, multidisciplinary initiative which supports the following programs: New Product Quality/Value Added, Crop Production, Crop Protection, Environmental Stewardship, and Library and Information Services. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

C) The 2024 Budget includes an increase of $88,500,000 for Climate Science of which $9,025,000 and 30 FTEs is for ARS' Crop Production Program.

This is a crosscutting, multidisciplinary initiative which supports the following programs: Livestock Production, Crop Production, Food Safety, Livestock Protection, Crop Protection, Environmental Stewardship, and Library and Information Services. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

D) The 2024 Budget includes an increase of $15,000,000 for Precision Nutrition of which $2,650,000 and 12 FTEs is for ARS' Crop Production Program.

This is a crosscutting, multidisciplinary initiative which supports the following programs: Livestock Production, Crop Production, and Human Nutrition. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

E) A decrease of $7,895,000 from ongoing research projects to support higher priority research.

The goal of ARS' research programs is to make the most effective use of taxpayer dollars within available resources. In order to respond to priority national needs, it is often necessary to reset priorities within the existing portfolio of projects. As a result, some projects no longer qualify for continued support.

Food Safety

(4) An increase of $9,789,000 and 18 staff years for Food Safety research ($127,614,000 and 696 staff years available in 2023).

ARS' Food Safety research program is designed to yield science-based knowledge on the safe production, storage, processing, and handling of plant and animal products, and on the detection and control of pathogenic bacteria and fungi, parasites, chemical contaminants, and plant toxins. All of ARS' research activities involve a high degree of cooperation and collaboration with USDA'sResearch, Education, and Economics agencies, as well as with the Food Safety and Inspection Service, Animal and Plant Health Inspection Service (APHIS), Food and Drug Administration, Centers for Disease Control and Prevention (CDC), Department of Homeland Security (DHS), and the Environmental Protection Agency (EPA). The agency also collaborates in international researchprograms to address and resolve global food safety issues. Specific research efforts are directed toward developing new technologies that assist ARS stakeholders and customers, including regulatory agencies, industry, and commodity and consumer organizations in detecting, identifying, and controlling foodborne diseases that affect human health.

Continuing Food Safety base funding is essential for ARS to carry out its research mission and responsibilities. Base funding supports ARS' program goal of protecting food from pathogens, toxins, and chemical contamination during production, processing, and preparation. This includes: developing and evaluating technologies for the detection and characterization of microbial contaminants; developing new intervention and control strategies for the reduction of foodborne pathogens; and developing and evaluating detection methods for the reduction and control of veterinary drugs, chemical residues, heavy metals, organic pollutants, and biological toxins derived from bacteria, fungi, and plants. In addition to the activities and functions specifically described in the budget request, current year and budget year base funds will be used to carry out activities and functions consistent with the full range of authorities and activities delegated to the

agency. ARS' Food Safety research program is carried out at numerous locations where agency scientists frequently collaborate with researchers from other Federal/State governments, academia, and private industry. The research supports many of USDA's Strategic Goals.

The funding change is requested for the following items:

A) An increase of $4,754,000 for 2024 Pay.

This increase will support the annualization of the 2023 4.6 percent Cost of Living pay increase and the 2024 5.2 percent Cost of Living pay increase. Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs, and carrying out ARS' mission. Elimination of the pay costs would require ARS to absorb these costs and reduce planned hiring levels, eroding USDA's ability to meet key Administration priorities.

B) The 2024 Budget includes an increase of $88,500,000 for Climate Science of which $7,900,000 and 18 FTEs is for ARS' Food Safety Program.

This is a crosscutting, multidisciplinary initiative which supports the following programs: Livestock Production, Crop Production, Food Safety, Livestock Protection, Crop Protection, Environmental Stewardship, and Library and Information Services. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

C) A decrease of $2,865,000 from ongoing research projects to support higher priority research.

The goal of ARS' research programs is to make the most effective use of taxpayer dollars within available resources. In order to respond to priority national needs, it is often necessary to reset priorities within the existing portfolio of projects. As a result, some projects no longer qualify for continued support.

Livestock Protection

(5) An increase of $8,563,000 for Livestock Protection research ($153,407,000 and 408 staff years available in 2023).

ARS' Livestock Protection research program is directed at protecting and ensuring the safety of the Nation's agriculture and food supply through improved disease detection, prevention, control, and treatment. Basic and applied research approaches are used to solve animal health problems of high national priority. Emphasis is given to methods and procedures to control animal diseases through the discovery and development of diagnostics, vaccines, biotherapeutics, animal genomics applications, disease management systems, animal disease models, and farm biosecurity measures. The research program has the following strategic objectives: establish ARS laboratories into a fluid, highly effective research network to maximize use of core competencies and resources; use specialized high containment facilities to study zoonotic and emerging diseases; develop an integrated animal and microbial genomics research program; establish core competencies in bovine,swine, ovine, and avian immunology; launch a biotherapeutic discovery program providing alternatives to animal drugs; build a technology driven vaccine and diagnostic discovery research program; develop core competencies in field epidemiology and predictive biology; establish a best- in-class training center for our Nation's veterinarians and scientists; and develop a model technology transfer program to achieve the full impact of ARS research discoveries. The ARS animal research program includes the following core components: biodefense research, animal genomics and immunology, zoonotic diseases, respiratory diseases, reproductive and neonatal diseases, enteric diseases, parasitic diseases, and transmissible spongiform encephalopathies.

Continuing Livestock Protection base funding is essential for ARS to carry out its research mission and responsibilities. Base funding supports ARS' program goal of preventing and controlling pestsand animal diseases that pose a threat to agriculture, public health, and the well-being of Americans. This includes:

identifying genes involved in animals with disease-resistant phenotypes;improving our understanding of microbial pathogenesis, transmission, and immune responses to develop countermeasures to prevent and control animal diseases; analyzing microbial genomes to better understand host-pathogen interactions; developing new vaccines to prevent disease in aquaculture species; developing new methods to minimize tick bites; identifying measures to restrict the cattle fever tick; developing methods to control stable flies, horn flies, and house flies and their impact on livestock; supporting the screwworm eradication program; and developing control methods for U.S. vectors of Rift Valley fever. In addition to the activities and functions specifically described in the budget request, current year and budget year base funds will be used to carry out activities and functions consistent with the full range of authorities and activities delegated to the agency.

ARS' Livestock Protection research program is carried out at numerous locations where agency scientists frequently collaborate with researchers from other Federal/State governments, academia,and private industry. The research supports many of USDA's Strategic Goals.

The funding change is requested for the following items:

A) An increase of $2,786,000 for 2024 Pay.

This increase will support the annualization of the 2023 4.6 percent Cost of Living pay increase and the 2024 5.2 percent Cost of Living pay increase. Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs, and carrying out ARS' mission. Elimination of the pay costs would require ARS to absorb these costs and reduce planned hiring levels, eroding USDA's ability to meet key Administration priorities.

B) The 2024 Budget includes an increase of $88,500,000 for Climate Science of which $8,700,000 is for ARS' Livestock Protection Program.

This is a crosscutting, multidisciplinary initiative which supports the following programs: Livestock Production, Crop Production, Food Safety, Livestock Protection, Crop Protection, Environmental Stewardship, and Library and Information Services. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

C) A decrease of $2,923,000 from ongoing research projects to support higher priority research.

The goal of ARS' research programs is to make the most effective use of taxpayer dollars within available resources. In order to respond to priority national needs, it is often necessary to reset priorities within the existing portfolio of projects. As a result, some projects no longer qualify for continued support.

Crop Protection

(6) A decrease of $15,855,000 and an increase of 27 staff years for Crop Protection research ($246,967,000 and 766 staff years available in 2023).

ARS' Crop Protection research program is directed to protect crops from insect and disease loss through research to understand pest and disease transmission mechanisms, and to identify and apply new technologies that increase our understanding of virulence factors and host defense mechanisms. The program's research priorities include: identification of genes that convey virulence traits in pathogens and pests; factors that modulate infectivity, gene functions, and mechanisms; genetic profiles that provide specified levels of disease and insect resistance under field conditions; and mechanisms that reduce the spread of pests and infectious diseases. ARS is developing new knowledge and integrated pest management approaches to control pest and disease outbreaks as they occur. Its research will improve the knowledge and understanding of theecology, physiology, epidemiology, and molecular biology of emerging diseases and pests. This knowledge will be incorporated into pest risk assessments and management strategies to minimize chemical inputs and increase production. Strategies and approaches will be available to producers to control emerging crop diseases and pest outbreaks and to address quarantine issues.

Continuing Crop Protection base funding is essential for ARS to carry out its mission and responsibilities. Base funding supports ARS' program goals of protecting our Nation's crops fromarthropods, plant pathogens, nematodes, and weeds; and developing economical alternatives to methyl bromide. In addition to the activities and functions specifically described in the budget request, current year and budget year base funds will be used to carry out activities and functionsconsistent with the full range of authorities and activities delegated to the agency. ARS' Crop Protection research program is carried out at numerous locations where agency scientists frequently collaborate with researchers from other Federal/State governments, academia,and private industry. The research supports many of USDA's Strategic Goals.

The funding change is requested for the following items:

A) An increase of $5,231,000 for 2024 Pay.

This increase will support the annualization of the 2023 4.6 percent Cost of Living pay increase and the 2024 5.2 percent Cost of Living pay increase. Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs, and carrying out ARS' mission. Elimination of the pay costs would require ARS to absorb these costs and reduce planned hiring levels, eroding USDA's ability to meet key Administration priorities.

B) The 2024 Budget includes an increase of $83,000,000 for Clean Energy of which $500,000 is for ARS' Crop Protection Program.

This is a crosscutting, multidisciplinary initiative which supports the following programs: New Product Quality/Value Added, Crop Production, Crop Protection, Environmental Stewardship, and Library and Information Services. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

C) The 2024 Budget includes an increase of $88,500,000 for Climate Science of which $8,100,000 and 27 FTEs is for ARS' Crop Protection Program.

This is a crosscutting, multidisciplinary initiative which supports the following programs: Livestock Production, Crop Production, Food Safety, Livestock Protection, Crop Protection, Environmental Stewardship, and Library and Information Services. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

D) A decrease of $29,686,000 from ongoing research projects to support higher priority research.

The goal of ARS' research programs is to make the most effective use of taxpayer dollars within available resources. In order to respond to priority national needs, it is often necessary to reset priorities within the existing portfolio of projects. As a result, some projects no longer qualify for continued support.

Human Nutrition

(7) An increase of $15,471,000 and 42 staff years for Human Nutrition research ($109,470,000 and 316 staff years available in 2023).

Maintenance of health throughout the lifespan along with prevention of obesity and chronic diseases via food-based recommendations are the major emphases of ARS' Human Nutrition research program. These health-related goals are based on the knowledge that deficiency diseases are no longer primary public health concerns in the U.S. Excessive consumption has become the primary nutrition problem in the American population. This is reflected by increased emphasis onprevention of obesity from basic science through intervention studies to assessments of large populations. The agency's research program also actively studies bioactive components of foods that have no known requirements but have health-promoting qualities. Four specific areas of research are emphasized: nutrition monitoring; the scientific basis for

dietary recommendations; prevention of obesity and related diseases; and life stage nutrition and metabolism, in order to better define the role of nutrition in pregnancy and growth of children, and for healthier aging.

Continuing Human Nutrition base funding is essential for ARS to carry out its mission and responsibilities. Base funding supports ARS' program goal of enabling Americas to make health promoting, science-based dietary choices. This includes: determining food consumption and dietary patterns of Americans; updating U.S. food composition data; enhancing the health promoting quality of the food supply; developing and evaluating strategies to prevent obesity andrelated diseases; and understanding the mechanisms by which nutrition promotes healthy development. In addition to the activities and functions specifically described in the budget request, current year and budget year base funds will be used to carry out activities and functions consistent with the full range of authorities and activities delegated to the agency. ARS' Human Nutrition research program is carried out at numerous locations where agency scientists frequently collaborate with researchers from other Federal/State governments, academia,and private industry. The research supports many of USDA's Strategic Goals.

The funding change is requested for the following items:

A) An increase of $2,156,000 for 2024 Pay.

This increase will support the annualization of the 2023 4.6 percent Cost of Living pay increase and the 2024 5.2 percent Cost of Living pay increase. Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs, and carrying out ARS' mission. Elimination of the pay costs would require ARS to absorb these costs and reduce planned hiring levels, eroding USDA's ability to meet key Administration priorities.

B) The 2024 Budget includes an increase of $5,000,000 and 21 FTEs to establish Nutrition Hubs.

Need for Change

The COVID pandemic brought into sharp focus the health disparities of underserved communities in the US. Nutrition-related chronic disease is a special disparity; Native Americans and Hispanics have diabetes rates 1.8 and 1.7 times greater, respectively, than non-Hispanic whites, and African Americans are 30 percent more likely to die of heart disease than non-Hispanic white Americans. These disparities call attention to the need to both gather more information on the role of diet in these sub-populations as well as better disseminate current nutrition policy and advice. The President has focused on the need to better serve underserved communities, and this proposal is focused on the specific nutritional needs of these communities.

"Nutrition Hubs" established within the USDA will allow outreach and contact with underserved communities. The USDA operates six Human Nutrition Research Centers (HNRC) across the United States and each of these centers has access to unique populations with unique nutritional needs and problems. The hubs will connect and cooperate with the centers in Grand Forks, ND to access Native American populations, Boston, MA to access inner-city urban poor, Little Rock, AR to access rural poor, Beltsville, MD to access African American populations, Houston, TX to access the Hispanic population and Davis, CA to access farm workers and Asians. These connections will be important for: 1 – gathering data to understand unique nutritional barriers and challenges and more precisely define unique nutritional requirements and guidance; and 2 – disseminate nutrition policy, guidance, and advice. The hubs will work closely with 1890's schools, tribal colleges. HBCUs, minority serving community colleges and other federal research and outreach programs targeting underserved populations. Nutrition hubs will serve to connect research in support of the Cancer Moonshot with education, extension, and program efforts to turn specific science outcomes into knowledge transfer with improved and more equitable outcomes.

A new program will be created that includes a Nutrition Hub coordinating center with a program leader that will be located at an HNRC. The program leader will coordinate targeted activities at all of the HNRCs as well as establish grants and contracts with groups outside of USDA (e.g., 1890's colleges, tribal colleges). One nutrition scientist, who communicates with the program leader, will be placed at each of the six

HNRCs. These scientists will develop specific collaborations and partnerships, focusing on institutions and programs that predominately serve the population of interest (e.g., Native American tribal councils, Cankdeska Cikana Community College, ND; Bowie State University, MD; University of Arkansas Pine Bluff, AR, investigational cohorts, food banks). These scientists will develop programs that gather information regarding specific nutritional concerns and disseminate current nutrition understanding, policy and guidance to the specific populations served by the center. These connections and collaborations will be fundamental to reducing health disparities and health care costs for a significant portion of the American population.

Means to Achieve Change

- Nutrition hub coordinating center ($2,000,000). ARS will:
    - Develop a center to communicate with all partners and develop and oversee contracts and agreements with participating institutions
- Regional nutrition coordinators ($3,000,000). ARS will:
    - Commit a scientist at each of the six Human Nutrition Research Centers to interact with the coordinator and develop outreach to the underserved population uniquely accessed by the Center

Partnerships and Collaborations

This initiative will require partnership and collaboration with each of the six HNRCs. Outside collaborations will be developed with Historically Black Colleges and Universities (HBCUs), Native American tribal councils, tribal colleges, community colleges with predominately Native American populations, state colleges and community colleges with predominately Hispanic populations, investigational cohorts and other federal programs focusing on rural and urban poor.

C) The 2024 Budget includes an increase of $15,000,000 for Precision Nutrition, of which $12,100,000 and 21 FTEs is for ARS's Human Nutrition Program.

This is a crosscutting, multidisciplinary initiative which supports the following programs: Livestock Production, Crop Production, and Human Nutrition. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

D) A decrease of $3,785,000 from ongoing research projects to support higher priority research.

The goal of ARS' research programs is to make the most effective use of taxpayer dollars within available resources. In order to respond to priority national needs, it is often necessary to reset priorities within the existing portfolio of projects. As a result, some projects no longer qualify for continued support.

Environmental Stewardship

(8) An increase of $69,954,000 and 242 staff years for Environmental Stewardship research ($306,301,000 and 1,176 staff years available in 2023).

ARS' Environmental Stewardship research program emphasis is on developing technologies and systems that support sustainable production and enhance the Nation's vast renewable natural resource base. The agency is currently developing the scientific knowledge and technologies needed to meet the challenges and opportunities facing U.S. agriculture in managing water resource quality and quantity under different climatic regimes, production systems, and environmental conditions. ARS' research also focuses on developing measurement, prediction, and control technologies for emissions of greenhouse gases, particulate matter, ammonia, hydrogen sulfide, and volatile organic compounds affecting air quality and land-surface climate interactions. The agency is a leader in developing measurement and modeling techniques for characterizing

gaseous and particulate matter emissions from agriculture. In addition, ARS is evaluating strategiesfor enhancing the health and productivity of soils, including developing predictive tools to assess the sustainability of alternative land management practices. Finding mechanisms to aid agriculture in adapting to changes in atmospheric composition and climatic variations is also an important component of this program. ARS' range and grazing land research objectives include the conservation and restoration of the Nation's range land and pasture ecosystems and agroecosystems through improved management of fire, invasive weeds, grazing, global change, and other agents of ecological change. The agency is currently developing improved grass and forage legume germplasm for livestock, conservation, bioenergy, and bioproduct systems as well asgrazing-based livestock systems that reduce risk and increase profitability. In addition, ARS is developing whole system management strategies to reduce production costs and risks.

Continuing Environmental Stewardship base funding is essential for ARS to carry out its mission and responsibilities. Base funding supports ARS program goals of providing integrated, effective, and safe water resources; improving the quality of atmosphere and soil resources and understanding the effects of climate change; effectively and safely managing the use of manure andother industrial byproducts that maximize their potential benefits while protecting the environmentand human and animal health; and developing and transferring economically viable and environmentally sustainable production and conservation practices, technologies, plant materials, and integrated management strategies that conserve and enhance the Nation's natural resources. Inaddition to the activities and functions specifically described in the budget request, current year and budget year base funds will be used to carry out activities and functions consistent with the fullrange of authorities and activities delegated to the agency. ARS' Environmental Stewardship research program is carried out at numerous locations whereagency scientists frequently collaborate with researchers from other Federal/State governments,academia, and private industry. The research supports many of USDA's Strategic Goals.

The funding change is requested for the following items:

A) An increase of $8,031,000 for 2024 Pay.

This increase will support the annualization of the 2023 4.6 percent Cost of Living pay increase and the 2024 5.2 percent Cost of Living pay increase. Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs, and carrying out ARS' mission. Elimination of the pay costs would require ARS to absorb these costs and reduce planned hiring levels, eroding USDA's ability to meet key Administration priorities.

B) The 2024 Budget includes an increase of $83,000,000 for Clean Energy for which $7,500,000 and 36 FTEs is for ARS' Environmental Stewardship Program.

This is a crosscutting, multidisciplinary initiative which supports the following programs: New Product Quality/Value Added, Crop Production, Crop Protection, Environmental Stewardship, and Library and Information Services. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

C) The 2024 Budget includes an increase of $88,500,000 for Climate Science of which $40,075,000 and 120 FTEs is for ARS' Environmental Stewardship Program.

This is a crosscutting, multidisciplinary initiative which supports the following programs: Livestock Production, Crop Production, Food Safety, Livestock Protection, Crop Protection, Environmental Stewardship, and Library and Information Services. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

D) The 2024 Budget includes an increase of $8,000,000 for Greenhouse Gas Monitoring and Measuring of which $8,000,000 and 45 FTEs is for ARS' Environmental Stewardship Program.

President Joe Biden on January 27, 2021 signed the "Executive Order on Tackling the Climate Crisis at Home and Abroad" which affirmed this administration's priority to place the climate crisis at the forefront of this Nation's foreign policy and national security planning, which included being leaders who promote ambitious approaches to meet the climate challenge. ARS has been a highly visible national and global leader for more than two decades in advancing the quantification and modeling of greenhouse gas (GHG) emissions and soil carbon storage in agricultural systems. Priorities have included developing key decision support tools that inform land and livestock managers about practices that can reduce GHG emissions and increase soil carbon storage, and by providing critical science and data for the National Greenhouse Gas Inventory. The current need will enable ARS to make critical advances in the measurement, models and monitoring tools. ARS will conduct innovative research to improve the sensitivity, durability and accessibility of real time sensors and monitors; create automated data collection tools for GHG phenomena - such as those that currently exist for monitoring weather conditions; and develop and leverage new AI and other Big Data analytics tools to increase the capability, power and accuracy of our GHG monitoring, measurement, and inventory. A key outcome of these efforts will be to increase our capacity to quantify and/or predict the GHG impact of changing management strategies or developing new production technologies that are GHG neutral and that are climate smart.

Taken together, ARS will conduct critical research to address the climate challenge to enable U.S. production systems to be more adaptive and climate smart while also providing the tools needed to quantify and account for the benefits to the environment and society. The research will fill a critical need to improve our ability to accurately measure and monitor the agricultural contributors to GHG emissions and climate change (e.g., advanced approaches to provide more and better data for GHG emissions) and opportunities for the sector to reduce net emissions and become net neutral (e.g., practices that sequester carbon or that reduce GHG promoting chemicals, such as emissions of carbon dioxide, methane, or nitrous oxide). It is critical to our agricultural enterprise and to our national security that we have the tools and resources to better understand and measure GHG emissions and remediation approaches, as well as to better monitor them (and the effectiveness of our efforts to reduce them) so that GHG concerns can be adeptly addressed.

These new funds will allow ARS to establish a new research initiative developing the next generation of highly automated, Internet of Things (IoT) enabled GHG sensor design and deployment, and the Big Data and AI tools needed to integrate and analyze that data in support of the national research community. This constitutes the next generation advancement of existing ARS instrumentation and research networks such as GRACEnet and Livestock GRACEnet. Developing advanced data pipelines capable of moving standardized salient data from the field to an appropriate and diverse set of end users including researchers, policymakers and producer decision support communities to fully understand the utility and impact of agricultural GHG mitigation options. The overarching goal of this funding is to enable: (1) advanced sensors and measurement approaches for addressing all critical aspects of GHG emissions, and (2) optimized measurement and monitoring of these and related processes to address climate change. This will include development and optimization of sensors that measure and monitor outcomes of processes that seek to lower or abate emissions (e.g., via carbon sequestration, optimized nitrogen fertilization to combat nitrous oxide emissions, and others). It will also include research that seeks to make these sensors both more sensitive/accurate and less expensive, so that they can be widely deployed and used. Finally, this effort will include development and deployment of advanced data pipelines and end user applications such as geospatial decision support tools and GHG flux quantifiers. The outcome will be improved understanding of GHG fluxes and related processes, improved decision support tools and apps for a variety of end user communities, more accurate National GHG Inventory reporting, and ultimately a more resilient and climate smart agricultural sector producing ample food, feed, fiber, fuels and environmental services.

Means to Achieve Change

- Establish an ARS Agricultural Measurement and Monitoring Innovation Lab with a focus on sensor design and deployment and data integration across the ARS field network ($1,382,000). ARS will:
  - Upgrade and expand current instrumentation and develop new instruments and low-cost sensor technologies, distributed initially to LTAR, GRACEnet and Livestock GRACEnet partner locations.

- Leverage the historical power of GRACEnet, LTAR and other GHG efforts, and develop powerful tools for enhancing these via development of next generation Internet of Things (IoT), AI and Big Data capabilities and tools.

- Improve local, regional and national scale models and tools for quantifying GHG emissions and carbon storage resulting in new apps, tools and models adapted to the needs of a variety of public and industry stakeholders including producer decision support ($918,000). ARS will:

  - Enhance the historically powerful GRACEnet network to lead in GHG assessment and modeling efforts and enable additional engagement with the measurement and monitoring data for facile data handling, storage and access via development of next generation IoT and Big Data capabilities and tools.

  - Develop effective data pipelines and data standardization protocols to ensure maximum impact, functionality and accessibility of GHG measurement and monitoring data.

- Catalyze the innovation of soil carbon measurement and GHG emissions quantification through deployment of new sensor and data tools, improved data management and standardization, and tools for data sharing ($700,000). ARS will:

  - Improve local, regional and national scale GHG monitoring data standardization and connectivity through enhancement of existing protocols and standards (e.g., LTAR and GRACEnet and PDI) and establishment of new efforts to streamline data delivery and increase impact. This will ensure network connectivity for widespread GHG measurement and monitoring coherence that further enables GHG assessment accuracy.

  - Enhance the LTAR network system for highly sensitive GHG measurement and monitoring that provides more accurate, regionally relevant outcomes from different practices seeking to mitigate GHG emissions, with a focus on advanced GHG sensor development and deployment, leveraging advances in the IoT.

- Enhance GHG measurement network data acquisition and processing by enabling leadership in Eddy Covariance (EC) system and other IoT instrumented data collection, assessment, and tool development for automated data processing ($1,200,000). ARS will:

  - Establish the *ARS Agricultural EddyFlux Network* of high speed and IoT and Artificial Intelligence (AI) enabled EC measurement sensors and technologies for enhanced data collection, handling, assessment – all within a common and scientifically valid standardization environment. This will enable more rapid and powerful analysis from EC towers and the Eddyflux network for better assessments of GHG mitigating practices and effects on emissions.

- Conduct systems-level data collection and analyses on livestock enteric methane, grazinglands soil carbon storage, and manure management emissions mitigation by creating a new GRACEnet site at the Meat Animal Research Center. ($2,000,000). ARS will:

  - Establish a new GRACEnet partner site with a focus on beef production systems and evaluating opportunities to monitor and measure emissions and carbon storage across the livestock system and exploring opportunities to adapt the system to optimize productivity while shifting toward net neutrality with regards to GHG emissions.

  - Enable sensor developments that better assess and that enhance animal welfare for 1) respiratory exhaled methane and 2) digestive system emitted methane, and that seek to 3) measure and assess the entire livestock (initially cattle) digestive system for determining opportunities to reduce all livestock methane production and subsequent emissions.

- Develop or enhance technologies for methane measurement in livestock production systems (instrumented sites/animal sensors) resulting in forage and animal management strategies that mitigate GHG emissions and optimize carbon capture and storage across livestock, rangeland, pasture, feedlot and manure management systems. ($1,800,000). ARS will:

  - Leverage sensor development to address animal in pasture and rangeland grazing systems and engage with GRACEnet Livestock network to implement robust sensor systems for these settings.

Partnership and Collaborations

Funding will create nationwide coordination among projects in ARS, and opportunities for collaboration with USDA Climate Hubs, USFS, NRCS, APHIS, and NIFA, as well as with BLM, NASA, Land Grant Universities (including 1890 and 1994 LGUs), and Tribal Nations. Through these partnerships, ARS will lead the way for conducting research to measure, monitor, and safeguard the most resilient production systems in the world.

E) An increase of $5,000,000 and 18 FTEs to establish Climate Hubs in Alaska and Hawaii.

The urgency of the global climate crisis is growing, as is the need for dedicated efforts in Alaska and Hawaii and the Affiliated Pacific Islands which are home to some of our most extreme impacts of climate change. Each of these regions need a dedicated Climate Hub presence to ensure we understand regional vulnerabilities and are providing science, tools and technologies that are especially relevant to growers and land managers within those regions. Deploying two new USDA regional Climate Hubs will provide tools and strategies to these agricultural communities to develop and implement weather resilient and climate-smart production systems. The current USDA-ARS climate hubs have been successful but additional and strategic hubs are needed for these unique production regions which face unique climate challenges.

There are several positive economic implications for this change. The ten regional Climate Hubs have been instrumental and foundational for the communication of effective practices that save producers money by enabling them to either avoid or strategically offset the devastating impacts of climate change (including severe weather events) on their production systems. It is anticipated that the new hubs for Alaska and Hawaii will likewise provide the regions' producers with region and climate specific practices and tools that will enable them to avoid climate impacts via forecasting tools (e.g., akin to "Grasscast") or the development of monitoring tools (as in the Drought Monitoring Network).

In addition to the economic implications for this change, there are several broad and impactful expected benefits: The outcomes of establishing these two new hubs are expected to mirror those of the initial 10 hubs. For example, from the Climate Hubs: Five Year Review document, stakeholders were contacted, and the following communication was developed: "*Findings indicate that since 2014, the Hubs have built a strong reputation as collaborators and conveners. They produce many timely and useful products that successfully disseminate information about the regional impacts of climate change. Their successful activities to date have generated even more demand for outreach and education among new audiences and more targeted outreach among USDA agency partners who can benefit further from the work*." and: "*The Hubs excel at outreach, partnership building, and as a convening body. The Hubs provided a platform for USDA agencies to meet and work on common issues and expand USDA outreach with partners and working lands managers. Stakeholders indicated they received the most benefit from activities with Hub staff, including presentations and training; they particularly appreciated the Hubs' primary role in facilitating the coordination of climate services among different groups. Additionally, partnering with the Hubs helped stakeholders secure project funding through NIFA grants*." and: "*The Hubs can integrate mitigation data and practices into adaptive management actions, as well as incorporate economic analysis of the costs and benefits of the practices. There are additional opportunities to use existing data, such as the Hubs partnership with NOAA's Climate Prediction Center (CPC), to leverage new developments in statistically downscaled climate models that could be useful in improving seasonal weather and climate predictions across regions*." - From: *Steele, R., Zycherman, A., Wiener, S., Hernandez, C., Wilson, M., Johnson, R., & Steele, C. (2019). USDA Climate Hubs: Five Year Review. Report prepared for the USDA Climate Hubs Executive Committee, U.S. Department of Agriculture, Washington D.C*.

This change will also support several of the USDA strategic priorities. The Climate Hubs are a critical part of addressing the USDA Strategic Plan, Strategic Goal 1: *Combat Climate Change to Support America's Working Lands, Natural Resources, and Communities* and are key parts of Objective 1.1: Use Climate-Smart Management and Sound Science to Enhance the Health and Productivity of Agricultural Lands and Objective 1.2: *Lead Efforts to Adapt to the Consequences of Climate Change in Agriculture and Forestry* and conduct critical efforts to address Objective 1.4: *Increase Carbon Sequestration, Reduce Greenhouse Gas Emissions, and Create Economic Opportunities (and Develop Low-Carbon Energy Solutions).* Furthermore the Climate Hubs address Strategic Goal 3: *Foster an Equitable and Competitive Marketplace for All Agricultural Producers* and Objective 3.1: *Foster Sustainable Economic Growth by Promoting Innovation, Building Resilience to Climate Change, and Expanding Renewable Energy* and under Strategic

Goal 6 (*Attract, Inspire, and Retain an Engaged and Motivated Workforce that's Proud to Represent USDA*), the Hubs address Objective 6.3: *Promote USDA Operational Excellence Through Better Use of Technology and Shared Solution.*

The climate hubs have been a good investment and their output and performance (see below) are exemplary of a government effort and furthermore demonstrate the OneUSDA initiative. It is important to point out key findings about the performance of the climate hubs (expected to be mirrored by the Alaska and Hawaii and Pacific Island Hubs) from the review document above:

1. The Climate Hubs assess and synthesize climate risks and vulnerabilities based on regional needs and input. Hubs outputs included Climate Vulnerability Assessments covering all 10 Hub regions of the United States, two special issues in the journal Climatic Change (which have been accessed more than 88,500 times as of January 17, 2020), and major authorship contributions to the regional chapters of the 4th National Climate Assessment.
2. The Climate Hubs participated in the publication of over 410 peer-reviewed publications and 690 other pieces of literature, including white papers, brochures, fact sheets, two-pagers, and blogs.
3. The Hubs and their partners developed 25 web-based decision-support tools to help track and respond to climate variability and its impacts. These tools are now regularly used by stakeholders to access information and make informed management decisions.
4. The Hubs educate and support stakeholders through in-person events, virtual platforms, and publications. Between 2014 and 2020, the Hubs and their partners hosted over 435 in-person events, including workshops and field demonstrations, and training, engaging more than 16,000 stakeholders in critical climate issues and adaptation opportunities. The Hubs and partners also provided virtual technical expertise to approximately 17,000 people through more than 237 webinars, podcasts, and other digital forms of communication. The Hubs website has been visited by 109,000 users who engaged with more than 161,000 website sessions. To support youth education and workforce development, the Hubs organized more than 50 events specifically aimed at youth under the age of 18. Additionally, the Hubs developed 36 pieces of formal curricula aimed at learners of all ages. These lessons will reach more than 17,000 students through dissemination, adoption, and implementation.

Means to Achieve Change

- Enhance the power of the USDA ARS Climate Hub engagement with their regions by creating two new climate hubs in Alaska and Hawaii ($5,000,000). ARS will:

  - Expand engagement with producers, including indigenous and underserved farmers and ranchers, across Alaska (Anchorage, AK), and Hawaii and Affiliated Pacific Islands (Hilo, HI) by creating the AKCH and the HAPICH.

  - Target the specific climate change adaptation needs and mitigation opportunities of these regions and address producer, consumer, and stakeholder priorities across their diverse and unique agroecosystems.

Partnerships and Collaborations

The Hubs customer and stakeholder community is regionally, and nationally diverse and these new climate hubs will interact strongly with USDA action agencies such as the Forest Service (FS), the Natural Resources Conservation Service (NRCS), Rural Development (RD), and others. Other Federal agencies (e.g., BLM, USGS, NOAA, and NASA), land grant universities, university extension, producers, producer groups, NGOs, and technical service providers will also be collaborators on the new Climate Hub efforts.

F) An increase of $1,500,000 and 6 FTEs to establish a Long-Term Agroecosystem Research (LTAR) research project in California.

The urgency of the global climate crisis is growing. Nearly every aspect of the nation's agricultural enterprise is increasingly called on to contribute to climate change mitigation by reducing Greenhouse Gas (GHG) emissions, sequestering carbon (C) to reduce atmospheric CO_2, and adapting quickly to unprecedented climate changes and weather extremes with minimal interruptions in production. These demands have

significant economic implications for farm profitability and rural community stability, especially for small farms of limited resource and minority producers and processors. The USDA-ARS Long-Term Agroecosystem Research (LTAR) Network is a one-of-a-kind research initiative that provides the coordinated, national scale research needed to solve the long-term, systems-level challenges associated with the need to sustainably intensify U.S. agriculture, so it is both adapted to and reduces contributions to climate change. Across the Network, coordinated site-based research is generating the knowledge needed to secure integrated solutions to complex problems and informing innovative science-based policies for increased agricultural production, sustained profits, more vibrant rural communities, and enhanced ecosystem services from agricultural lands. There are currently 18 LTAR sites representing important agricultural production regions of the U.S., but key regions that are being significantly impacted by climate change are not represented, including California. ARS will establish a new LTAR research project in this climate sensitive region and conduct research that will provide scientific information necessary to fully understand the climate change drivers and impacts, develop approaches to mediate climate change impacts, and enable agriculture to continue to provide food and ecosystem services. Creating a new LTAR site in this region will ensure that they are receiving the science research associated with water sustainability, rangeland management, tropical crop production, and climate adaptation that is required to make sure producers have the knowledge and resources to maintain profitability.

This LTAR expansion will:

- Enable ARS scientists, land grant universities, other research institutions, and Federal agencies to conduct multidisciplinary research and leverage funding to determine how best to sustain or enhance agricultural productivity, profitability, environmental quality, and ecosystem services in climate-sensitive regions.
- Increase the ability to leverage existing and developing infrastructure supported by USDA and other Federal agencies, notably the NSF supported Critical Zone Observatory, Long-Term Ecological Research (LTER), and NEON networks; the DOE supported Ameriflux network; the EPA supported Ammonia Deposition Network; the USDA Climate Hubs; and USDA's GRACEnet, REAP, and CEAP networks.
- Increase the ability of the LTAR research platform to be a uniquely critical "organizing principle" for U.S. agriculture to connect key agricultural science disciplines needed to find solutions to climate adaptation and mitigation issues for agriculture.

Means to Achieve Change

Expand the LTAR Network to focus on agricultural systems in the climate sensitive region of California ($1,500,000). ARS will:

- Create a new LTAR project in California that will focus research on the two primary agricultural regions (Central Valley and Imperial Valley), and primary watersheds that supply much of the water necessary for irrigated farmland. The California LTAR will address the following themes of sustainable agriculture: coping with climate change and environmental uncertainty in irrigated and drought prone landscapes; increasing ecosystem services of agricultural production; optimization of diverse management techniques for sustainable food production; and understanding integrated water management systems in response to changing climates.

Partnership and Collaborations

External partners with ARS on this effort are extensive and will include those whose missions and needs contribute to long-term science advances. These include USDA agencies such as NIFA, NRCS, Forest Service; other non-USDA federal agencies, such as BLM, EPA, NASA, NOAA, USGS; state and regional government agencies focused on long term land management and its beneficial outcomes; Land Grant Universities, their faculty, students, and extension teams; ecosystem service market quantifiers and brokers; NGOs and industry, including but not limited to: Soil Health communities; Conservation Districts; The Nature Conservancy; Field to Market, and other private industries involved with animal and plant breeding, germplasm development, animal welfare, and with sustainability commitments that depend on improved long-term science.

G) An increase of $5,000,000 to expand the Climate Hub Fellows Initiative.

As mentioned, the USDA-ARS climate hubs have been successful, but demand to ensure ARS research and engagement extends across all Climate Hubs outpaces what can be accomplished by current staff. A strategic approach to address these needs is to use the USDA-ARS Climate Hub Fellows initiative to attract early career experts in needed domains. Funding in the ARS fiscal year 2022 appropriation initiated the establishment of the first set of USDA ARS climate hub fellows, but this additional funding is needed to enhance that program and to further provide strategic, on-the-ground expertise, scientific synthesis, training, and outreach. Ultimately, USDA ARS Fellows will be exemplary candidates for jobs in the agricultural sector, industry, academia, and NGOs, to support the pressing need for experts to address climate change impacts on agriculture and society.

There are several positive economic implications for this change. The climate hub fellows are anticipated to have similar impacts as to when they were initially established on the effectiveness of the Climate Hubs for their regions. For example, from the Five-Year Review (Steele, R., Zycherman, A., Wiener, S., Hernandez, C., Wilson, M., Johnson, R., & Steele, C. (2019). USDA Climate Hubs: Five Year Review. Report prepared for the USDA Climate Hubs Executive Committee, U.S. Department of Agriculture, Washington D.C.), the Climate Hubs Fellows were noted to be "*a critical resource for the Climate Hubs team. The Fellows provided significant research, training, and outreach support to Hub activities. Fellows were respected and well received by stakeholders. The program's continuation will ensure the Hubs maintain the high level of successful engagement previously achieved*." And "*Hubs Fellows work on multiple projects relating to scientific research, science translation, outreach, collaborating with agency and other partners, and associated activities, and contribute to a variety of Hubs products. Fellows balance many different work responsibilities, spending time on a variety of projects and activities. All Fellows participate in working on economic, technical, and scientific issues of current and immediate importance to the USDA and on average dedicate just under 30 percent of their time to these activities.*"

In addition to the economic implications for this change, there are several broad and impactful expected benefits: The benefits of establishing additional fellows are expected to mirror the benefits generated by the first cohort of fellows, with the added benefit of long-term continuity for extended engagement with stakeholders and addressing their needs. For example, from the Climate Hub Five-year review, these findings were communicated: "The Climate Hubs Fellows contribute to a variety of Hubs products. They are exposed to different kinds of science, technical skills, and outreach opportunities, which creates a unique workforce development program. One of the highlights of the program is networking and collaborating with senior colleagues, in addition to network building with other Fellows. Conversely, the Fellows can benefit from consistent, high-quality mentoring. For example, plans of work focused too much on research instead of outreach and were occasionally developed without Fellow input. USDA could improve the Fellows program and the Fellows experience by ensuring that training, opportunities, and associated activities are consistent across agencies. Finally, it will be important to provide detailed job opportunity announcements in future Fellows iterations that clearly describe the intent and scope of the Fellows program."

This change will also support several of the USDA strategic priorities. The Climate Hub fellows are part of the Climate Hubs and therefore are expected to be engaged in addressing the USDA Strategic Plan, Strategic Goal 1: *Combat Climate Change to Support America's Working Lands, Natural Resources, and Communities* and are key parts of Objective 1.1: Use Climate-Smart Management and Sound Science to Enhance the Health and Productivity of Agricultural Lands and Objective 1.2: *Lead Efforts to Adapt to the Consequences of Climate Change in Agriculture and Forestry* and conduct critical efforts to address Objective 1.4: *Increase Carbon Sequestration, Reduce Greenhouse Gas Emissions, and Create Economic Opportunities (and Develop Low-Carbon Energy Solutions).* Furthermore the Climate Hubs address Strategic Goal 3: *Foster an Equitable and Competitive Marketplace for All Agricultural Producers* and Objective 3.1: *Foster Sustainable Economic Growth by Promoting Innovation, Building Resilience to Climate Change, and Expanding Renewable Energy* and under Strategic Goal 6 (*Attract, Inspire, and Retain an Engaged and Motivated Workforce that's Proud to Represent USDA*), the Hubs address Objective 6.3: *Promote USDA Operational Excellence Through Better Use of Technology and Shared Solution.*

The climate hub fellows were initially supported by sister agencies in the USDA, but funding was lowered over time as other priorities arose and eventually eliminated. The establishment of the USDA ARS fellows is anticipated to be a strong investment because of past performance of the climate hub fellows (see above

and below), consistent and stable funding, and owing to the exemplary mentorship of the USDA climate hub leadership for these fellows.

As a result of this initiative, ARS will provide:

- An invigorated Climate Hubs Fellow program with a streamlined funding source that will increase the capacity for Climate Hubs to achieve their mission.
- Career development opportunities for personnel who post-fellowship can contribute much-needed expertise to helping the agricultural industry develop and implement climate-smart production systems.

Means to Achieve Change

- Enhancing Climate Hub Impact by establishing a vital Fellowship Initiative that actively supports climate hub research, communication, and impact and that integrates with the efforts of other agencies and offices across USDA ($5,000,000). ARS will:

  - Expand the Fellows program for the Climate Hubs that supports a total of twelve (12) fellows positioned across the full network of USDA regional Climate Hubs – as well as at the proposed new ("Alaska" and "Hawaii and the Affiliated Pacific Islands") locations. These fellows will further expand and enhance each Hub's research and communication capacity and help to ensure the best and most relevant ARS scientific findings are being translated and synthesized in a way that maximizes impact for producers and rural communities. Fellows will work at individual Hubs but be coordinated across the entire Hub network.

  - Coordinate support needed for the Fellows program with emphasis on) effective outreach and engagement of the fellows for all the local and national climate hub priorities and, ii) ensuring the fellows program clearly supports the extreme weather and climate change adaptation and mitigation priorities of the Department.

  Partnership and Collaborations

  The Hubs customer and stakeholder community is regionally and nationally diverse and the Climate Hub Fellows will collaborate with USDA action agencies such as the Natural Resources Conservation Service (NRCS), Rural Development (RD), and others. Other Federal agencies (e.g., BLM, USGS, NOAA, and NASA), land grant universities, university extension, producers, producer groups, NGOs, and technical service providers will also be collaborators on the Climate Hub Fellows effort.

H) An increase of $3,000,000 and 12 FTEs to establish Long-term Agroecosystems Research (LTAR) research projects in Alaska and Hawaii.

There are currently 18 LTAR sites representing important agricultural production regions of the U.S., but key regions that are being significantly impacted by climate change are not represented, including Alaska, and Hawaii. ARS will establish two new LTAR research projects in these climate sensitive regions and conduct research that will provide scientific information necessary to fully understand the climate change drivers and impacts, develop approaches to mediate climate change impacts, and enable agriculture to continue to provide food and ecosystem services. Creating new LTAR sites in these regions will ensure that they are receiving the science research associated with water sustainability, rangeland management, tropical crop production, and northern climate adaptation that is required to make sure producers have the knowledge and resources to maintain profitability.

This LTAR expansion will:

- Enable ARS scientists, land grant universities, other research institutions, and Federal agencies to conduct multidisciplinary research and leverage funding to determine how best to sustain or enhance agricultural productivity, profitability, environmental quality, and ecosystem services in climate-sensitive regions.
- Increase the ability to leverage existing and developing infrastructure supported by USDA and other Federal agencies, notably the NSF supported Critical Zone Observatory, Long-Term Ecological

Research (LTER), and NEON networks; the DOE supported Ameriflux network; the EPA supported Ammonia Deposition Network; the USDA Climate Hubs; and USDA's GRACEnet, REAP, and CEAP networks.
- Increase the ability of the LTAR research platform to be a uniquely critical "organizing principle" for U.S. agriculture to connect key agricultural science disciplines needed to find solutions to climate adaptation and mitigation issues for agriculture.

Means to Achieve Change

- Expand the LTAR Network to focus on agricultural systems in the climate sensitive regions of Alaska and Hawaii ($3,000,000). ARS will:

  - Create a new LTAR project in Alaska that will focus on challenges facing Alaska agricultural production, especially the impacts of climate change, and the unique challenges faced by small farms and indigenous production systems. The Alaska LTAR will conduct aspirational research to accelerate climate-smart and regionally and culturally relevant practices that help increase local food production and production system resilience. This will help local farmers and ranchers across Alaska by providing adapted crops and management strategies that overcome rapidly changing lengths of growing seasons, warmer and wetter growing conditions, changes in pest and disease pressures, and changing soil conditions due to new temperature regimes and microbial responses.

  - Create a new LTAR project in Hawaii that will focus on developing preharvest and postharvest technologies and management strategies for invasive pests, especially as a function of changing climate, and to open and maintain market access and improved quality of tropical fruit, vegetable and ornamental crops grown in the Pacific Basin. The Hawaii LTAR will provide aspirational research that results in climate smart and regionally and culturally relevant solutions to the unique challenges faced by small farms and indigenous production systems across Hawaii and the Pacific Basin.

Partnership and Collaborations

External partners with ARS on this effort are extensive and will include those whose missions and needs contribute to long-term science advances. These include USDA agencies such as NIFA, NRCS, Forest Service; other non-USDA federal agencies, such as BLM, EPA, NASA, NOAA, USGS; state and regional government agencies focused on long term land management and its beneficial outcomes; Land Grant Universities, their faculty, students, and extension teams; ecosystem service market quantifiers and brokers; NGOs and industry, including but not limited to: Soil Health communities; Conservation Districts; The Nature Conservancy; Field to Market, and other private industries involved with animal and plant breeding, germplasm development, animal welfare, and with sustainability commitments that depend on improved long-term science.

I) An increase of $1,500,000 and 3 FTEs to establish a Long-term Agroecosystem Research (LTAR) research project in the Southern Great Basin.

As previously mentioned, there are currently 18 LTAR sites representing important agricultural production regions of the U.S., but key regions that are being significantly impacted by climate change are not represented, including the Great Basin region. ARS will establish a new LTAR research project in this climate sensitive region and conduct research that will provide scientific information necessary to fully understand the climate change drivers and impacts, develop approaches to mediate climate change impacts, and enable agriculture to continue to provide food and ecosystem services. Creating a new LTAR site in this region will ensure that they are receiving the science research associated with water sustainability, rangeland management, tropical crop production, and northern climate adaptation that is required to make sure producers have the knowledge and resources to maintain profitability.

This LTAR expansion will:

- Enable ARS scientists, land grant universities, other research institutions, and Federal agencies to conduct multidisciplinary research and leverage funding to determine how best to sustain or enhance

agricultural productivity, profitability, environmental quality, and ecosystem services in climate-sensitive regions.

- Increase the ability to leverage existing and developing infrastructure supported by USDA and other Federal agencies, notably the NSF supported Critical Zone Observatory, Long-Term Ecological Research (LTER), and NEON networks; the DOE supported Ameriflux network; the EPA supported Ammonia Deposition Network; the USDA Climate Hubs; and USDA's GRACEnet, REAP, and CEAP networks.
- Increase the ability of the LTAR research platform to be a uniquely critical "organizing principle" for U.S. agriculture to connect key agricultural science disciplines needed to find solutions to climate adaptation and mitigation issues for agriculture.

Means to Achieve Change

- Expand the LTAR Network to focus on agricultural systems in the climate sensitive region of the Southern Great Basin ($1,500,000). ARS will:

  - Create a new LTAR project in the Southern Great Basin that will focus on the sustainable management of livestock grazing rangelands and the specific themes of reducing invasion of annual grasses, minimizing rangeland soil erosion by wind and water, reducing wildfire threat, restoring rangeland vegetation after wildfire or removal of invasive grasses, and maintaining resilient rangeland ecosystems during and following periods of prolonged drought.

Partnership and Collaborations

External partners with ARS on this effort are extensive and will include those whose missions and needs contribute to long-term science advances. These include USDA agencies such as NIFA, NRCS, Forest Service; other non-USDA federal agencies, such as BLM, EPA, NASA, NOAA, USGS; state and regional government agencies focused on long term land management and its beneficial outcomes; Land Grant Universities, their faculty, students, and extension teams; ecosystem service market quantifiers and brokers; NGOs and industry, including but not limited to: Soil Health communities; Conservation Districts; The Nature Conservancy; Field to Market, and other private industries involved with animal and plant breeding, germplasm development, animal welfare, and with sustainability commitments that depend on improved long-term science.

J) A decrease of $9,652,000 from ongoing research projects to support higher priority research.

The goal of ARS' research programs is to make the most effective use of taxpayer dollars within available resources. In order to respond to priority national needs, it is often necessary to reset priorities within the existing portfolio of projects. As a result, some projects no longer qualify for continued support.

Library and Information Services

(9) An increase of $6,349,000 and 20 FTEs for Library and Information Services ($29,677,000 and 110 staff years available in 2023).

The National Agricultural Library (NAL) is the largest and most accessible agricultural research library in the world. It provides services directly to the staff of USDA and to the public, primarily via its web site, http://www.nal.usda.gov. NAL was created with the USDA in 1862 and was named a national library in 1962 by Congress as the "primary agricultural information resource of the United States". NAL is the premier library for collecting, managing, and disseminating agricultural knowledge. The Library is the repository of our Nation's agricultural heritage, the provider of world class information, and a wellspring for generating new fundamental knowledge and advancing scientific discovery. It is a priceless national resource that, through its services, programs, information products, and web-based tools and technologies, serves anyone who needs agricultural information. The Library's vision is "advancing access to global information for agriculture."

Continuing Library and Information Services base funding is essential for NAL to carry out its mission and responsibilities. Base funding supports ARS' goal of ensuring the provision and access of agricultural information for USDA, the Nation, and the global agricultural community. This includes:

delivering unified, easy to use, convenient 24/7 digital services; improving information delivery; extending AGRICultural OnLine Access (AGRICOLA); conserving rare and at-risk items; extending partnerships with USDA and other Federal agencies to develop targeted information services; and marketing NAL services to specific audiences. In addition to the activities and functions specifically described in the budget request, current year and budget year base funds will be used to carry out activities and functions consistent with the full range of authorities and activities delegated to the agency.

The funding change is requested for the following item:

A) An increase of $751,000 for 2024 Pay.

This increase will support the annualization of the 2023 4.6 percent Cost of Living pay increase and the 2024 5.2 percent Cost of Living pay increase. Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs, and carrying out ARS' mission. Elimination of the pay costs would require ARS to absorb these costs and reduce planned hiring levels, eroding USDA's ability to meet key Administration priorities.

B) The 2024 Budget includes an increase of $83,000,000 for Clean Energy of which $998,000 and 3 FTEs is for Library and Information Services.

This is a crosscutting, multidisciplinary initiative which supports the following programs: New Product Quality/Value Added, Crop Production, Crop Protection, Environmental Stewardship, and Library and Information Services. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

C) The 2024 Budget includes an increase of $88,500,000 for Climate Science of which $4,600,000 and 17 FTEs is for Library and Information Services.

This is a crosscutting, multidisciplinary initiative which supports the following programs: Livestock Production, Crop Production, Food Safety, Livestock Protection, Crop Protection, Environmental Stewardship, and Library and Information Services. A full description of the initiative is presented on title page, "Crosscutting/Multidisciplinary Initiatives" at the conclusion of the "Justifications of Increases/Decreases."

National Bio and Agro-Defense Facility - Operations and Maintenance

(10) An increase of $13,560,000 for the National Bio and Agro-Defense Facility Operations and Maintenance ($112,358,000 and 82 staff years available in 2023).

The funding change is requested for the following items:

A) An increase of $560,000 for 2024 Pay.

This increase will support the annualization of the 2023 4.6 percent Cost of Living pay increase and the 2024 5.2 percent Cost of Living pay increase. Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs, and carrying out ARS' mission. Elimination of the pay costs would require ARS to absorb these costs and reduce planned hiring levels, eroding USDA's ability to meet key Administration priorities.

B) The 2024 Budget includes an increase of $13,000,000 for the National Bio and Agro-Defense Facility -- Operations and Maintenance.

The National Bio and Agro-Defense Facility (NBAF), located in Manhattan, Kansas, will be a state-of-the-art biocontainment facility for the study of foreign, emerging, and zoonotic animal diseases that pose a

threat to United States animal agriculture and public health. The facility will serve as a "One Health" national and international resource, offering capabilities for training, research and development, surveillance, prevention, and response to emerging infectious diseases. NBAF will provide the first U.S large animal biosafety level-4 (BSL-4) facilities to house livestock infected with zoonotic agents within the highest biocontainment envelope, a critical capability that is currently lacking in the U.S. NBAF will also house a Biologics Development Module that will provide small scale production of standardized biological reagents needed for basic and applied research, and biological test materials for supporting proof-of-concept studies and early phase veterinary medical countermeasures development.

ARS is working closely with the Department of Homeland Security and APHIS to ensure a smooth transition of operations from PIADC to NBAF. Once the transition is complete, both ARS and APHIS will share responsibility for the operation of NBAF.

Means to Achieve Change

Operations and Maintenance ($13,000,000). ARS will:

- Increase training efforts to support this one-of-a-kind sophisticated biocontainment infrastructure to house large animals.

- Increase operations and maintenance testing, and verification to ensure process readiness to meet NBAF mission. These efforts will provide subject matter expertise for facilities operations assessments on:
    - Critical infrastructure spare parts requirements,
    - Preventative Maintenance Program,
    - Standard Operating Procedure Program,
    - Computerized maintenance management system workflow,
    - Developing/optimizing current procedures/processes/documents for the NBAF Campus.

Partnership and Collaborations

With regards to Operations and Maintenance, NBAF will work closely with the National Centers for Animal Health and collaborate with other high containment facilities across the United States (Federal and University) to share best practices and lessons learned through operating unique and complex facilities.

CROSSCUTTING/MULTIDISCIPLINARY INITIATIVES

Clean Energy

ARS requests an increase of $83,000,000 and 327 FTEs for this crosscutting, multidisciplinary initiative that will integrate research conducted in multiple agency program areas to achieve the expected outcomes. Funding increases for this initiative are located under the New Products/Product Quality/Value Added, Crop Production, Crop Protection, Environmental Stewardship, and the Library and Information Services sections of this document.

Need for Change

President Joe Biden on January 27, 2021 signed the "Executive Order on Tackling the Climate Crisis at Home and Abroad" which ordered federal agencies to develop clean energy technologies and accelerate clean energy generation projects that stimulates clean energy industries and benefits rural economies. The change to clean energy, and away from fossil-based energy, works by producing power without the negative environmental impacts such as greenhouse gases, like carbon dioxide and methane. And is generated from renewable, zero emission sources that do not pollute the atmosphere, as well as energy saved by energy efficiency measures. The various sources of clean energy are wind, solar, tidal, geothermal, nuclear, hydrogen, and agriculturally based, renewable biomass feedstocks. The need for clean energy is multi-purposed: 1. it's important for future generations, as clean energy sources are inexhaustible and adapt well to natural cycles and do not emit greenhouse gases. 2. Clean Energy gives local economies an advantage by reducing the cycle of economic losses from a dependence on fossil fuels, to relying on locally produced renewable energy sources found everywhere and readily available for ensuring energy sustainability. 3. Clean Energy is becoming more affordable, with costs trending at a declining rate and becoming more competitive with natural gas, coal, and oil. And 4. Clean Energy is a benefit to local economies due to creating locally produced new jobs in the generation of energy. But research and development must happen faster to make clean energy solutions viable. Therefore, although, clean energy already makes good business sense, fully realizing its potential, however, requires further innovation to optimize technologies and system integration. A robust new research and development effort would strengthen and ensure global leadership of the American agriculture industry as well as creating new initiatives for rural development through generation of Bioenergy.

Means to Achieve Change

ARS is the only agency within the federal government with an integrated feedstock breeding, production, and biorefining system that produces high-value consumer biobased products and sustainable, carbon-neutral clean energy—including green hydrogen—that benefits rural America.

- Sustainable Clean Bioenergy ($51,000,000). ARS will:
  - Develop sustainable clean energy conversion technologies (biochemical and thermochemical) focused on bio-jet, renewable marine fuels, oxygenated fuel additives, renewable natural gas, chemicals, and green hydrogen energy systems. Sustainability will be achieved by utilizing waste products and recovering compounds used in manufacturing.
- Clean Energy Feedstocks ($14,500,000). ARS will:
  - Determine through innovative hemicellulosic feedstocks and cropping systems for the U.S. that overcome current barriers to clean energy bioconversion, including increasing biomass per acre for non-crop plants, crop residues, altered hemicellulosic makeup, reducing inputs required for feedstock production, improving soil health and other ecosystems, e.g., carbon sequestration.
- Biowaste-stream to Bioenergy ($17,500,000). ARS will:
  - Use existing low-value agricultural and municipal waste products to create a renewable flex-use biomethane gas or synthesis gas (a mixture of methane, hydrogen, and carbon oxides).

Partnership and Collaborations

This initiative requires contributions from ARS scientists working within the four national program areas: Human Nutrition, Food Safety and Quality; Crop Production and Protection; Animal Production and protection; and Natural Resources and Sustainable Agriculture. Along with the National Agricultural Library. External partners include but are not limited to other federal agencies e.g., US Department of Energy, universities, and commercial stakeholders.

Climate Science

ARS requests an increase of $88,500,000 and 242 FTEs for this crosscutting, multidisciplinary initiative that will integrate research conducted in multiple agency program areas to achieve the expected outcomes. Funding increases for this initiative are located under the Livestock Production, Crop Production, Food Safety, Livestock Protection, Crop Protection, Environmental Stewardship, and the Library and Information Services sections of this document.

Need for Change

The urgency of the global climate crisis is growing. Nearly every aspect of the nation's agricultural enterprise is increasingly called on to contribute to climate change mitigation by reducing GHG emissions, sequestering carbon (C) to reduce atmospheric carbon dioxide (CO_2) and developing agriculturally based approaches for generating energy as alternatives to fossil fuels. Agriculture is also faced with adapting quickly to unprecedented climate changes and weather extremes with minimal interruptions in production. These enormous challenges call for innovative research supported by bold, trans-disciplinary collaborations. USDA-ARS has research projects and scientific expertise that address many topics related to climate change mitigation and adaptation. This existing infrastructure positions ARS to enable these advancements by establishing new research efforts and collaborations described below to support agriculture's response to the climate crisis.

Means to Achieve Change

- Adaption to Climate Change Response Plan ($9,025,000). ARS will:
  - Develop high yielding crop varieties (for example, wheat, corn, soybean, rice) with climate resilient traits that are equipped with genes to preserve nutritional quality and improve sensory quality when grown under extreme climates.
  - Apply novel methods, including AI and machine learning, to elucidate the underlying physiological and elements of exposure to changing climate, determine the sensitivity of crops to various elements of extreme climates and assess physiological outcomes of prolonged exposure to climate extremes.
  - Produce new varieties and cultivars for American farmers that ensure adequate production, processing, and utilization of nutritious food and rural prosperity.

- Plant Health Protection Against Climate Change ($8,100,000). ARS will:
  - Through the ARS-Cornell Breeding Insight project, NPGS genebanks, and in collaboration and university and private-sector partners, develop and implement novel, high through-put "phenomic" and multiple trait evaluations, analytical methods (involving hyperspectral imagery, weather sensors, UAVs), and data handling capacities to identify traits and germplasm for adapting crops in diverse US production regions to climate change.

- Mitigate Climate-Driven Food Safety Risk Caused by Food and Waterborne Pathogens ($4,500,000). ARS will:
  - Use high-throughput genomic technologies and bioinformatics to identify current and emerging parasites responsible for foodborne illnesses from a range of complex environments affected by climate change. Use mathematical modeling and artificial intelligence to assess complexities of climate and infection interactions that allow testing of adaption or mitigation measures to counteract the negative impacts of climate change on agricultural systems, food safety and public health.
  - Use genomic and advanced bioinformatic analytical tools to determine how climate-related stressors cause functional shifts in the broiler chicken gut microbiome and changes in enteric neurochemistry.

- Mitigate the Impact of Mycotoxins to the Food and Feed Supply ($3,400,000). ARS is the only agency in the Federal Government that undertakes research related to mitigating, eliminating and/or removing mycotoxin

contamination in foods and feeds. ARS, through its various research locations, can address the agricultural commodities that are critically and principally impacted by mycotoxin contamination; for example, cereal crops such as wheat, corn, ground and tree nuts, and their derived products such as baby foods. ARS will:

- Determine the genetic basis for enhanced resistance to Fusarium mycotoxin contamination of cereal crops such as wheat, barley, oats, and corn.
- Use bioinformatic resources to identify novel sources of resistance resources so that breeders can develop climate resistant varieties.
- Delineate the molecular basis of Aspergillus flavus resistance in corn.
- Identify novel regulatory genes and gene networks that play key roles in host plant resistance against the fungus to contribute in marker-assisted breeding.
    - Apply functional genomics and bioinformatic resources to identify metabolic pathways that contribute to resistance to A. flavus and aflatoxin production.
    - Develop transgenic corn lines for cereal production expressing antifungal capacities that inhibit A. flavus contamination.

- Establish the USDA ARS Comprehensive Climate Change "center of excellence" ($9,400,000). ARS will:
    - Create a climate change adaptation and mitigation modeling, data management and tool development project that serves as an ARS center of excellence to strengthen research across ARS and regional engagement of the Climate Hubs. This will increase the climate change mitigation and adaptation impact of ARS efforts such as LTAR, Breeding Insights, ARS Grand Challenges Synergies, and others.
    - Catalyze a data-driven and precision agriculture focus on climate change adaptation and mitigation.
    - Develop approaches to support and enhance precision agriculture efforts already underway at ARS as well as at new precision livestock management efforts at other locations.
    - Increase focus on climate-smart practices, data, tools and technologies that are relevant both regionally and nationally, and that can lead to GHG mitigation, producer participation in carbon and ecosystem markets, resilience to weather extremes, and adaptation to future climate.

- Establish ARS Advanced Climate Change Research Teams at each core ARS Climate Hub location to support regionally relevant locations and expand Hub impact ($5,375,000). ARS will:
    - Establish critical scientific and climate expertise at ARS sites within each region of the ARS Climate Hubs to research field-level climate change impacts.
    - Connect to the efforts of the USDA ARS climate research project created at each Climate Hub location and engage that Climate Hub to meet regional climate hub challenges faced by the USDA ARS hub communities.
    - Modernize the current wind and water erosion science and assessment with the most current climate science and future change scenarios to quantify how weather extremes may affect environmental quality and to incorporate risk assessment that can be used to plan response and remediation strategies.

- Enhance the LTAR Network to focus on climate change ($18,000,000). ARS will:
    - Create a coordinated climate change adaptation and mitigation focus within the LTAR network that builds on the current collaborations and common research framework to increase adoption of climate smart practices that can lead to GHG mitigation, producer participation in carbon and ecosystem markets, resilience to weather extremes, and adaptation to future climate.
    - Establish a LTAR program in California that will:
        - Create a four-pronged network that includes the two primary agricultural regions of California (the Central Valley and the Imperial Valley), the extensive network of California livestock grazing rangelands, and watersheds that supply much of the water for irrigated farmland.
        - Address five themes of sustainable agriculture: coping with climate change and environmental uncertainty on drought prone landscapes; Sustaining production in the face of human population growth; understanding and minimizing the impacts of environmental change on ecosystem services of rangelands; optimizing diverse management techniques and food production and ecosystems service market development; and developing water management systems in response to changing climates.

- Enhance the power of the USDA ARS Climate Hub engagement with their regions ($7,300,000)
    - Enhance Climate hub direct activities by strategic engagement of critical needs of each regional hub.

- Provide resources to promote and integrate climate hub programming and communication and synthesis needs.
- Strengthen and enhance the Climate Hub teams to support the Director and Coordinator and Liaison team members by creation of a Climate Hub "coordinating" scientist who facilitates the research to critically address pressing needs of the Hub and its community.

- National Agricultural Library Support for Climate Science Research ($4,600,000). ARS will:
  - Build capacity to improve Life-Cycle Assessment (LCA) in the agricultural economy and lead cross-government efforts to standardize LCA methods and data.
  - Align ARS research capacity with LCA assessment methods to support development of Environmental Product Declarations (EPDs)
  - Inform EPD development in the food and agriculture sectors in a scientifically grounded manner as U.S. states and the European Union adopt EPD protocols in public procurement and foreign trade.
  - Enhance existing NAL platforms to provide preservation and access to digital objects (i.e., data sets, literature, models, etc., and their associated metadata) to support climate research, including the Federal LCA program.
  - Build on initial ARS investments at NAL to provide access to USDA-funded research (scholarly literature and digital scientific research data) to also ensure long-term preservation and access to digital objects with enduring scientific value with appropriate context and at scale.
  - Support ARS scientists and USDA decision makers with systematic reviews and meta-analyses that provide deep insight and synthesis of scientific literature and other resources in support of climate research.
  - Support scientific integrity and research efficiency and effectiveness through evidence synthesis, as well as identify the new or potentially intersecting areas for research to facilitate the creation of new scientific knowledge in food and agriculture by ARS researchers.

- Develop new animal feeds that reduce methane emissions ($5,000,000). ARS will:
  - Develop feeds that meet the nutrient requirements of beef cattle throughout the production cycle while reducing methane emissions.

- Develop methods to reduce and mitigate the impacts of climate change on pests and pathogen of livestock, poultry, and aquaculture. ($13,800,000). ARS will:
  - Develop and implement strategies for reducing or eliminating the on-farm impacts of pest and pathogens on livestock, poultry, and aquaculture species due to climate change for trout, hybrid striped bass, salmon, eastern oyster and pacific oyster.
  - Implement strategies for reducing or eliminating the on-farm impacts of Vesicular Stomatitis Virus and stable flies resulting from climate change.
  - Develop countermeasures to Orbivirus of livestock, including bluetongue and epizootic hemorrhagic Fever.
  - Predict and control Vesicular Stomatitis Virus (VSV) in North America.
  - Develop Detection and Control Strategies for tick transmitted Bovine Babesiosis and anaplasmosis.
  - Evaluate germplasm for genetic resistance to pests and pathogens.

Partnership and Collaborations

External partners with ARS on this effort are extensive and will include those whose missions and needs contribute to Climate Science advances. These include USDA agencies such as ERS, NASS, NIFA, NRCS, Forest Service; other non-USDA federal agencies, such as EPA, DOE, NASA, NOAA, USGS, Health and Human Services; state and regional government agencies focused on climate science and its beneficial outcomes; a wide spectrum of Land Grant Universities, their faculty, students, and extension teams; ecosystem service market quantifiers and brokers; NGOs and industry, including but not limited to: Soil Health communities; Conservation Districts; The Nature Conservancy; Field to Market, and other private industries involved with animal and plant breeding, germplasm development, animal welfare, and with sustainability commitments that depend on improved Climate Science.

Precision Nutrition- Ag Science Center for Excellence for Nutrition and Diet (ASCEND)

ARS requests an increase of $15,000,000 and 33 FTEs for this crosscutting, multidisciplinary initiative. Funding increases for this initiative are located under the Livestock Production, Crop Production, and Human Nutrition sections of this document.

Need for Change

A major risk factor for cancer is poor health, which also increases the risk of chronic disease. Good nutrition choices can increase positive health outcomes. Research shows that a diet filled with a variety of vegetables, fruits, whole grains, beans, and other plant foods helps lower risk for many cancers. Agriculture is therefore fundamentally connected to many health outcomes, including cancer. Food can prevent cancer, where other interventions treat or control cancer. Consequently, a program that seeks to reduce the burden of chronic disease and cancer in all Americans must partner with agriculture and human nutrition research. Precision nutrition seeks to establish nutritional requirements and inform programs and policies that are inclusive/representative of all Americans, especially increasing data for subpopulations. Subpopulations include those delineated by age, sex, physiologic status (e.g., pregnancy), ethnicity, health, genetics, epigenetics, and activity level. The USDA human nutrition research program supports cancer prevention goals by bringing to the table expertise and facilities to conduct carefully controlled human nutrition studies. USDA human nutrition research programs have a unique focus on food-based strategies for health promotion and disease prevention, including cancer. The Cancer Moonshot is a priority of the White House and has a national goal to cut the death rate from cancer by at least 50 percent over the next 25 years. Advancing precision nutrition can contribute to the Cancer Moonshot by providing a research base for helping specific populations achieve their healthiest outcomes through food.

Means to Achieve Change

- Food Intake and Nutrient Status in Human Health ($3,650,000). ARS will:
  - Develop and validate innovative methods of determining food intake in subpopulations.
  - Develop innovative methods of determining nutrient status in subpopulations.
  - Elucidate the relationship between human behavior and diet selection/attitudes toward healthy diets/barriers to consuming healthy diets.
  - Develop predictive modelling systems to relate food intake, nutrient status and health outcomes.
- Genetics, Epigenetics and the Microbiome in Human Nutritional and Health Status ($1,900,000). ARS will:
  - Delineate the impact of genetics and epigenetics on nutritional status and response to diet.
  - Delineate the impact of the microbiome on nutritional and health status.
- Impact of Diet on Early Indicators of Long-Term Health ($7,450,000). ARS will:
  - Conduct human studies to test dietary patterns in multiple locations and subpopulation and determine the impact of diet on selected biomarkers in individual subpopulations.
  - Determine the relationship between agricultural production and the nutritional composition of crops; analyze foods, develop publicly accessible databases and disseminate information.
- Impact of Environmental Change on Human Nutrition in Crops ($2,000,000). ARS will:
  - Determine the impact of environmental changes on the nutritional composition of crops; analyze foods, develop publicly-accessible databases and disseminate information.
  - Determine the relationship between genetics, environment and management on the uptake of potentially dangerous metals by plants.

Partnership and Collaborations

This initiative will require partnership and collaboration with each of the six HNRCs and the Institute for Advancing Health through Agriculture and the Foods Systems Research Unit. Outside collaborations will be developed with NIH, the National Academies, Robert Woods-Johnson, Historically Black Colleges and Universities (HBCUs), Native American tribal councils, tribal colleges, community colleges with predominately Native American populations, state colleges and community colleges with predominately Hispanic populations, investigational cohorts and other federal programs focusing on rural and urban poor.

PROPOSED LEGISLATION

Program: Experienced Services Program, 16 U.S.C. 3851

Current legislative authority to be amended: 2024 Budget Request – Salaries and Expenses

Proposed legislative language (general provision): *Provided further*, That appropriations hereunder shall be available for the Experienced Services Program at ARS (16 U.S.C. 3851)

Proposal: The reason for this proposed legislative language is that funding has to be authorized, in accordance with the authorizing legislation at 16 U.S.C. 3851(c) 3.

Rationale: The proposed change will achieve the Secretary of Agriculture's requirements set forth in 16 U.S.C. 3851, which specifies that the Secretary shall establish an Experienced Services Program (program) to enter into agreements on behalf of the Agricultural Research Service (ARS) with nonprofit private agencies and organizations eligible to receive Cooperative Agreements under the Community Service Senior Opportunities Act (42 U.S.C. 3056 et seq.) Participants for the program are to provide technical, professional, or administrative services, as applicable, to support the Research Education and Economics (REE) Mission Area, including ARS, and such services include: supporting agricultural research and information; advancing scientific knowledge relating to agriculture; enhancing access to agricultural information; providing statistical information and research results to farmers, ranchers, agribusiness, and public officials; and assisting research, education, and extension programs in land-grant colleges and universities (as defined in section 3103 of Title 7).

Goal: To use ARS Salaries and Expenses account for the Experienced Services Program

Table ARS-16. Change in Funding Due to Additional Private Investment (thousands of dollars)

Item	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	10 Year Total
Budget Authority	0	0	0	0	0	0	0	0	0	0	0
Outlays	0	0	0	0	0	0	0	0	0	0	0

GEOGRAPHIC BREAKDOWN OF OBLIGATIONS AND FTE

Table ARS-17. Geographic Breakdown of Obligations and FTE (thousands of dollars, FTE)

State/Territory/Country	2021 Actual	FTE	2022 Actual	FTE	2023 Estimated[4]	FTE	2024 Estimated	FTE
Alabama								
Auburn	$18,962	39	$21,462	44	$24,020	44	$24,297	44
Total	18,962	39	21,462	44	24,020	44	24,297	44
Arizona								
Maricopa	10,021	62	10,778	58	11,933	58	17,136	82
Tucson	6,717	47	6,411	45	6,608	45	8,557	51
Total	16,738	109	17,189	103	18,541	103	25,693	133
Arkansas								
Booneville	3,912	26	4,310	28	4,011	28	3,228	28
Fayetteville	1,995	15	3,234	13	2,592	13	4,474	16
Jonesboro	1,326	9	1,320	10	1,457	10	2,600	16
Little Rock	9,504	-	10,413	3	10,454	3	12,183	9
Stuttgart	9,330	55	12,196	52	8,357	52	10,846	61
Total	26,067	105	31,473	106	26,871	106	33,331	130
California								
Albany	38,177	173	40,148	166	40,958	166	54,291	214
Davis	17,762	77	20,209	76	19,308	76	25,637	91
Parlier	12,449	81	11,833	76	12,963	76	15,602	85
Riverside	5,364	28	6,010	31	6,000	31	6,195	31
Salinas	7,503	49	8,032	47	7,209	47	8,315	50
Total	81,255	408	86,232	396	86,438	396	110,040	471
Colorado								
Akron	1,808	12	1,788	9	-	-	-	-
Fort Collins	22,127	139	21,192	135	23,634	144	28,698	156
Total	23,935	151	22,980	144	23,634	144	28,698	156
Delaware								
Newark	2,207	14	2,657	14	2,062	14	2,960	17
Total	2,207	14	2,657	14	2,062	14	2,960	17
District of Columbia								
National Arboretum	14,843	59	12,684	60	14,399	60	14,777	60
Headquarters Federal Administration[5]	169,767	469	182,003	481	166,591	481	156,006	488
Total	184,610	528	194,687	541	180,990	541	170,783	547
Florida								
Canal Point	3,685	28	3,926	32	4,144	32	4,346	32
Fort Lauderdale	3,346	28	3,071	31	2,514	31	2,709	31
Fort Pierce	18,281	95	18,072	91	18,153	91	21,980	106
Gainesville	11,665	80	11,392	78	12,344	78	13,577	81
Miami	5,537	27	5,614	30	6,042	30	6,231	30
Total	42,514	258	42,075	262	43,197	262	48,843	280
Georgia								
Athens	30,525	141	37,922	149	36,899	149	40,539	170
Byron	4,773	31	7,313	29	7,954	29	8,137	29
Dawson	4,665	26	5,583	27	6,199	27	6,369	27
Griffin	2,429	15	2,615	16	2,479	16	2,580	16
Tifton	10,361	76	11,408	73	11,199	73	15,732	97
Total	52,753	289	64,841	294	64,730	294	73,357	339

[4] Funding allocations for priority programs in 2023 are not yet attributed by geographic breakdown and are reflected in Extramural and Funds Administered from Headquarters-Held.

[5] Federal Administration contains supplemental funding for kelp and seagrass in 2021, 2022 and 2023.

State/Territory/Country	2021 Actual	FTE	2022 Actual	FTE	2023 Estimated[4]	FTE	2024 Estimated	FTE
Hawaii								
Hilo	13,009	54	15,138	68	15,251	68	19,257	83
Total	13,009	54	15,138	68	15,251	68	19,257	83
Idaho								
Aberdeen	7,567	36	8,036	36	8,246	36	8,185	36
Boise	2,751	28	2,805	24	2,959	24	4,595	30
Dubois	2,557	10	2,974	13	3,083	13	3,165	13
Kimberly	5,457	41	5,622	41	5,735	41	5,993	41
Total	18,332	115	19,437	114	20,023	114	21,938	120
Illinois								
Peoria	32,095	157	32,023	158	33,789	158	59,175	263
Urbana	5,738	34	7,660	33	5,801	33	7,674	39
Total	37,833	191	39,683	191	39,590	191	66,849	302
Indiana								
West Lafayette	7,820	55	8,688	52	8,174	52	10,492	61
Total	7,820	55	8,688	52	8,174	52	10,492	61
Iowa								
Ames	53,895	328	59,329	324	60,790	324	64,577	334
Total	53,895	328	59,329	324	60,790	324	64,577	334
Kansas								
Manhattan	109,552	221	144,760	261	161,888	261	178,744	261
Total	109,552	221	144,760	261	161,888	261	178,744	261
Kentucky								
Bowling Green	2,671	16	2,961	15	2,689	15	2,379	15
Lexington	4,257	11	4,494	12	4,448	34	3,854	34
Total	6,928	27	7,455	27	7,137	49	6,233	49
Louisiana								
Baton Rouge	2,810	22	2,685	17	3,177	17	3,284	17
Houma	5,285	39	5,239	41	5,672	41	5,931	41
New Orleans	20,906	100	23,543	91	24,530	91	37,581	139
Total	29,001	161	31,467	149	33,379	149	46,796	197
Maine								
Orono	5,703	20	10,653	25	7,680	25	8,648	28
Total	5,703	20	10,653	25	7,680	25	8,648	28
Maryland								
Beltsville	122,340	517	122,987	510	127,429	510	139,200	540
National Ag Library	31,721	74	31,975	72	27,975	72	33,467	92
Frederick	5,898	29	6,898	30	6,621	30	6,810	30
Total	159,959	620	161,860	612	162,025	612	179,477	662
Massachusetts								
Boston	16,352	8	16,657	8	16,170	8	17,862	11
Total	16,352	8	16,657	8	16,170	8	17,862	11
Michigan								
East Lansing	2,292	8	2,262	12	2,477	12	2,552	12
Total	2,292	8	2,262	12	2,477	12	2,552	12
Minnesota								
Morris	2,701	16	4,455	16	3,036	16	4,442	25
St. Paul	11,250	51	12,699	53	12,549	53	13,423	56
Total	13,951	67	17,154	69	15,585	69	17,865	81
Mississippi								
Mississippi State	17,131	62	18,145	62	23,865	62	24,256	62
Oxford	14,107	61	15,241	65	16,081	65	13,824	68
Poplarville	5,737	29	5,825	30	6,022	30	5,497	30
Stoneville	50,508	208	49,307	215	54,953	215	50,806	215
Total	87,483	360	88,518	372	100,921	372	94,383	375

State/Territory/Country	2021 Actual	FTE	2022 Actual	FTE	2023 Estimated[4]	FTE	2024 Estimated	FTE
Missouri								
Columbia	11,029	55	12,967	60	13,148	60	14,184	63
Total	11,029	55	12,967	60	13,148	60	14,184	63
Montana								
Miles City	4,786	25	5,189	24	4,754	24	4,474	24
Sidney	4,991	41	5,690	41	5,414	41	8,711	47
Total	9,777	66	10,879	65	10,168	65	13,185	71
Nebraska								
Clay Center	23,089	105	23,433	107	24,139	107	28,414	122
Lincoln	7,571	51	8,390	50	8,949	50	23,851	110
Total	30,660	156	31,823	157	33,088	157	52,265	232
Nevada								
Reno	2,422	13	2,337	12	2,343	12	3,769	15
Total	2,422	13	2,337	12	2,343	12	3,769	15
New Mexico								
Las Cruces	7,399	41	11,595	46	8,097	46	10,367	52
Total	7,399	41	11,595	46	8,097	46	10,367	52
New York								
Geneva	5,569	29	7,459	30	7,592	30	7,782	30
Ithaca	18,739	51	16,116	52	13,412	52	14,361	55
Orient Point	8,483	23	7,436	22	-	-	-	-
Total	32,791	103	31,011	104	21,004	82	22,143	85
North Carolina								
Raleigh	12,384	76	13,385	72	13,004	72	13,652	75
Total	12,384	76	13,385	72	13,004	72	13,652	75
North Dakota								
Fargo	27,652	99	30,718	108	31,612	108	32,878	111
Grand Forks	8,914	33	9,097	33	10,075	33	12,219	39
Mandan	6,090	33	6,944	37	6,973	37	7,144	40
Total	42,656	165	46,759	178	48,660	178	52,241	190
Ohio								
Columbus	1,902	17	1,826	18	1,961	18	2,885	21
Wooster	9,859	49	9,433	50	8,137	50	7,970	50
Total	11,761	66	11,259	68	10,098	68	10,855	71
Oklahoma								
El Reno	6,530	40	6,687	37	15,382	77	19,807	95
Stillwater	5,502	26	6,421	25	-	-	-	-
Woodward	2,475	16	2,058	15	-	-	-	-
Total	14,507	82	15,166	77	15,382	77	19,807	95
Oregon								
Burns	4,762	27	5,120	32	5,402	32	5,154	32
Corvallis	24,466	95	25,764	106	20,389	94	21,803	97
Newport	-	-	-	-	5,465	12	5,220	16
Pendleton	4,734	14	4,850	16	2,704	16	2,780	12
Total	33,962	136	35,734	154	33,960	154	34,957	157
Pennsylvania								
University Park	7,624	35	7,047	36	7,049	36	8,086	39
Wyndmoor	31,425	129	34,220	140	33,625	140	40,702	170
Total	39,049	164	41,267	176	40,674	176	48,788	209
South Carolina								
Charleston	9,946	35	10,982	34	11,299	34	11,513	34
Florence	3,959	25	4,106	24	4,427	24	4,578	24
Total	13,905	60	15,088	58	15,726	58	16,091	58

State/Territory/Country	2021 Actual	FTE	2022 Actual	FTE	2023 Estimated[4]	FTE	2024 Estimated	FTE
South Dakota								
Brookings	3,126	22	3,313	24	3,496	24	3,647	24
Total	3,126	22	3,313	24	3,496	24	3,647	24
Texas								
Bushland	6,983	35	6,905	37	7,483	37	7,197	40
College Station[6]	30,980	71	31,307	73	15,460	73	15,920	73
Houston	16,389	7	16,650	7	16,024	7	19,129	19
Kerrville	10,323	36	12,021	40	12,068	40	13,131	40
Lubbock	10,037	66	9,933	65	10,330	65	11,509	68
Temple	4,746	32	4,645	34	4,786	34	5,811	37
Total	79,458	247	81,461	256	66,151	256	72,697	277
Utah								
Logan	10,050	70	10,175	72	10,510	72	10,905	72
Total	10,050	70	10,175	72	10,510	72	10,905	72
Vermont								
Burlington	9,664	1	8,851	4	9,905	4	9,930	4
Total	9,664	1	8,851	4	9,905	4	9,930	4
Washington								
Pullman	23,140	115	25,780	114	26,994	114	37,276	138
Wapato	6,871	46	8,712	48	7,834	48	8,137	48
Wenatchee	2,898	15	3,666	19	3,440	19	3,560	19
Total	32,909	176	38,158	181	38,268	181	48,973	205
West Virginia								
Kearneysville	9,609	40	9,295	44	9,971	44	8,081	44
Leetown	8,859	30	9,298	32	9,769	32	7,986	35
Total	18,468	70	18,593	76	19,740	76	16,067	79
Wisconsin								
Madison	21,707	106	30,520	108	30,757	108	30,754	117
Total	21,707	106	30,520	108	30,757	108	30,754	117
Puerto Rico								
Mayaguez	3,306	33	3,549	32	3,655	32	4,217	32
Total	3,306	33	3,549	32	3,655	32	4,217	32
Other Countries								
France, Montpellier	3,967	1	4,243	1	3,125	1	3,132	1
Total	3,967	1	4,243	1	3,125	1	3,132	1
Extramural & Funds Administered from Headquarters Held Funds	34,151	-	39,640	-	258,640	-	145,446	-
Repair & Maintenance of Facilities	20,144	-	26,144	-	26,556	-	26,556	-
Total Obligations	1,510,403	6,045	1,650,574	6,169	1,857,728	6,169	1,938,303	6,878
Lapsing Balances	3,530	-	3,212	-	-	-	-	-
Bal. Available, EOY	88,406	-	112,949	-	-	-	-	-
Total, Available	1,602,339	6,045	1,766,735	6,169	1,857,728	6,169	1,938,303	6,878

[6] Human Nutrition mandatory funding of $20M is reflected in 2021 and 2022.

CLASSIFICATION BY OBJECTS

Table ARS-18. Classification by Objects (thousands of dollars)

Item No.	Item	2021 Actual[7,8]	2022 Actual[7,8,9]	2023 Estimated[7]	2024 Estimated
	Personnel Compensation:				
	Washington D.C.	$37,579	$48,494	$50,513	$53,064
	Personnel Compensation, Field	465,218	476,601	496,438	521,513
11	Total personnel compensation	502,797	525,096	546,951	574,577
12	Personal benefits	195,352	208,218	218,123	229,407
13.0	Benefits for former personnel	395	539	-	-
	Total, personnel comp. and benefits	698,544	733,852	765,073	803,984
	Other Objects:				
21.0	Travel and transportation of persons	793	3,745	4,461	4,631
22.0	Transportation of things	821	533	634	659
23.1	Rental payments to GSA	4,717	4,648	4,717	4,095
23.2	Rental payments to others	2,067	1,381	1,645	1,708
23.3	Communications, utilities, and misc. charges	42,192	48,918	59,096	62,151
24.0	Printing and reproduction	3,592	1,868	2,225	2,310
25.1	Advisory and assistance services	1,315	48,866	58,214	60,434
25.2	Other services from non-Federal sources	24,043	39,431	46,975	48,766
25.3	Other goods and services from Federal sources	6,196	11,900	14,176	14,717
25.4	Operation and maintenance of facilities	50,577	14,509	17,284	17,943
25.5	Research and development contracts	391,501	421,859	503,121	522,306
25.6	Medical Care	204	454	540	561
25.7	Operation and maintenance of equipment	31,058	50,736	60,442	62,747
25.8	Subsistence and support of persons	1	-	-	-
26.0	Supplies and materials	85,347	101,022	120,348	124,937
31.0	Equipment	85,026	81,522	97,118	100,821
32.0	Land and Structures	37,437	47,183	56,209	58,352
41.0	Grants, subsidies, and contributions	44,972	38,150	45,448	47,181
	Total, Other Objects	811,859	916,722	1,092,655	1,134,319
99.9	Total, new obligations	1,510,403	1,650,574	1,857,728	1,938,303
	DHS Building Security Payments (included in 25.3)	$184	$244	$244	$244
	Information Technology Investments:				
	Major Investment Totals	-	-	9,769	9,769
25.2	Mission Area Non-Major Investment Totals	45,601	41,401	54,800	54,800
	Mission Area Standard Investment Totals	12,008	14,768	-	-
25.3	Mission Area WCF Transfers	33,342	39,232	43,424	46,332
	Position Data:				
	Average Salary (dollars), ES Position	$148,868	$177,912	$185,317	$177,500
	Average Salary (dollars), GS Position	$77,202	$78,463	$81,729	$77,000
	Average Grade, GS Position	10.7	10.8	10.8	10.8

[7] Supplemental funding for kelp and seagrass is reflected in 2021, 2022, and 2023.
[8] Human Nutrition mandatory funding of $20M is reflected in 2021 and 2022.
[9] Large differences in funding between 2021 and 2022 are due to the Budget Object Class restructuring within USDA.

STATUS OF PROGRAMS

The Agricultural Research Service (ARS) is the U.S. Department of Agriculture's chief scientific in-house research agency. Our mission is to deliver scientific solutions to national and global agricultural challenges. ARS' major research programs -- New Products/Product Quality/Value Added; Livestock/Crop Production; Food Safety; Livestock/Crop Protection; Human Nutrition; and Environmental Stewardship -- address the Department's goals and priorities. A brief summary of the agency's selected 2022 accomplishments and current activities, including the National Agricultural Library, are detailed below.

Program Evaluations

In 2022, ARS conducted retrospective reviews of its Human Nutrition Program; Grass, Forage and Rangeland Agroecosystems Program; and Sustainable Ag Systems Program. Overall, the programs were found to have had high impact (i.e., significant benefit or influence). The programs were evaluated by experts who represented government, private industry, customer/stakeholder groups, and nonprofits. Performance was evaluated based on the quality of the research leading to actual impact, or progress toward anticipated benefits. The panel of experts provided recommendations that ARS managers can use in making future management decisions.

New Products/Product Quality/Value Added

Current Activities:

ARS' New Products/Product Quality/Value Added research program is directed toward: Improving the efficiency and reducing the cost for the conversion of agricultural products into biobased products and biofuels; developing new and improved products for domestic and foreign markets; and providing higher quality, healthy foods.

Selected Examples of Recent Progress:

USDA-certified biobased personal care ingredients from renewable vegetable oils. New, economically viable, agri-based materials must be developed to sustain a bioeconomy that includes natural, renewable products to replace petroleum-based products. For example, ultraviolet absorbents used in personal care products such as sunscreen are derived from petroleum-based products and are potentially associated with adverse environmental and health effects. ARS researchers in Peoria, Illinois, developed biobased methods to convert vegetable oils and compounds—which are found in all plants and are particularly abundant in corn and wheat bran—into products for the personal care market. The agri-based products recently earned the USDA Certified Biobased Product label and were shown to perform equally well, if not better, as their petroleum-based counterparts. These biobased commercial ultraviolet absorbents and antioxidants make up part of a $60-million market in the United States and European Union for personal care products made with natural ingredients, a market that is projected to grow 5 percent annually. This research created new and expanded market opportunities for agricultural commodities and combats climate change by reducing dependence on petroleum-based chemicals.

Self-neutralizing antibiotics to treat bovine mastitis. Bovine mastitis is caused by an infection in the milk ducts of dairy cattle and results in significant losses to the industry, because even when cattle are successfully treated, their milk and meat cannot be marketed for consumption. Current treatments use a significant amount of antibiotics, along with high doses of iodine, copper sulfate, and formalin. ARS researchers in Albany, California, developed a novel 'reversible antibiotic', or biocide, derived from natural products that has demonstrated excellent efficacy against pathogens that cause mastitis. When formulated in a mastitis balm, this reversible biocide dramatically reversed the onset of mastitis and was as effective as high doses of iodine, the industry standard. Further research showed that the diluted biocide reverted to benign, farm-safe ingredients, which minimizes the development of antibiotic resistance associated with a residual accumulation of unwanted chemicals.

Livestock Production

Current Activities:

ARS' Livestock Production research program is directed toward fostering an abundant, safe, nutritionally wholesome, and competitively priced supply of animal products produced in a viable, competitive, and sustainable animal agriculture sector of the U.S. economy. This is accomplished by: safeguarding and utilizing animal genetic resources, associated genetic and genomic databases, and bioinformatic tools; developing a basic understanding of food animal physiology to address priority issues related to animal production, animal well-being, and product

quality and healthfulness; and developing information, best management practices, novel and innovative tools, and technologies that improve animal production systems, enhance human health, and ensure domestic food security. The research is heavily focused on the development and application of genomics technologies to increase the efficiency and product quality of beef, dairy, swine, poultry, aquaculture, and sheep systems. Areas of emphasis include increasing the efficiency of nutrient utilization; increasing animal well-being and reducing stress in production systems; increasing reproductive rates and breeding animal longevity; developing and evaluating non-traditional production systems (e.g., organic and natural); and evaluating and conserving animal genetic resources.

Selected Examples of Recent Progress:

New methodology results in unprecedented microbiome findings. ARS scientists in Madison, Wisconsin; Clay Center, Nebraska; and Beltsville, Maryland, led studies conducted with researchers from the Netherlands, Israel, Russia, and industry that resulted in a revolutionary new microbiome DNA screening method that revealed previously indistinguishable differences between microorganism strains within the livestock microbiome. ARS scientists worked with bioinformaticians at Pacific Biosciences to develop MAGPhase, an open-source software tool that automates genetic sequence variant discovery and validation in the microbiome. The improved accuracy enabled the MAGPhase algorithm to identify clusters of sequence variants that represent divergent strains and types of microbes within the microbiome that may harbor antibiotic resistance or pathogenesis genes. The team assembled 428 complete genomes of microbes obtained from a GI tract sample of a single individual, a record for a scientific field that previously celebrated the assembly of 10 genomes from one individual. These innovations created a new benchmark for microbiome studies and are serving as the foundation for current applications and new surveys in human clinical, and agricultural microbial systems.

Advanced bovine genome assembly enhances genetic merit prediction. Breeding better cattle through genomics enhanced, informative genome knowledge from multiple, diverse breeds of cattle. Led by ARS scientists in Beltsville, Maryland; Madison, Wisconsin; and Clay Center, Nebraska, the Bovine Pangenome Consortium employed genomic data from two parents and an offspring to develop greatly improved genome assemblies within breeds. The Consortium published 11 breed-specific reference assemblies in noted journals, characterized breeds with global economic impact, and noted genetic variation. Collectively, these genome assemblies rival the most complete and accurate vertebrate genomes ever produced. Scientists have already used these assemblies to identify novel trait-associated variations and to increase accuracy of genetic merit prediction and selection for important production traits in target populations and the farm level. The Bovine Pangenome Consortium has expanded to more than 90 members at 58 institutions in 27 countries.

Crop Production

Current Activities:

ARS' Crop Production research program focuses on developing and improving ways to reduce crop losses while protecting and ensuring a safe and affordable food supply. The program concentrates on production strategies that are environmentally friendly, safe to consumers, and compatible with sustainable and profitable crop production systems. Research activities are directed at safeguarding and utilizing plant genetic resources and their associated genetic, genomic, and bioinformatic databases that facilitate selection of varieties and/or germplasm with significantly improved traits. Research activities attempt to minimize the impacts of crop pests while maintaining healthy crops and safe commodities that can be sold in markets throughout the world. The agency is conducting research to discover and exploit naturally occurring and engineered genetic mechanisms for plant pest control, develop agronomic germplasm with durable defensive traits, and transfer genetic resources for commercial use. ARS provides taxonomic information on invasive species that strengthens prevention, aids in detection/identification, and increases control through tactics that restore habitats and biological diversity.

Selected Examples of Recent Progress:

Deciphering the gene controlling the protein content locus in soybean. Seed protein content in U.S. commercial soybean cultivars released over the past several decades has gradually decreased to levels below the threshold required in the animal feed industry, which impacts competitiveness of U.S. soybean in the export market. ARS scientists in Beltsville, Maryland, and Columbia, Missouri, collaborated with university scientists to identify the location of the key gene regulating soybean seed protein content and found an insertion in the gene, which they named POWER1, was responsible for the negative relationship that reduced protein and increased seed weight/oil content in soybean during breeding. They also found that when the gene lacked the insertion, soybean protein content was consistently higher than normal. The results provide the foundation to further understand the molecular

mechanism underlying the trait and to design new strategies for efficiently improving soybean seed quality through genome editing and molecular breeding approaches. These results also increase the chances of simultaneously improving soybean seed protein, oil, and yield without negative impacts on any of these economically important traits.

Cryotherapy eradicates pathogens from apple genetic resources. Apple stem grooving virus and apple chlorotic leaf spot virus are serious, prevalent, difficult to eradicate, and threaten the $3+ billion (annual farmgate value) U.S. apple industry. ARS scientists at the National Plant Germplasm System (NPGS) genebank in Fort Collins, Colorado, and NPGS genebank in Geneva, New York, collaborated with the Animal Plant Health Inspection Service (APHIS) and University of California-Davis on ways to eliminate these viruses and the apple hammerhead viroid. They applied a combination of thermotherapy and cryotherapy to eliminate the viruses and viroid from shoot tips of four apple cultivars in the ARS-Cornell-Geneva apple rootstock breeding program. Those methods now serve to eliminate pathogens from commercial apple rootstocks as well as apple genetic resources introduced into the United States. The results of this research have enabled the expansion of the apple genetic resource collection, the evaluation of traits in disease-free apple germplasm, and most importantly, large-scale nursery propagation of apple trees in regions where these viruses are found. Those methods produced virus-cleaned apple rootstocks that have been transferred to micropropagation nurseries to support the U.S. apple industry.

Food Safety

Current Activities:

ARS' Food Safety research program is designed to yield science-based knowledge on the safe production, storage, processing, and handling of plant and animal products, and on the detection and control of pathogenic bacteria and fungi, parasites, chemical contaminants, and plant toxins. All of ARS' research activities involve a high degree of cooperation and collaboration with USDA's Research, Education, and Economics agencies, as well as with the FSIS, APHIS, FDA, CDC, DHS, and the EPA. The agency also collaborates in international research programs to address and resolve global food safety issues. Specific research efforts are directed toward developing new technologies that assist ARS stakeholders and customers, including regulatory agencies, industry, and commodity and consumer organizations in detecting, identifying, and controlling foodborne diseases that affect human health.

Selected Examples of Recent Progress:

Seasonality of E. coli O157:H7 survival and microbiome in cold-stored fresh-cut lettuce. Outbreaks of *Escherichia coli* O157:H7 (E. coli O157) foodborne illness linked to romaine lettuce grown on California's Central West Coast are more prevalent in the Fall season. The cause of this seasonal trend is unknown and is of critical concern to regulatory agencies, public health agencies, and the produce industry. These outbreaks have greatly impacted the California lettuce industry, which is valued at more than $2 billion annually. ARS researchers in Albany and Salinas, California, collaborated with FDA scientists and found two factors associated with the outbreaks: E. coli O157 survives better on cold-stored fresh-cut romaine harvested in the Fall rather than in the Spring, and the lettuce microbiome itself has seasonal characteristics. It is not clear how the seasonal properties of lettuce and/or its microbiome factor into the seasonal behavior of E. coli O157 in lettuce, but the results indicate that producers should be more cautious in the Fall season. These findings also open a new branch of study for identifying plant traits and microbiome components that may be used in plant breeding or manipulated to suppress enhanced E. coli O157 survival.

Wireless, high-resolution, time-temperature measurement by low-cost tags. Ready-to-eat foods in retail shelves may be subject to temperature fluctuations due to opening and shutting of storage cases. Continuous temperature monitoring is essential for food safety assessment and to ensure that these foods are not harmed by these fluctuations. ARS-funded scientists at the Center for Food Safety Engineering in West Lafayette, Indiana, designed and validated a high-resolution and high-sensitivity temperature sensor system that leverages wireless measurement technologies to monitor individual products through low-cost tags attached to their packaging. The tag structure is optimized for fabrication with low-cost techniques, such as screen and ink-jet printing, to facilitate integration into the food packaging. Implementing this system to tag the packaging of perishable food items would enable continuous monitoring for harmful temperature fluctuations and allow potentially damaged or dangerous items to be removed from retail food outlets before they are purchased.

Livestock Protection

Current Activities:

ARS' Livestock Protection research program is directed at protecting and ensuring the safety of the Nation's agriculture and food supply through improved disease detection, prevention, control, and treatment. Basic and applied research approaches are used to solve animal health problems of high national priority. Emphasis is given to methods and procedures to control animal diseases through the discovery and development of diagnostics, vaccines, biotherapeutics, animal genomics applications, disease management systems, animal disease models, and farm biosecurity measures. The research program has the following strategic objectives: establish ARS laboratories into a fluid, highly effective research network to maximize use of core competencies and resources; use specialized high containment facilities to study zoonotic and emerging diseases; develop an integrated animal and microbial genomics research program; establish core competencies in bovine, swine, ovine, and avian immunology; launch a biotherapeutic discovery program providing alternatives to animal drugs; build a technology driven vaccine and diagnostic discovery research program; develop core competencies in field epidemiology and predictive biology; establish a best-in-class training center for our Nation's veterinarians and scientists; and develop a model technology transfer program to achieve the full impact of ARS research discoveries. ARS' animal research program includes: biodefense research, animal genomics and immunology, zoonotic diseases, respiratory diseases, reproductive and neonatal diseases, enteric diseases, parasitic diseases, and transmissible spongiform encephalopathies.

Selected Examples of Recent Progress:

Development and approval of the first African swine fever vaccine. African swine fever (ASF) is a devastating and highly lethal disease of pigs for which there were no commercial vaccines. ARS scientists at the Plum Island Animal Disease Center (PIADC) successfully developed innovative genetic engineering techniques that enabled the discovery of a live attenuated vaccine called ASFV-G-dI177L, which was shown to be fully protective and safe in experimental clinical studies at PIADC. The vaccine was subsequently transferred in June 2020 to the National Veterinary Joint Stock Company (NAVETCO) in Vietnam through a research agreement. ARS scientists working in partnership with NAVETCO successfully tested, in record time, the vaccine against locally circulating Vietnamese ASF virus field strains in pigs of European and Asian genetic background. NAVETCO also showed that ASFV-G-dI177L is genetically stable, remains attenuated, and has no toxicity when inoculated in domestic pigs. NAVETCO received a certificate of Marketing Authorization from the Vietnamese Department of Agriculture and Rural Development on June 3, 2022, making ASFV-G-dI177L the first ASFV vaccine ever approved for commercial use. The vaccine is currently being deployed under control field conditions in swine farms in Vietnam to further evaluate its safety and efficacy characteristics. If successful, Vietnamese authorities will develop plans to integrate ASF vaccination in their National ASF Control Program.

Antibacterial activity and stability of a new antimicrobial peptide. The increasing prevalence of antibiotic resistance among pathogenic microbes highlights the urgent need for the identification and development of alternatives to antibiotics. Antimicrobial peptides (AMPs) are highly effective against microbial pathogens that cause diseases in humans and animals, but they are sensitive to proteases and kidney clearance. ARS scientists in Ames, Iowa, developed a stable small peptide and tested it for resistance against degradation, stability, toxicity, and *in vitro* and *in vivo* antibacterial activities against *Histophilus somni*, one of the bacterial organisms causing respiratory diseases in cattle. The peptide was able to kill *H. somni* very efficiently. These results demonstrate the possible use of an alternative treatment for controlling bacteria that cause respiratory diseases in cattle.

Crop Protection

Current Activities:

ARS' Crop Protection research program is directed to protect crops from insect and disease loss through research to understand pest and disease transmission mechanisms, and to identify and apply new technologies that increase our understanding of virulence factors and host defense mechanisms. The program's research priorities include: identification of genes that convey virulence traits in pathogens and pests; factors that modulate infectivity, gene functions, and mechanisms; genetic profiles that provide specified levels of disease and insect resistance under field conditions; and mechanisms that reduce the spread of pests and infectious diseases. ARS is developing new knowledge and integrated pest management approaches to control pest and disease outbreaks as they occur. Its research will improve the knowledge and understanding of the ecology, physiology, epidemiology, and molecular biology of emerging diseases and pests. This knowledge will be incorporated into pest risk assessments and

management strategies to minimize chemical inputs and increase production. Strategies and approaches will be available to producers to control emerging crop diseases and pest outbreaks and address quarantine issues.

Selected Examples of Recent Progress:

Precipitation changes amplify how temperature affects aphid dispersal. Rising temperatures and precipitation in some of the world's most productive agroecosystems have the potential to greatly alter insect herbivore-plant interactions in ecologically and economically significant ways. While there is growing evidence that early flights of aphids are advancing in response to warming winters, little is known about how the many dimensions of aphid phenology will respond to the combined effects of changing temperature and precipitation. ARS researchers in Urbana, Illinois, and University of Illinois and University of Georgia collaborators studied more than 500,000 of three agriculturally important aphid species collected from the U.S. Midwest Suction Trap Network between 2005 and 2019 to determine how aphid species phenology varied with seasonal temperature and precipitation. Their findings, published in the peer-reviewed journal *Ecological Applications,* determined that climate change projections with climate-aphid phenology models predicted shifts in aphid phenology by 2050 and 2080. Overall, the climate-aphid models predict that changes in climate will extend the period of crop colonization for three aphid species, possibly leading to increased damage to soybean crops and increased spread.

Plant symbiont systems deliver crop protectants. A major challenge in plant disease control is delivering protectants to the plant vascular system to control pathogens and the insects that transmit them via feeding on plant vessels. A plant symbiont-based system (Symbiont™) developed by ARS researchers promises to be a cost-effective method for delivering biological therapeutic molecules that control citrus greening disease (Huanglongbing, or HLB) devastating the citrus industry in Florida. Traditionally, scientists use *Agrobacterium*, a common bacterium, to modify plant genes to generate transgenic plants that enable farmers to protect their crops against harmful insect pests and pathogens. However, transgenic plant adoption in agriculture has been limited, largely due to concerns over potential environmental impacts and the cost and time associated with environmental impact studies needed for regulatory approval of transgenic crops. ARS researchers in Fort Pierce, Florida, and Ithaca, New York, worked with a small Florida agribusiness to develop a method that, for the first time, used *Agrobacterium* to engineer independently growing plant cells, referred to as 'Symbionts', to produce molecules that can modify plant traits. When transplanted onto a plant, these engineered symbionts provide real-time delivery of desirable plant traits, eliminating the need to make the plant transgenic. Their results demonstrated that symbionts on citrus trees lasted more than 2 years without producing harmful effects to the trees, and improved symbiont transplantation and inoculation methods to produce more uniform and rapid growing symbionts. The results show that the Symbiont system has potential to efficiently deliver therapeutic molecules to the difficult-to-reach vascular system where it is needed most for controlling vectored plant diseases.

Human Nutrition

Current Activities:

Maintenance of health throughout the lifespan along with prevention of obesity and chronic diseases via food-based recommendations are the major emphases of ARS' Human Nutrition research program. These health-related goals are based on the knowledge that deficiency diseases are no longer primary public health concerns in the U.S. Excessive consumption has become the primary nutrition problem in the American population. This is reflected by increased emphasis on prevention of obesity from basic science through intervention studies to assessments of large populations. The agency's research program also actively studies bioactive components of foods that have no known requirements but have health promoting qualities. Four areas of research are emphasized: nutrition monitoring; the scientific basis for dietary recommendations; prevention of obesity and related diseases; and life stage nutrition and metabolism.

Selected Examples of Recent Progress:

Antibiotic resistance is lower with diverse, high-fiber diets. Antibiotic resistance is expected to be a major cause of death worldwide in the coming decades. ARS researchers in Davis, California, studied how diet is related to the antibiotic resistance (ABR) of bacteria in healthy adults. The researchers found that individuals who consumed diverse high-fiber diets had bacteria with lower ABR levels than ABR levels in bacteria from individuals with less diverse diets. These results suggest that dietary modification towards a more diverse, fiber-rich diet may reduce the individual and population-scale burden of bacterial infections resistant to antibiotics treatment.

Maternal weight affects some human milk amino acids influencing infant growth. To better understand how excessive maternal weight changes human milk composition, cooperative researchers in Little Rock, Arkansas, investigated how the branched-chain amino acid content in human milk differed between mothers of normal weight and overweight or obese mothers. They found that the amino acid content differed in milk from the two groups and that infant consumption of these branched-chain amino acids was associated with growth and body composition.

Release of national dietary survey data - What We Eat in America, NHANES 2017-March 2020. Monitoring dietary intakes is critical to understand nutrition's implication to health and well-being of Americans. New nationwide dietary intake data collected in What We Eat in America (WWEIA) for 2017-March 2020 were released on the web for public use. The data include information on dietary intakes of more than 12,600 individuals from 2 nonconsecutive days, 24-hour dietary recalls, and sample weights that can be used to make estimates about dietary intakes of the U.S. population. Select results show that 1) two out of three adults are late evening eaters (from 8:00 p.m. on), and that sweets, sandwiches, and beverages the most likely types of foods reported; 2) one out of four adults consume food items from convenience stores on any given day, accounting for nearly 20 percent of daily energy intake for reporters who reported convenience store purchases; and 3) more than one in three individuals consume a savory snack food such as chips, flavored snacks, popcorn, and pretzels on any given day. Linked with health indicators from other components of the NHANES, these data provide stakeholders critical measures to study relationships between nutrient intake, eating patterns, and health conditions. The data and 39 summarized data tables are accessible from www.ars.usda.gov/nea/bhnrc/fsrg.

Environmental Stewardship

Current Activities:

ARS' Environmental Stewardship research program emphasis is on developing technologies and systems that support sustainable production and enhance the Nation's vast renewable natural resource base. The agency is currently developing the scientific knowledge and technologies needed to meet the challenges and opportunities facing U.S. agriculture in managing water resource quality and quantity under different climatic regimes, production systems, and environmental conditions. ARS' research also focuses on developing measurement, prediction, and control technologies for emissions of greenhouse gases, particulate matter, ammonia, hydrogen sulfide, and volatile organic compounds affecting air quality and land-surface climate interactions. The agency is a leader in developing measurement and modeling techniques for characterizing gaseous and particulate matter emissions from agriculture. In addition, ARS is evaluating strategies for enhancing the health and productivity of soils, including developing predictive tools to assess the sustainability of alternative land management practices. Finding mechanisms to aid agriculture in adapting to changes in atmospheric composition and climatic variations is also an important component of this program. ARS' range and grazing land research objectives include the conservation and restoration of the Nation's range land and pasture ecosystems and agroecosystems through improved management of fire, invasive weeds, grazing, global change, and other agents of ecological change. The agency is currently developing improved grass and forage legume germplasm for livestock, conservation, bioenergy, and bioproduct systems as well as grazing-based livestock systems that reduce risk and increase profitability. In addition, ARS is developing whole system management strategies to reduce production costs and risks.

Selected Examples of Recent Progress:

Snowmelt modeling technology to predict water availability in California. Drought and ongoing climate warming have greatly altered snow water supply in the mountainous Western United States, requiring new approaches to water supply forecasting that explicitly account for variations in snow accumulation and melt. California receives most of its precipitation during the winter, and mountain snowmelt typically accounts for about one-third of the annual water used by California farms and cities. The California Department of Water Resources (CADWR) initiated a pilot program for incorporating the Automated Water Supply Model (AWSM)/iSnobal snow model developed by ARS researchers in Boise, Idaho, into their operational snow water supply forecasting infrastructure, and ARS researchers provided technical support and software troubleshooting to CADWR engineers. The physically based modeling framework was successfully implemented in real time on CADWR computing resources, and the spatial snowmelt information was integrated into the CADWR operational forecast used to allocate limited water resources. This valuable tool has allowed water supply forecasters with CADWR to readily incorporate complex physically based modeling to forecast reliable estimates of the amount and timing of available snowmelt, which is critical for ensuring sustained production across California. This improved ability to monitor snow depth and predict the volume and timing of spring and summer snowmelt and river flow can greatly aid in early warning of drought or flooding and help optimize planning for agricultural and urban water use.

Demonstrating the benefits of high utility crop rotations. In 2000, ARS researchers in Brookings, South Dakota, established a replicated no-till field experiment comparing a 2-year corn-soybean crop rotation with a set of 4-year crop rotations containing corn and soybean. Increases in crop rotational diversity led to increased yields of greater than 20 percent and greenhouse gas emission reductions of more than 20 percent. The diverse rotations also increased sequestered soil carbon (C), suppressed plant pathogens, and reduced input costs by 14 percent. The rotation treatments were completed for five full cycles and prompted other national and international multilocation studies across a range of soil and climatic conditions. Results from all these studies demonstrated that diverse crop rotations produce higher yields that increase with time and that yield stability increases in the face of adverse growing conditions. Diverse crop rotations increase soil C via modification of the soil microbial community and increased soil C is associated with increased plant available water and drought resistance. These efforts will help improve standardized testing procedures to verify the success of improved management practices and provide a robust foundation for decision making and policy formulation that advance sustainable food production systems around the globe. Results have been shared with local NRCS and conservation districts, the South Dakota Soil Health Coalition, and U.S. Northern Plains producer groups. They are applicable to corn-soybean production regions in the United States, Canada, and Europe. Increased adoption of these practices will lead to improved economic and agroecosystem sustainability and productivity for multiple regions of the United States and other countries.

Library and Information Services

***Current Activities**:*

The National Agricultural Library (NAL) is the largest and most accessible agricultural research library in the world. It provides services directly to the staff of USDA and to the public, primarily via its web site, http://www.nal.usda.gov. NAL, which was created with the USDA in 1862, was named a national library 100 years later, in 1962, by Congress as "the primary agricultural information resource of the United States." NAL is the premier library for collecting, managing, and disseminating agricultural knowledge.

Selected Examples of Recent Progress:

Public access policy innovations. In compliance with USDA Departmental Regulation 1020-006, Public Access to Scholarly Publications and Digital Scientific Research Data (July 2022), the National Agricultural Library in Beltsville, Maryland, promulgated the first USDA departmental regulation of its kind that ensures public access to USDA-funded scientific research. This activity and related policy work enabled USDA to close out recommendations in the GAO report Federal Research: Additional Actions Needed to Improve Public Access to Research Results (GAO-20-81). USDA is one of only three Cabinet-level Departments (out of 13 Departments government-wide) that has closed out all their recommendations in GAO-20-81.
NAL staff provided essential contributions to the National Science and Technology Council's Subcommittee on Open Science (SOS) policy development for digital persistent identifiers (DPIs) for USDA-funded researchers and their scientific outputs (NSPM-33 implementation guide). This policy provides defining characteristics for data repositories for Federally-funded research, and information about the economic landscape of federal public access policy. These contributions culminated in the White House Office of Science and Technology Policy landmark policy memorandum entitled "Ensuring Free, Immediate, and Equitable Access to Federally Funded Research." The memorandum was issued August 25, 2022 and will reshape public access policy across the U.S. government.

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ACCOUNT 2: BUILDINGS AND FACILITIES

APPROPRIATIONS LANGUAGE

The appropriations language follows (new language underscored; deleted matter enclosed in brackets):

For the acquisition of land, construction, repair, improvement, extension, alteration, and purchase of fixed equipment or facilities as necessary to carry out the agricultural research programs of the Department of Agriculture, where not otherwise provided, [$74,297,000]$41,405,000 to remain available until expended[, of which $56,697,000 shall be for the purposes, and in the amounts, specified for this account in the table titled "Community Project Funding/Congressionally Directed Spending" in the explanatory statement described in section 4 (in the matter preceding division A of this consolidated Act)].

Change Description

This change (line 3) deletes Community Project language which is not proposed in the 2024 Budget.

LEAD-OFF TABULAR STATEMENT

Table ARS-19. Lead-Off Tabular Statement (In dollars)

Item	Amount
Estimate, 2023	$74,297,000
Change in Appropriation	-32,892,000
Budget Estimate, 2024	41,405,000

PROJECT STATEMENT APPROPRIATIONS

Table ARS-20. Project Statement on Basis of Appropriations (thousands of dollars, FTE)

Item	2021 Actual	2022 Actual	2023 Estimated	2024 Estimated	Inc. or Dec.
Discretionary Appropriations:					
Buildings and Facilities[10]					
Buildings and Facilities	$24,500	$45,405	$17,600	$41,405	+$23,805
ARS Co-Located Facilities	11,200	20,000	-	-	-
Community Based Projects	-	62,400	56,697	-	-56,697
Subtotal	35,700	127,805	74,297	41,405	-32,892
Supplemental Appropriations:					
Disaster Relief	-	-	58,000	-	-58,000
Subtotal	-	-	58,000	-	-58,000
Total Appropriation	35,700	127,805	132,297	41,405	-90,892
Recoveries, Other	906	3,248	-	-	-
Bal. Available, SOY	109,368	100,449	61,441	151,376	+89,935
Total Available	145,974	231,502	193,738	192,781	-957
Bal. Available, EOY	-100,449	-61,441	-151,376	-121,611	+29,765
Total Obligations	45,525	170,061	42,362	71,170	+28,808

Note: The details associated with Supplemental appropriations provided to the Office of the Secretary, but implemented in this Agency is found in the USDA Budget Summary and is not reflected above.

[10] Emergency Hurricane Supplemental funds were appropriated in 2018 and are not displayed on the Project Statement Appropriations exhibit. The funds are still being obligated through 2024 and are reflected on the Project Statement Obligations exhibit.

FUNDING DETAIL APPROPRIATIONS

Table ARS-21. Funding Detail (thousands of dollars)

Allocations	2021 Actual BA	2022 Actual BA	2023 Estimated BA	2024 Budget Request BA	Change from 2023 Estimate BA
Buildings and Facilities					
Beltsville, MD, Beltsville Area Research Center, Building 002	$24,500	-	-	-	-
Beltsville, MD, Beltsville Area Research Center, Building 005	-	$34,805	-	-	-
Beltsville, MD, Beltsville Area Research Center, Infrastructure	-	-	$17,600	$30,805	+$13,205
Manhattan, KS, National Bio and Agro-Defense Facility	-	10,600	-	10,600	+10,600
Subtotal	24,500	45,405	17,600	41,405	+23,805
ARS Co-Located Facilities					
Lincoln, NE, University of Nebraska	11,200	20,000	-	-	-
Subtotal	11,200	20,000	-	-	-
Community Based Projects					
Athens, GA, U.S National Poultry Research Center	-	-	1,000	-	-1,000
Booneville, AR, Wastewater Treatment Plant Rehabilitation	-	-	117	-	-117
Burns, OR, Range and Meadow Forage Management Research	-	-	408	-	-408
Columbia, MO, Center for Agricultural Animal Genetic Engineering and Health	-	4,000	4,000	-	-4,000
Dubois, ID, U.S Sheep Experiment Station	-	4,200	-	-	-
El Reno, OK, Grazinglands Research Laboratory	-	-	1,260	-	-1,260
Hilo, HI, U.S Pacific Basin Agricultural Research Center	-	-	1,215	-	-1,215
Houma, LA, Sugarcane Research	-	10,000	4,000	-	-4,000
Houston, TX, Children's Nutrition Research Center	-	-	7,115	-	-7,115
Kimberly, ID, Idaho Center for Agriculture, Food, and the Environment	-	-	1,000	-	-1,000
Las Cruces, NM, Range Management Research Unit	-	-	2,831	-	-2,831
Madison, WI, Marshfield Agricultural Research Station	-	-	6,000	-	-6,000
Madison, WI, Plant Germplasm Research Facility	-	39,700	-	-	-
Maricopa, AZ, U.S. Arid Land Agricultural Research Center	-	-	1,478	-	-1,478
Orono, ME, National Cold Water Marine Aquaculture Center	-	-	3,500	-	-3,500
Pendleton, OR, Columbia Plateau Conservation Research Center	-	-	700	-	-700
Peoria, IL, Capital Improvements	-	-	3,500	-	-3,500
Peoria, IL, National Center for Agricultural Utilization Research Center	-	4,500	-	-	-
Raleigh, NC, Central Crops Research Station	-	-	1,000	-	-1,000
St. Paul, MN, Cereal Disease Laboratory	-	-	7,000	-	-7,000
Stillwater, OK, Hydraulic Engineering Research Unit	-	-	3,254	-	-3,254

Allocations	2021 Actual BA	2022 Actual BA	2023 Estimated BA	2024 Budget Request BA	Change from 2023 Estimate BA
Stillwater, OK, Wheat, Peanut, and Other Field Crops Research Unit	-	-	4,177	-	-4,177
Tucson, AZ, Facility Upgrades	-	-	698	-	-698
Urbana, IL, Capital Improvements	-	-	500	-	-500
Wenatchee, WA, Deferred Maintenance	-	-	400	-	-400
Woodward, OK, Southern Plains Range Research Center	-	-	1,544	-	-1,544
Subtotal	-	62,400	56,697	-	-56,697
Disaster Relief Supplemental					
Auburn, AL, National Soil Dynamics Research Laboratory	-	-	28,000	-	-28,000
Madison, WI, U.S. Dairy Forage Research Center	-	-	10,000	-	-10,000
Pullman, WA, Crop and Land Management Research Laboratory	-	-	20,000	-	-20,000
Subtotal	-	-	58,000	-	-58,000
Total	35,700	127,805	132,297	41,405	-90,892

PROJECT STATEMENT OBLIGATIONS

Table ARS-22. Project Statement (thousands of dollars)

Item	2021 Actual	2022 Actual	2023 Estimated	2024 Estimated	Inc. or Dec.
Discretionary Obligations:					
Buildings and Facilities[11]					
Buildings and Facilities	$16,153	$63,957	$2,662	$2,000	-$662
ARS Co-Located Facilities	24,814	56,981	-	-	-
Community Based Projects	-	43,700	18,100	31,170	+13,070
Subtotal	40,967	164,638	20,762	33,170	+12,408
Supplemental Obligations:					
Emergency Supplemental	4,558	5,423	1,600	1,500	-100
Disaster Relief	-	-	20,000	36,500	+16,500
Subtotal	4,558	5,423	21,600	38,000	+16,400
Total Obligations	45,525	170,061	42,362	71,170	+28,808
Balances Available, EOY	100,449	61,441	151,376	121,611	-29,765
Total Available	145,974	231,502	193,738	192,781	-957
Recoveries, Other	-906	-3,248	-	-	-
Bal. Available, SOY	-109,368	-100,449	-61,441	-151,376	-89,935
Total Appropriation	35,700	127,805	132,297	41,405	-90,892

Note: The details associated with Supplemental appropriations provided to the Office of the Secretary, but implemented in this Agency is found in the USDA Budget Summary and is not reflected above.

[11]Emergency Hurricane Supplemental funds were appropriated in 2018 and are not displayed on the Project Statement Appropriations exhibit. The funds are still being obligated through 2024 and are reflected on the Project Statement Obligations exhibit.

FUNDING DETAIL OBLIGATIONS

Table ARS-23. Funding Detail (thousands of dollars, FTE)

Allocations	2021 Actual BA	2022 Actual BA	2023 Estimated BA	2024 Budget Request BA	Change from 2023 Estimate BA
Buildings and Facilities					
Athens, GA, Southeast Poultry Research Laboratory ...	$599	$1,313	$1,833	-	-$1,833
Beltsville, MD, Beltsville Area Research Center, Buildings 002, 005 and 308	-	1,202	-	-	-
Beltsville, MD, Beltsville Area Research Center, Building 307.....	1,650	388	-	-	-
Beltsville, MD, Beltsville Area Research Center, Building 002.....	-	24,500	-	-	-
Beltsville, MD, Beltsville Area Research Center, Building 005 and Infrastructure	-	34,805	-	-	-
Beltsville, MD, Beltsville Area Research Center Infrastructure.....	-	-	-	$2,000	+2,000
Kerrville, TX, Knipling Bushland Research Center.....	24	227	-	-	-
Salinas, CA, U.S. Agricultural Research Station	3,568	878	829	-	-829
Temple, TX, Grassland, Soil and Water Research Laboratory.....	286	578	-	-	-
Tifton, GA, Southeast Watershed Research Laboratory	7,500	-	-	-	-
Tucson, AZ, Southwest Watershed Research Laboratory.....	718	66	-	-	-
University Park, PA, U.S. Pasture Laboratory	1,808	-	-	-	-
Subtotal	16,153	63,957	2,662	2,000	-662
ARS Co-Located Facilities					
Auburn, AL, National Soil Dynamics Laboratory	-	21	-	-	-
Davis, CA, University of California.....	14	4,338	-	-	-
Geneva, NY, Grape Genetics Research Center.....	13,600	-	-	-	-
Lexington, KY, University of Kentucky.....	-	10,422	-	-	-
Lincoln, NE, University of Nebraska.....	11,200	20,000	-	-	-
Pullman, WA, Pullman ARS Research Laboratory.....	-	22,200	-	-	-
Subtotal	24,814	56,981	-	-	-
Community Based Projects					
Athens, GA, U.S. Southeast Poultry Research Laboratory.....	-	-	-	900	+900
Booneville, AR, Wastewater Treatment Plant Rehabilitation.....	-	-	-	117	+117
Burns, OR, Range and Meadow Forage Management Research.....	-	-	-	408	+408
Columbia, MO, Center for Agricultural Animal Genetic Engineering and Health	-	4,000	4,500	500	-4,000
Dubois, ID, U.S Sheep Experiment Station	-	-	600	3,375	+2,775
El Reno, OK, Grazinglands Research Laboratory.....	-	-	-	150	+150
Hilo, HI, U.S. Pacific Basin Agricultural Research Center.....	-	-	-	175	+175
Houma, LA, Sugarcane Research	-	-	2,000	11,400	+9,400
Houston, TX, Children's Nutrition Research Center	-	-	5,000	1,000	-4,000
Kimberly, ID, Idaho Center for Agriculture, Food, and the Environment.....	-	-	-	150	+150
Las Cruces, NM, Range Management Research Unit ...	-	-	-	831	+831
Madison, WI, Marshfield Agricultural Research Station	-	-	-	1,000	+1,000
Madison, WI, Plant Germplasm Research Facility	-	39,700	5,500	1,000	-4,500
Maricopa, AZ, U.S. Arid Land Agricultural Research Center.....	-	-	-	200	+200

Allocations	2021 Actual BA	2022 Actual BA	2023 Estimated BA	2024 Budget Request BA	Change from 2023 Estimate BA
Orono, ME, National Cold Water Marine Aquaculture Center	-	-	-	500	+500
Pendleton, OR, Columbia Plateau Conservation Research Center	-	-	-	650	+650
Peoria, IL, Capital Improvements	-	-	-	500	+500
Peoria, IL, National Center for Agricultural Utilization Research Center	-	-	-	600	+600
Raleigh, NC, Central Crops Research Station	-	-	-	100	+100
St. Paul, MN, Cereal Disease Laboratory	-	-	500	5,100	+4,600
Stillwater, OK, Hydraulic Engineering Research Unit	-	-	-	254	+254
Stillwater, OK, Wheat, Peanut, and Other Field Crops Research Unit	-	-	-	550	+550
Tucson, AZ, Facility Upgrades	-	-	-	650	+650
Urbana, IL, Capital Improvements	-	-	-	500	+500
Wenatchee, WA, Deferred Maintenance	-	-	-	400	+400
Woodward, OK, Southern Plains Range Research Center	-	-	-	160	+160
Subtotal	-	43,700	18,100	31,170	+13,070
Disaster Relief Supplemental					
Auburn, AL, National Soil Dynamics Research Laboratory	-	-	-	27,000	+27,000
Madison, WI, U.S. Dairy Forage Research Center	-	-	-	9,500	+9,500
Pullman, WA, Crop and Land Management Research Laboratory	-	-	20,000	-	-20,000
Subtotal	-	-	20,000	36,500	+16,500
Emergency Hurricane Supplemental					
Subtotal	4,558	5,423	1,600	1,500	-100
Total	45,525	170,061	42,362	71,170	+28,808

JUSTIFICATIONS OF INCREASES/DECREASES

Buildings and Facilities

ARS operates laboratories and facilities that have a capitalization value of $5 billion. Many of these laboratories/facilities are decades old, have outlived their functional lifespan, and are badly in need of major repairs, renovation, or replacement.

In 2012, ARS completed an extensive review of its laboratory portfolio and developed a plan for future capital investments. The report, known as the "Capital Investment Strategy (CIS)," highlighted ARS' aging infrastructure, noting that approximately $200,000,000 in capital investments was needed on a regular and recurring basis. Since 2012, modernization or replacement has begun on 24 of ARS' priority facilities.

ARS has updated its 2012 CIS to identify its highest priority facilities in need of modernization or replacement. Funding is requested below to address some of the highest priority facilities.

(1) An increase of $10,600,000 for capital improvement and maintenance at the National Bio and Agro-Defense Facility in Manhattan, Kansas.

The National Bio and Agro-Defense Facility (NBAF) is a $1.25 billion facility that is being constructed by the Department of Homeland Security in Manhattan, Kansas. Beginning in 2023, USDA will own and operate the only large animal BSL-4 laboratory in the United States. The high containment facility is extraordinarily complex and requires sophisticated air handling system to protect the people, animals, and the environment. NBAF science programs will be located within a 574,000 square-foot high-containment laboratory facility. Several ancillary facilities will support the main laboratory complex, including the central utility plant (CUP), wastewater treatment plant, trans-shipping facility, and visitor's center. Including all buildings, NBAF will total 709,000 square feet. Dedicated resources are needed to address ongoing capital improvement and maintenance needs of this critical center charged with the study of highly contagious, emerging, and zoonotic animal diseases that pose a threat to the U.S. agriculture, the food supply, and public health.

(2) An increase of $30,805,000 to fully fund the upgrade of major infrastructure at the Beltsville Agricultural Research Center (BARC) in Beltsville, Maryland.

The existing underground steam and electrical substation and secondary feeders are in poor condition and in need of replacement. The systems are 40 plus years old and causing outages that affect research at the Center. The steam system is also a major source of energy loss. The sanitary and water systems are upwards of 50 years old and require urgent repairs and upgrade. Currently the water and sanitary systems are impacting the research and quality of services at BARC. There are also concerns that eventually, these systems can create environmental problems that could lead to state and Federal violations.

CLASSIFICATION BY OBJECTS

Table ARS-24. Classification by Objects (thousands of dollars)

Item No.	Item	2021 Actual	2022 Actual	2023 Estimated	2024 Estimated
	Other Objects:				
32.0	Land and structures.....	$45,525	$170,061	$42,362	$71,170
99.9	Total, new obligations	45,525	170,061	42,362	71,170

STATUS OF CONSTRUCTION

Status of Construction Projects as of December 2022. Status of research facilities authorized or funded in prior years and reported as uncompleted in the 2022 Explanatory Notes, are as follows: NOTE: Program of Requirement: A study/document that defines the research program, associated space and equipment needs and associated design criteria. DESIGN: The design is either a conceptual design - designated as 35 percent - or a complete design designated as 100 percent. YEARS: All references to years are fiscal years.

Location and Purpose	Year	Amount of Funds Provided	Description
Alabama, Auburn National Soil Dynamics Research Laboratory	2019 Design and Construction [2023 Supplemental (Planning)] Total	$43,300,000 [28,000,000] 71,300,000	New funding was provided in 2019. Project transferred to USACE for managing the design and construction. New sites determined at Research Park for Land Swap. Land Swap to be finalized for 2nd Quarter 2023. Program of Requirements (POR) completed in 1st Quarter 2022. Design to be complete in the 3rd Quarter 2023. Projected Contract Award for 1st Quarter 2024.
Arkansas, Booneville Waste Water Treatment Plant Rehabilitation	2023 Planning	$117,000	
Arizona, Maricopa U.S Arid Land Agricultural Research Center	2023 Planning	$1,478,000	
Arizona, Tucson Southwest Watershed Research Center	2016 Design and Construction	$12,400,000	Design/Programming completed in the 1st Quarter 2018. Construction contract awarded in the 4th Quarter 2018. Construction completion date is scheduled for 4th Quarter 2023.
Arizona, Tucson Facility Upgrades	2023 Planning	$698,000	
California, Albany Western Regional Research Center (Research and Development Facility)	2000 Planning and Design 2001 Construction 2002 Construction 2009 ARRA 2015 Rescission Total	$2,600,000 4,889,220 3,800,000 15,624,460 (166) 26,913,514	Construction of Phases 1-3a of the Research and Development Facility is complete. The re-design of the remaining work (Phases 3b, 4, 5, and 6) was completed in the 1st Quarter 2010. Construction contract award for the final phases 3 thru 6 was awarded for 3rd Quarter 2010 with ARRA funding and was completed in the 3rd Quarter 2015.
California, Davis Center for Advanced Viticulture and Tree Crop Research	2004 Planning and Design 2005 Construction 2006 Construction 2008 Construction 2009 Construction 2010 Construction 2011 Rescission 2020 Design and Construction Total	$2,684,070 2,976,000 3,588,750 1,869,819 2,192,000 3,000,000 (16,062,114) 76,200,000 76,448,525	POR completed in the 2nd Quarter 2007. Lease agreement was not executed. Project transferred to USACE for managing the design and construction. Land purchased for an off-campus site adjacent to UC-Davis was completed in the 3rd Quarter 2022. Award of A-E contract in 4th Quarter 2021. Design to be completed in 2nd Quarter 2023. Projected Construction Contract Award for 1st Quarter 2026.

Location and Purpose	Year	Amount of Funds Provided	Description
California, Salinas Agricultural Research Station	2004 Planning and Design 2005 Planning and Design 2006 Construction 2008 Construction 2009 Construction 2010 Construction 2011 Rescission 2016 Design 2017 Construction 2018 Construction Total	$4,473,450 2,976,000 3,588,750 1,869,819 2,192,000 3,654,000 (14,937,644) 1,300,000 30,200,000 71,200,000 106,516,375	Design (100 percent) completed in the 2nd Quarter 2007. A design update was awarded 1st Quarter 2017 and completed 4th Quarter 2018. Design changed from 3 phases to 2 phases for construction. Contract awarded in 4th Quarter 2020. Construction completion date is scheduled for 4th Quarter 2024.
Connecticut, Storrs Center of Excellence for Vaccine Research	2008 Planning and Design 2009 Design and Construction 2010 Construction 2011 Rescission Total	$1,869,819 2,192,000 3,654,000 (7,221,296) 494,523	POR completed 4th Quarter 2010. Lease agreement was not executed.
District of Columbia U.S. National Arboretum	2000 Planning and Design 2001 Design and Construction 2002 Design and Construction 2003 Design and Construction 2008 Construction 2009 ARRA 2011 Rescission Total	$500,000 3,322,674 4,600,000 1,688,950 695,100 8,041,842 (2,066,637) 16,781,929	Design (100 percent) of Bladensburg Road Entrance completed 1st Quarter 2006. The Administrative Building Modernization design completed 1st Quarter 2006. Construction of Phase 2, Greenhouse and mechanical support space, completed 1st Quarter 2009. ARRA funds were used to award a construction contract for Administrative Building Modernization 4th Quarter 2010. Construction completed 2nd Quarter 2013.
Florida, Canal Point Agricultural Research Service Laboratory	2008 Planning and Design 2009 Planning and Design 2010 Construction 2011 Rescission 2015 Rescission Total	$521,325 1,096,000 3,422,000 (4,106,211) (149,125) 783,989	POR completed 2nd Quarter 2011. Land purchases complete. Historic preservation consultation completed and building demolition contract awarded 4th Quarter 2016. Demolition was completed in the 4th Quarter 2017.
Georgia, Athens U.S. National Poultry Research Center	2005 Planning 2005 Construction 2008 Planning and Design 2009 Planning and Design 2011 Rescission 2015 Planning, Design, Construction 2016 Construction 2023 Planning Total	$400,000 677,000 2,780,400 2,427,000 (5,832,898) 45,000,000 113,701,000 1,000,000 160,152,502	Draft POR completed 1st Quarter 2007. The POR was awarded in the 3rd Quarter 2015 and completed 4th Quarter 2015. POR/Bridging documents were awarded 4th Quarter 2015 and completed in the 3rd Quarter 2016. Design Build Construction Contract was awarded in the 4th Quarter 2017. Total contract duration from notice to proceed to completion is expected to take 7 1/2 years with all work completed by the 2nd Quarter 2025. The Government has taken ownership of buildings and infrastructure as they are completed. See list below for status: - B43A Hatchery/Brooding - 4th Quarter 2019 (actual) - B45 Laboratory/Office/Administration – 1st Quarter 2022 (actual) - B47 BLS-3 Animal Holding/Laboratory – 4th Quarter 2022 (actual) - B46 BSL-2 Animal Holding – 1st Quarter 2025 - Finalize Roadways, Sidewalks etc. - 2nd Quarter 2025

Location and Purpose	Year	Amount of Funds Provided	Description
Georgia, Tifton Southeast Watershed Research Laboratory	2019 Design and Construction	$39,900,000	New Funding provided in 2019. Project transferred to USACE for managing the design and construction. A-E Contract awarded for 4th Quarter 2020. Design complete by 2nd Quarter 2023. Construction award by 4th Quarter 2023. Construction complete by 4th Quarter 2025.
Hawaii, Hilo U.S. Pacific Basin Agricultural Research Center	1999 Planning and Design	$4,500,000	Design of Phases 1 and 2 is complete. Construction of Phase 1 completed 3rd Quarter 2007. Construction contract for Phase 2 awarded 4th Quarter 2010 and completed 1st Quarter 2012.
	2000 Construction	4,500,000	
	2001 Construction	4,989,000	
	2002 Construction	3,000,000	
	2003 Design and Construction	2,980,500	
	2004 Construction	4,831,326	
	2005 Construction	2,976,000	
	2006 Construction	3,588,750	
	2008 Construction	1,737,750	
	2009 Construction	1,565,000	
	2010 Construction	5,000,000	
	2011 Rescission	(7,730,452)	
	2015 Rescission	(129,570)	
	2023 Planning	1,215,000	
	Total	33,023,304	
Idaho, Dubois U.S. Sheep Experiment Station	2022 Construction Design	$4,200,000	Project to be managed by the Area/Location. Schedule to be determined.
Idaho, Hagerman Aquaculture Facility	2005 Planning and Design	$992,000	Lease agreement is in place. POR completed 3rd Quarter 2007.
	2006 Construction	990,000	
	2008 Construction	695,100	
	2009 Construction	544,000	
	2011 Rescission	(2,907,600)	
	Total	313,500	
Idaho, Kimberly Idaho Center for Agriculture, Food, and the Environment	2023 Planning	$1,000,000	
Illinois, Peoria National Center for Agricultural Utilization Research (Central Wing)	2000 Construction Design	$1,800,000	The modernization of the Chemical Wing was completed in 3 segments. The construction of phases 1 and 2 is complete. Construction for all remaining phases of the Central Wing awarded 2nd Quarter 2010 using ARRA funding and completed 3rd Quarter 2012.
	2002 Construction	6,500,000	
	2004 Construction	2,684,070	
	2005 Construction	2,976,000	
	2006 Construction	3,588,750	
	2008 Construction	1,869,819	
	2009 Construction	2,192,000	
	2009 ARRA	16,237,165	
	2015 Rescission	(142,565)	
	Total	37,705,239	
Illinois, Peoria New Greenhouse	2022 Construction Design	$4,500,000	Project to be managed by the Area/Location. Schedule to be determined.
Illinois, Peoria Capital Improvements	2023 Planning	$3,500,000	
Illinois, Urbana Capital Improvements	2023 Planning	$500,000	

Location and Purpose	Year	Amount of Funds Provided	Description
Iowa, Ames National Centers for Animal Health	1999 Design and Construction	$4,475,805	All major components of the modernization are complete. - Phase 1 Lab/Office (APHIS) completed in 2004. - Large Animal BSL-3Ag facilities construction completed 2nd Quarter 2007. - Central Utility Plant and Infrastructure, Phase 1 and 2 construction is complete. Phase 3 construction completed 1st Quarter 2009. - Construction of the Consolidated Laboratory Facility completed 2nd Quarter 2009. - Low Containment Large Animal Facility construction completed 1st Quarter 2009. - Demolition of existing facilities on 1st and 2nd Street completed 3rd Quarter 2012. - Buildings 1 and 2 demolition completed.
	2001 Design and Construction	8,980,200	
	2002 Design and Construction	40,000,000	
	2002 Construction	50,000,000	
	2002 APHIS Transfers	15,753,000	
	[Supplemental]	[14,081,000]	
	[Other Transfers]	[1,672,000]	
	2002 Construction	25,000,000	
	2003 Construction	32,785,500	
	2003 Construction	110,000,000	
	2005 Construction	121,024,000	
	2006 Construction	58,212,000	
	2009 Construction	10,500,000	
	2015 Rescission	(1,108,686)	
	Total	491,374,819	
National Laboratory for Agricultural and the Environment	2016 Design and Construction	$13,500,000	Design awarded 4th Quarter 2016 and bridging documents were completed 4th Quarter 2017. Construction awarded 4th Quarter 2018 and was completed 4th Quarter 2020.
Kansas, Manhattan National Bio and Agro-Defense Facility (NBAF) Laboratory	2022 Design and Construction	$10,600,000	Project managed by NBAF. Schedule to be determined.
Kentucky, Bowling Green Animal Waste Management Research Laboratory	2005 Planning and Design	$2,281,600	POR is complete for total project. Design (100 percent) for the Headhouse/Greenhouse only was completed 3rd Quarter 2008. Lease agreement is in place. Construction of the Headhouse/Greenhouse awarded 4th Quarter 2010 and completed 2nd Quarter 2012.
	2006 Construction	2,970,000	
	2008 Construction	1,390,200	
	2009 Construction	1,088,000	
	2010 Construction	2,000,000	
	2011 Rescission	(5,880,338)	
	Total	3,849,462	
Kentucky, Lexington Forage Animal Research Laboratory	2005 Planning and Design	$2,976,000	Lease agreement terminated 2016. Design (100 percent) was completed 2nd Quarter 2011. Project transferred to USACE for managing the design and construction. Project reactivated by 2020. Lease agreement for the new Lab office and Animal Facilities are ongoing. POR completed 2nd Quarter 2022. Design completion planned 2nd Quarter 2023. Construction award planned for 4th Quarter 2023. All work completion planned for 2nd Quarter 2026.
	2006 Construction	3,960,000	
	2008 Construction	2,085,300	
	2009 Construction	1,632,000	
	2010 Construction	2,000,000	
	2011 Rescission	(9,678,689)	
	2020 Construction	65,900,000	
	Total	68,874,611	

Location and Purpose	Year	Amount of Funds Provided	Description
Louisiana, Houma Sugarcane Research Unit	2004 Planning and Design	$1,342,035	Design (100 percent) completed 4th Quarter 2007. Repackaging of design to allow for construction of some elements within the available funding completed 2nd Quarter 2008. Phase 1A construction completed 4th Quarter 2010. Phase 1B construction awarded 2nd Quarter 2011 and completed 3rd Quarter 2013. Funds provided in 2022 for construction of Greenhouses. Award A-E for updating design by 2nd Quarter 2023. Design and construction schedule still to be determined.
	2005 Construction	2,976,000	
	2006 Construction	3,588,750	
	2008 Construction	1,869,819	
	2009 Construction	2,505,000	
	2010 Construction	3,654,000	
	2015 Rescission	(100)	
	2022 Construction	10,000,000	
	2023 Planning	4,000,000	
	Total	29,935,504	
Louisiana, New Orleans Southern Regional Research Center (Industrial Wing)	1998 Planning and Design	$1,100,000	The 2006 Supplemental funding was appropriated for the design and construction of the Long-Term Restoration (LTR) of facilities damaged by Hurricane Katrina. Design (100 percent) for the LTR of facilities completed 4th Quarter 2008. Construction of the LTR awarded 3rd Quarter 2009 and completed 3rd Quarter 2011.
	1999 Modernization	6,000,000	
	2000 Modernization	5,500,000	
	[2006 Supplemental (design)]	[4,900,000]	
	[2006 Supplemental (construct.)]	[20,000,000]	
	Total	37,500,000	
Maine, Orono National Cold Water Marine Aquaculture Center	2001 Planning and Design	$2,494,500	Construction of all facilities at Franklin (Pump House, Storage Tanks, Lab/Office/Tank Bldg.) is complete. Program for the laboratory facility located at the University of Maine Campus in Orono, ME needs to be developed when funds are made available.
	2002 Construction	3,000,000	
	2003 Construction	9,090,525	
	2004 Design and Construction	2,684,070	
	2005 Design and Construction	2,976,000	
	2006 Design and Construction	2,475,000	
	2011 Rescission	(2,012,504)	
	2023 Planning	3,500,000	
	Total	24,207,591	
Maryland, Beltsville Beltsville Agricultural Research Center, (BARC)	1988 Design and Construction	$5,750,000	Study to evaluate boiler plants, steam lines, and electrical distribution completed 4th Quarter 2009. Construction contract for repairs to boiler plants and portions of the steam distribution system awarded 4th Quarter 2010 with ARRA funding and completed 2nd Quarter 2012. Design-Build contract for major renovations to Building 306 awarded 4th Quarter 2010 with ARRA funding and completed 4th Quarter 2012.
	1989 Design and Construction	6,100,000	
	1990 Design and Construction	9,860,000	
	1991 Design and Construction	15,999,792	
	1992 Design and Construction	16,000,000	
	1993 Design and Construction	13,547,000	
	1994 Design and Construction	19,700,000	
	1995 Design and Construction	3,960,000	
	1996 Design and Construction	8,000,000	
	1997 Design and Construction	4,500,000	
	1998 Design and Construction	3,200,000	
	1999 Design and Construction	2,500,000	
	2000 Design and Construction	13,000,000	
	2001 Design and Construction	13,270,740	
	2002 Design and Construction	3,000,000	
	2003 Design and Construction	4,152,830	
	2004 Design and Construction	2,684,070	
	2005 Design and Construction	2,976,000	
	2006 Design and Construction	3,588,750	
	2009 Design and Construction	2,192,000	
	2009 ARRA	21,513,046	
	2010 Construction	3,000,000	
	2011 Rescission	(9,831,954)	
	Total	168,662,274	

Location and Purpose	Year	Amount of Funds Provided	Description
Maryland, Beltsville (BARC) Renovate Building 307	2016 Design and Construction	$37,100,000	Preparation of design bridging documents for Building 307 was awarded for 4th Quarter 2016 and completed in the 1st Quarter 2018. Construction was awarded in the 1st Quarter 2020 and occupancy was taken in the 3rd Quarter 2022.
Maryland, Beltsville (BARC) Renovate Buildings 002, 005, and 308	2020 Design	$12,300,000	Design awarded for Building 002 was awarded for 4th Quarter 2020 and was completed in the 4th Quarter 2021. Construction award planned for 2nd Quarter 2022. Design awarded for Building 005 was awarded 4th Quarter 2020 and was completed in the 3rd Quarter 2022. Award for 35 percent design of Building 308 executed in 4th Quarter 2020 and was completed in the 3rd Quarter 2022.
Maryland, Beltsville (BARC) Renovate Building 002	2021 Construction	$24,500,000	Construction awarded 3rd Quarter 2022. Construction completion planned for 2nd Quarter 2025.
Maryland, Beltsville (BARC) Renovate Building 005	2022 Construction	$34,805,000	Construction award planned for 3rd Quarter 2023. Construction completion planned for 1st Quarter 2026.
Maryland, Beltsville BARC Infrastructure	2023 Planning	$17,600,000	
Maryland, Beltsville National Agricultural Library	1998 Design and Construction 1999 Design and Construction 2001 Design and Construction 2002 Construction 2003 Design and Construction 2004 Design and Construction 2009 ARRA 2011 Rescission Total	$2,500,000 1,200,000 1,766,106 1,800,000 1,490,250 894,690 6,357,422 (115,175) 15,893,293	Renovation of the NAL building continues. Completed projects include: replacement of the computer room HVAC and fire suppression systems; completion of chiller replacement and brick repairs of three building elevations; and 14th floor window replacements. Construction for the deteriorated building envelope, repair of brick façade, and replacement of the plumbing system awarded for 1st Quarter 2010 using ARRA funding and completed in the 3rd Quarter 2012.
Maryland, Frederick (Fort Detrick) Foreign Disease-Weed Science Research Laboratory	2016 Design 2017 Construction Total	$4,900,000 64,300,000 69,200,000	Design/Programming awarded for the 4th Quarter 2016 and completed 2nd Quarter 2018. Project transferred to USACE for managing the design and construction. Construction was scheduled to be awarded in the 4th Quarter 2021, but funding was insufficient for award. ARS has requested additional funds from Congress and if additional funds are not provided in 2022, the project team will abandon the current plan to construct the facility.

Location and Purpose	Year	Amount of Funds Provided	Description
Michigan, East Lansing Avian Disease and Oncology Laboratory	1992 Planning 1993 Planning 1998 Planning and Design 2011 Rescission Total	$250,000 212,000 1,800,000 (63,193) 2,198,807	Design (100 percent) for this multi-phased facility modernization is complete but no funds were provided for modernization. ADOL will move to South East Poultry Research Center (SEPRL) when their modernization program is complete in 2nd Quarter of 2025 and this facility will be closed.
Minnesota, St. Paul Cereal Disease Laboratory	2023 Planning	$7,000,000	
Mississippi, Lorman Biotechnology Laboratory Alcorn State University	2006 Planning and Design 2008 Planning and Design 2009 Construction 2010 Construction 2011 Rescission Total	$1,980,000 1,390,200 1,176,000 1,500,000 (5,798,055) 248,145	A lease agreement with Alcorn State University for the new facility completed 4th Quarter 2009. POR completed 3rd Quarter 2008.
Mississippi, Poplarville Thad Cochran Southern Horticulture Laboratory	2002 Design 2003 Construction [2006 Supplemental] 2011 Rescission Total	$800,000 9,140,200 [4,300,000] (9,178) 14,231,022	Construction of the Headhouse/Greenhouse awarded for 4th Quarter 2007 and completed in the 1st Quarter 2008.
Mississippi, Starkville Poultry Science Research Facility	2005 Planning and Design 2006 Construction 2008 Construction 2009 Construction 2011 Rescission Total	$2,976,000 4,950,000 1,390,200 3,177,000 (10,345,645) 2,147,555	Lease agreement is in place. Design (100 percent) completed in the 1st Quarter 2008.
Mississippi, Stoneville Jamie Whitten Delta States Research Center	2004 Construction 2005 Construction 2008 Construction 2009 ARRA 2010 Construction 2011 Rescission 2015 Rescission Total	$4,831,326 2,976,000 2,780,400 36,347,783 4,000,000 (6,047,327) (134) 44,888,048	Design (100 percent) completed. Construction of Phase 1 completed. Construction of mechanical, electrical, and plumbing systems for phases 2 thru 5 (of 5 total) and repair of deteriorated building envelope awarded for 3rd Quarter 2010. Phase 2 and 3 completed in the 1st Quarter 2013, Phase 4 completed in the 2nd Quarter 2015, and Phase 5 completed in the 2nd Quarter 2016.
Missouri, Columbia National Plant and Genetics Security Center	2004 Planning and Design 2005 Construction 2006 Construction 2008 Construction 2009 Construction 2010 Construction 2011 Rescission 2020 Design and Construction Total	$2,415,663 4,960,000 3,687,750 2,085,300 1,633,000 3,500,000 (15,590,075) 24,800,000 27,491,638	Initial Design completed in the 4th Quarter 2008. Funding for redesign and construction in 2020. Project transferred to USACE for managing the design and construction. A-E contract awarded in the 3rd Quarter 2021 and design completed 4th Quarter of 2022. Construction award planned for 2nd Quarter 2023 and construction completion planned for 4th Quarter of 2024.
Missouri, Columbia Center for Agricultural Animal Genetic Engineering and Health	2022 Planning and Design 2023 Planning and Design Total	$4,000,000 4,000,000 8,000,000	Project transferred to USACE for managing the planning and design. Schedule still to be determined.

Location and Purpose	Year	Amount of Funds Provided	Description
Montana, Bozeman Animal Bioscience Facility	2005 Planning and Design 2006 Construction 2008 Construction 2009 Construction 2010 Construction 2011 Rescission Total	$1,984,000 3,960,000 1,869,819 2,192,000 3,654,000 (12,720,879) 938,940	Lease agreement in place. Conceptual Design (35 percent) completed in the 3rd Quarter 2008.
Montana, Sidney Northern Plains Agricultural Research Laboratory	1998 Planning and Design 1999 Construction 2004 Design and Construction 2011 Rescission Total	$606,000 7,300,000 2,505,132 (29,505) 10,381,627	Construction of Phase 1 (Lab/Office Building) completed 2003 and Phase 2 (Quarantine Lab) completed in the 4th Quarter 2008.
Nebraska, Lincoln University of Nebraska National Center for Resilient Precision Agriculture	2021 Design 2022 Construction Total	$11,200,000 20,000,000 31,200,000	Project transferred to USACE for managing the design and construction. Lease should be finalized by 3rd Quarter 2023. A-E contract awarded for 2nd Quarter 2022. POR completed 1st Quarter 2023. Design planned completion 4th Quarter 2023. Current funding is only sufficient for construction of Greenhouse/Headhouse and award is planned for 3rd Quarter 2024 and construction completion planned for 3rd Quarter 2026.
New Mexico, Las Cruces Range Management Research Unit	2023 Planning	$2,831,000	Maintenance of the Southwest Climate Hub.
New York, Geneva Grape Genetics Research Center	2004 Planning and Design 2005 Construction 2006 Construction 2008 Construction 2009 Construction 2010 Construction 2011 Rescission 2019 Design and Construction Total	$2,415,663 2,976,000 3,588,750 1,869,819 2,192,000 3,654,000 (14,806,870) 68,900,000 70,789,362	Project transferred to USACE for managing the design and construction. A-E contract awarded in 4th Quarter 2020. Design to be completed by 1st Quarter 2024. Projected contract award 3rd Quarter 2024 and final acceptance 3rd Quarter 2026.
New York, Ithaca Crop-Based Health Genomics	2004 Planning and Design 2005 Construction 2006 Construction 2011 Rescission Total	$3,847,167 2,976,000 3,588,750 (7,314,491) 3,097,426	Design (100 percent) completed in the 2nd Quarter 2008.
North Carolina, Raleigh Central Crops Research Station	2023 Planning	$1,000,000	

Location and Purpose	Year	Amount of Funds Provided	Description
North Carolina, Raleigh Plant Science Research	2019 Design and Construction	$30,600,000	New funding was provided in 2019. Project transferred to USACE for managing the design and construction. NCSU has reserved a 15-acre parcel at the Lake Wheeler site for ARS; once the ARS project has been designed and a premises established, a lease agreement can be executed. A-E contract awarded in 2nd Quarter 2021. Design to be completed in 2nd Quarter 2023. Anticipated construction contract award for 3rd Quarter 2023 and final acceptance 4th Quarter 2025.
Ohio, Toledo University of Toledo	2005 Planning and Design	$1,984,000	Design (100 percent) completed in the 1st Quarter 2010. Lease agreement in place.
	2006 Construction	1,584,000	
	2008 Construction	1,869,819	
	2009 Construction	2,192,000	
	2010 Construction	3,654,000	
	2011 Rescission	(9,356,845)	
	Total	1,926,974	
Oklahoma, El Reno Grazinglands Research Laboratory	2023 Planning	$1,260,000	Facility Improvements
Oklahoma, Stillwater Hydraulic Engineering Research Unit	2023 Planning	$3,254,000	Facility Improvements
Oklahoma, Stillwater Wheat, Peanut, and Other Field Crops Research Unit	2023 Planning	$4,177,000	Facility Improvements
Oklahoma, Woodward Southern Plains Range Research Center	2002 Planning and Design	$1,500,000	Phases 1 and 2 of the three-phased construction project completed.
	2003 Construction	7,948,000	
	2005 Construction	2,976,000	
	2011 Rescission	(152,556)	
	2023 Planning	1,544,000	Facility Improvements
	Total	13,815,444	
Oregon, Burns Range and Meadow Forage Management Research	2023 Planning	$408,000	
Oregon, Corvallis National Clonal Germplasm Repository	2020 Design and Construction	$13,500,000	Project transferred to USACE for managing the design and construction. AE Task Order Awarded 3rd Quarter 2021. Design completed by 4th Quarter 2022. Anticipated construction contract award in 3rd Quarter 2023 and final acceptance 3rd Quarter 2024.
Oregon, Pendleton Columbia Plateau Conservation Research Center	2023 Planning	$700,000	

Location and Purpose	Year	Amount of Funds Provided	Description
Pennsylvania, Wyndmoor Eastern Regional Research Center	1997 Construction 1998 Construction 1999 Construction 2000 Construction 2002 Design and Construction 2009 ARRA 2015 Rescission Total	$4,000,000 5,000,000 3,300,000 4,400,000 5,000,000 15,084,486 (2) 36,784,484	Modernization of the Center accomplished in nine phases, with construction of Phases 1 through 7 completed. Construction award for Phases 8 and 9 was made in 4th Quarter 2010 with ARRA funding and completed in the 2nd Quarter 2012.
Pennsylvania, University Park Pasture Systems & Watershed Management Research	2019 Design and Construction	$21,900,000	New funding was provided in 2019. Project transferred to USACE for managing the design and construction. Design started in 1st Quarter 2021. Design completed 3rd Quarter 2022. Anticipated contract award for 2nd Quarter 2023 and final acceptance 2nd Quarter 2025.
South Carolina, Charleston U.S. Vegetable Laboratory	1988 Feasibility Study 1990 Planning and Construction 1994 Construction 1995 Construction 1996 Construction 1997 Construction 1998 Construction 2000 Construction 2002 Construction 2003 Design 2004 Construction 2005 Construction 2006 Construction 2011 Rescission Total	$50,000 1,135,000 909,000 5,544,000 3,000,000 3,000,000 4,824,000 1,000,000 4,500,000 1,390,900 3,131,415 2,976,000 1,980,000 (517) 33,439,798	Construction of Phase 1 (Laboratory) and Phase 2A (Headhouse) completed. Phase 2B (Greenhouse) construction awarded 2nd Quarter 2007 and completed 4th Quarter 2008. Reprogrammed from Horticultural Crop and Water Management Research Laboratory, Parlier, CA.
Texas, Houston Children's Nutrition Research Center	2016 Design and Construction 2023 Planning Total	$29,200,000 7,115,000 36,315,000	Design (bridging documents stage) awarded for 4th Quarter 2016 and completed in the 4th Quarter 2017. Project transferred to USACE to manage the design and construction. Project re-started in 4th Quarter 2020. Anticipated design complete by 2nd Quarter 2022. Anticipated contract award in 1st Quarter 2023, however bids exceeded funding. Package is to be redone to change acquisition strategy to a design bid build package and only include facade work in base bid package. Project management team is still determining procurement schedule.
Texas, Kerrville Knipling Bushland Laboratory	2008 Planning and Design 2009 Planning and Design 2011 Rescission 2017 Planning and Design 2018 Construction Total	$1,390,200 1,957,000 (2,768,214) 3,700,000 50,700,000 54,978,986	POR completed 2nd Quarter 2010 for a new site. Project transferred to USACE for managing the design and construction. The design was awarded for 1st Quarter 2019 and completed in the 2nd Quarter 2021. Construction awarded in 1st Quarter 2022. Construction completion planned for 2nd Quarter 2025.

Location and Purpose	Year	Amount of Funds Provided	Description
Texas, Temple Grassland Soil & Water Research Laboratory	2017 Planning and Design 2018 Construction Total	$1,400,000 18,700,000 20,100,000	In 2017, funding was appropriated for planning and design of a laboratory modernization at Temple and repairs at the associated field site in Riesel, TX. The POR and Investigative Study was awarded for 1st Quarter 2018. Additional funding provided in 2018 for construction. Design was completed in the 4th Quarter 2019. Funding was only sufficient to award modernization work at the Temple site. Construction awarded in the 4th Quarter 2020. Construction completion is planned for 2nd Quarter 2023.
Utah, Logan Agricultural Research Center	2008 Planning and Design 2009 Design and Construction 2010 Construction 2011 Rescission Total	$5,560,800 4,351,000 4,527,000 (13,839,929) 598,871	Lease completed 3rd Quarter 2010. POR completed in the 4th Quarter 2010.
Washington, Pullman Crop and Land Management Research Laboratory	[2023 Supplemental (Planning)]	[$20,000,000]	
Washington, Pullman Pullman ARS Research Laboratory	2004 Planning and Design 2005 Construction 2006 Construction 2008 Construction 2009 Construction 2010 Construction 2011 Rescission 2019 Design and Construction Total	$3,936,636 2,976,000 3,588,750 1,869,819 2,192,000 3,740,000 (17,240,830) 104,900,000 105,962,375	Lease agreement with Washington State University in place. Conceptual Design (35 percent) completed in 2011. New funding was provided in 2019. The previous design, completed to 35 percent cannot be used. Project transferred to USACE for managing the design and construction. A-E awarded for 4th Quarter 2020 and was completed in 2nd Quarter of 2022. Anticipated contract award in 1st Quarter 2023 with a beneficial occupancy 4th Quarter 2025.
Washington, Wenatchee Deferred Maintenance	2023 Planning	$400,000	
West Virginia, Kearneysville Appalachian Fruit Laboratory	2003 Planning and Design 2004 Construction 2005 Construction 2006 Construction 2008 Planning and Design 2009 Planning and Design 2010 Construction 2011 Rescission Total	$471,913 1,789,380 3,608,896 2,024,550 1,529,220 783,000 2,000,000 (3,430,725) 8,776,234	Construction of Phases 1 and 2 (immediate laboratory repairs and renovation) completed in 3rd Quarter 2007. The construction of the Greenhouse completed in 1st Quarter 2008. POR for the new laboratory completed in 2nd Quarter 2010. Conceptual design for new laboratory completed in the 3rd Quarter 2011.
West Virginia, Leetown National Center for Cool and Cold Water Aquaculture (Broodstock Facility)	2002 Design and Construction 2006 Construction 2011 Rescission Total	$2,200,000 891,000 (4,717) 3,086,283	Construction completed in the 3rd Quarter 2008.

Location and Purpose	Year	Amount of Funds Provided	Description
Wisconsin, Marshfield Nutrient Management Laboratory	2003 Planning, Design and Const. 2004 Construction 2005 Construction 2006 Construction 2011 Rescission Total	$2,980,500 3,668,229 4,860,800 7,920,000 (18,229) 19,411,300	Design (100 percent) of Phase 1 and Phase 2 completed. Phase 1 (Nutrient Lab) construction completed in the 4th Quarter 2008. Phase 2 construction (Animal Holding Facility) awarded for 4th Quarter 2007. Phase 2 construction completed in the 1st Quarter 2010.
Wisconsin, Prairie du Sac Dairy Forage Agriculture Research Center	2008 Planning and Design 2009 Construction 2010 Construction 2011 Rescission 2019 Design and Construction Total	$2,502,360 2,002,000 4,000,000 (7,675,381) 71,700,000 72,528,979	POR completed 3rd Quarter 2011. New funding was provided in 2019. Funds have been transferred to the USACE to manage design and construction of this project. A-E awarded in 3rd Quarter 2021. Design anticipated completion in the 2nd Quarter 2023. Anticipated contract award for 4th Quarter 2023 and final acceptance 1st Quarter 2026.
Wisconsin, Madison Marshfield Agricultural Research Station	2023 Planning	$6,000,000	
Wisconsin, Madison Plant Germplasm Research Facility	2022 Planning/Design and Construction	$39,700,000	Project transferred to USACE for managing the planning/design and construction. AE contract award planned for 4th Quarter 2023. Remaining schedule to be determined.
Wisconsin, Madison U.S. Dairy Forage Research Center	[2023 Supplemental (Planning)]	[$10,000,000]	
Emergency Hurricane Supplemental Funding	2018 Planning, Design and Construction	$22,000,000	The majority of the awarded funds in 2021 were for a major greenhouse/quarantine facility renovation project. In 2022, two major underground distribution projects were awarded. Remaining funds will be used for projects in 2023 and 2024.

AGENCY-WIDE PERFORMANCE

Introduction

The Agriculture Research Service (ARS) was established November 2, 1953, within the Department of Agriculture and is the chief scientific in-house research agency. The agency's mission is to "deliver scientific solutions to national and global agricultural challenges."

The purpose of the Summary of Performance section is to provide an update on Performance and Evidence and Evaluation efforts, facilitating compliance with the Government Performance Results Modernization Act (GPRMA) and the Evidence Act of 2018, as well as departmental Key Performance Indicators (KPI). The Office of Budget and Program Analysis (OBPA) leads the Department in performance, evaluation, evidence, and risk management and chairs the Performance, Evaluation, Evidence Committee (PEEC) and the Enterprise Risk Management (ERM) committee. Each USDA Mission Area is represented on these committees.

The Research, Education, and Economics (REE) mission area and the Office of the Chief Scientist are jointly represented through the OCS' Strategic Planning, Program Evaluation, and Enterprise Risk Officer, whose team functions as the coordinating members on USDA's PEEC and ERM committees.

The Research, Education, and Economics (REE) mission area of the U. S. Department of Agriculture has Federal leadership responsibility for advancing scientific knowledge related to agriculture through research, extension, and education. The mission area office is led by the Under Secretary for the Research, Education, and Economics (REE) and Chief Scientist for USDA, whose responsibilities include oversight of the four agencies that comprise OCS/REE, the Agricultural Research Service (ARS), National Institute for Food and Agriculture (NIFA), Economic Research Service (ERS), and National Agricultural Statistics Service (NASS.) The National Agriculture Library, National Arboretum, and the Office of the Chief Scientist also fall under this mission area.

The mission of the Office of the Chief Scientist (OCS) is to provide strategic coordination of the science that informs the Department's and the Federal government's decisions, policies, and regulations that impact all aspects of U.S. food and agriculture, related landscapes, and communities.

Therefore, REE performance, evaluation, evidence and risk management efforts are coordinated and led by the Office of the Chief Scientist on behalf of the Mission Area. The OCS Strategic Planning, Program Evaluation, and Enterprise Risk Officer leads the Mission Area by chairing two committees: the OCS/REE Performance, Evaluation and Evidence Committee (OCS/REE-PEEC) and the OCS/REE Enterprise Risk Management (ERM) Committee. The two Mission Area committees are comprised of REE agency leaders in performance, evaluation, evidence and risk management, as well as the Mission Area's functional and operational leads as necessary.

ALIGNMENT TO USDA 2022 – 2026 STRATEGIC PLAN

ARS contributes to Goal 2 of the Department's Strategic Goals in the current FY 2022 – 2026 USDA Strategic Plan. Departmental KPIs are performance indicators that are aligned to the Strategic Objectives laid out in the USDA's Strategic Plan.

- Strategic Goal 2: Ensure America's Agricultural System is Equitable, Resilient, and Prosperous
  - Objective 2.3: Foster Agricultural Innovation

SUMMARY OF PERFORMANCE

A more detailed report of the performance plan can be found at https://www.usda.gov/our-agency/aboutusda/performance. The following table summarizes the results for the Departmental Key Performance Indicators (KPIs) for which the ARS is responsible.

Table ARS-25. Key Performance Indicators

Strategic Objective 2.3		2023	2024
USDA Patents	**Results**	**-**	**-**
Percent of USDA Patents Licensed per Patents Issued	**Target**	**35%**	**35%**

Expected Performance Progress Towards the Achievement of Strategic Objectives:

Strategic Objective 2.3: Foster Agricultural Innovation.

USDA Patents: The purpose of this KPI is to approximate the extent to which ARS-funded research led to innovations in the food and agriculture space by tracking patents and licenses associated with ARS-funded research. Advancements in machine learning and artificial intelligence (AI) offer new methods for assessing the path from USDA-funded research to market-based solutions. USDA, led by OBPA and REE, is exploring opportunities to expand on NASS's pilot to develop a new KPI that draws on both citation and patent data.