2013 Explanatory Notes
Agricultural Research Service

Contents

AGRICULTURAL RESEARCH SERVICE

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); Agricultural Research Act of 1935 (7 U.S.C. 427); Research and Marketing Act of 1946 (P.L. 79-733), as amended (7 U.S.C. 427, 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. 3101 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 (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.

ARS is committed to addressing the Department's priorities:

- Assist rural communities to create prosperity so they are self-sustaining, repopulating, and thriving economically.
- Ensure our national forests and private working lands are conserved, restored, and made more resilient to climate change, while enhancing our water resources.
- Help America promote agricultural production and biotechnology exports as America works to increase food security.
- Ensure that all of America's children have access to safe, nutritious, and balanced meals.

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

Geographic Dispersion of Offices and Employees

ARS' Headquarters Offices are located in the Washington, D.C. metropolitan area. The agency's research is organized under 19 national programs. Field activities are managed through eight area offices. Research is conducted at field locations in the United States, the District of Columbia, 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, 2011, there were 6,480 permanent, full-time employees including 469 in the Headquarters offices and 6,011 in field offices.

GAO Audits (Completed)

GAO-11-43, 11/30/2010, Information Security: Federal Agencies Have Taken Steps to Secure Wireless Networks, but Further Actions Can Mitigate Risk.

GAO-11-71, 7/28/2011, Climate Engineering: Technical Status, Future Directions, and Potential Responses.

GAO-11-345, 2/15/2011, Climate Change Issues: Options for Addressing Challenges to Carbon Offset Quality.

GAO-10-383, 2/18/2011, Federal Requirements that May Delay Recovery Act Projects.

GAO-11-376, 5/3/2011, School Meal Programs: More Systematic Development of Specifications Could Improve the Safety of Foods Purchased through USDA's Commodity Program.

GAO-11-484, 6/17/2011, ACORN II.

GAO-11-513, 6/3/2011, Biofuels: Challenges to the Transportation, Sale, and Use of Intermediate Ethanol Blends.

GAO-11-652, 8/19/2011, Homeland Security: Actions Needed to Improve Response to Potential Terrorist Attacks and Natural Disasters Affecting Food and Agriculture.

GAO-11-801, 9/7/2011, Antibiotic Resistance: Agencies Have Made Limited Progress Addressing Antibiotic Use in Animals.

GAO-11-802, 9/15/2011, Chesapeake Bay: Restoration Effort Needs Common Federal and State Goals and Assessment Approach.

460617, 5/23/2011, High Containment Laboratories Duplication of Federal Oversight Activities.

GAO Audits (In Progress)

361185, Renewable Energy Initiatives.

361260, USDA Efforts to Reduce E. Coli.

361302, Pesticides and Food Safety.

440979, Equal Access to Justice Act.

460612, High Containment Laboratories: GAO Assessment of Commissioned Reports on Biosafety and Biosecurity.

460619, Duplication of Federal Inspections of High-Containment Laboratories.

OIG Audits (Completed)

50401-70-FM, 11/15/2011, Fiscal Year 2010 Consolidated Financial Statement Audit.

50601-14-TE, 2/10/2011, USDA's Role in the Export of Genetically Engineered Agricultural Commodities.

50601-16-TE, 5/31/2011, Controls Over Genetically Engineered Animal and Plant Research.

OIG Audits (In Progress)

02601-1-CH, Adequacy of Controls over the Release of Sensitive Data.

50024-01-13, Review of the Department's U.S. Bank Purchase and Travel Charge Card Data.

50099-11-HY, Implementation of Research Misconduct Policy Within the USDA.

50099-84-HY, USDA’s Response to Colony Collapse Disorder.

50501-01-IT, USDA's Management and Security over Wireless Handheld Devices.

50501-1-12, USDA's Security over Domain Name Systems Services.

50501-2-12, FY 2011 Federal Information Security Management Act Audit.

50601-0001-16, Section 632(a) Transfer of Funds from USAID to USDA.

50601-01-22, Effectiveness of the Department’s Recent Efforts to Enhance Agricultural Trade.

50601-6-TE, Controls over Plant Variety Protection and Germplasm Storage.

50601-10-AT, Follow up Report on the Security of Biological Agents at U.S. Department of Agriculture Laboratories.

50601-17-TE, Controls over Importation of Transgenic Plants and Animals.

50703-01-HQ, Oversight and Control of USDA ARRA Activities.

This year, ARS coordinated an audit database clean up with the Department and recognized that the agency was still reporting audits that had been closed in prior years. ARS is not always notified of audit closures, making it difficult to keep the database current. The audits that were closed in prior years are listed below.

120696, 5/7/2009, Global Positioning System.

120788, Date Unknown, DOD Research Facilities and Administration Cost Reimbursement.

194749, 3/13/2009, Improving Federal Oversight and Accountability of Federal Grant Funds.

360855, 2/4/2009, Veterinarian Capabilities for Disease Prevention, Food Safety, and Defense.

360867, 4/29/2008, Carbon Offsets.

360910, 1/29/2009, Regulation of Dietary Supplements and Functional Foods.

360973, 2/5/2010, Biofuels: Potential Effects and Challenges of Required Increases in Production and Use.

440674, 6/30/2010, Integration of U.S. Biosurveillance Efforts.

450547, 8/17/2009, Improving Federal Agency Use of Performance Information.

450696, 11/24/2009, National Pandemic Implementation Plan Action Items Assessment.

460579, 9/21/2009, High-Containment Laboratories: National Strategy for Oversight Is Needed.

460599, 9/10/2010, Safety Reporting Options for Bio-Safety Labs.

AGRICULTURAL RESEARCH SERVICE

Available Funds and Staff Years

(Dollars in thousands)

Item	2010 Actual		2011 Actual		2012 Estimate		2013 Estimate	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Salaries and Expenses:								
Discretionary Appropriations.............	$1,179,639	7,770	$1,135,501	7,529	$1,094,647	7,294	$1,102,565	7,294
Building and Facilities:								
Discretionary Appropriations.............	70,873	-	-	-	-	-	-	-
Rescission..	-	-	-231,853	-	-	-	-	-
Transfers In..	2,145	-	131	-	-	-	-	-
Adjusted Appropriation......................	1,252,657	7,770	903,779	7,529	1,094,647	7,294	1,102,565	7,294
Balance Available, SOY.......................	375,544	-	263,180	-	16,943	-	2,674	-
Other Adjustments (Net).......................	2,500	-	3,435	-	-	-	-	-
Total Available..................................	1,630,701	7,770	1,170,394	7,529	1,111,590	7,294	1,105,239	7,294
Lapsing Balances.................................	-7,907	-	-1,856	-	-	-	-	-
Balance Available, EOY.......................	-263,180	-	-16,943	-	-2,674	-	-629	-
Obligations..	1,359,614	7,770	1,151,595	7,529	1,108,916	7,294	1,104,610	7,294
Obligations under other USDA appropriations: 1/								
Agricultural Marketing Service……….	288	1	307	1	306	1	306	1
Agriculture & Food Research Initiative (AFRI)………………………	7,269	29	4,095	16	4,081	16	4,081	16
Animal & Plant Health Inspection Service…………………………………	15,487	61	16,108	65	16,052	65	16,052	65
Assistant Secretary for Civil Rights……	110	1	-	-	-	-	-	-
Departmental Administration………….	3,117	13	222	1	222	1	222	1
Economic Research Service...................	3,180	13	3,407	13	3,395	13	3,395	13
Food, Nutrition & Consumer Services....	1,442	6	1,468	6	1,463	6	1,463	6
Food Safety & Inspection Service..........	1,165	4	3,281	13	3,270	13	3,270	13
Foreign Agricultural Service	13,719	54	7,567	30	7,540	30	7,540	30
Forest Service	1,404	6	1,527	6	1,522	6	1,522	6
Hazardous Waste	1,098	4	3,402	14	3,390	14	3,390	14
National Agricultural Statistics Service..	4,438	18	4,683	19	4,666	19	4,666	19
National Institute of Food and Agriculture...	9,784	39	15,899	63	15,844	63	15,844	63
Natural Resources Conservation Service..	1,721	7	3,627	14	3,614	14	3,614	14
Risk Management Agency	-	-	158	1	157	1	157	1
Specialty Crops Research Initiative (SCRI, NIFA)........................	2,188	10	2,123	8	2,116	8	2,116	8
Misc., Other USDA Funds…………….	1,638	7	935	4	932	4	932	4
Total, Other USDA............................	68,048	273	68,809	274	68,570	274	68,570	274
Total, Agriculture Appropriations..........	1,427,662	8,043	1,220,404	7,803	1,177,486	7,568	1,173,180	7,568

AGRICULTURAL RESEARCH SERVICE

Available Funds and Staff Years

(Dollars in thousands)

Item	2010 Actual		2011 Actual		2012 Estimate		2013 Estimate	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Other Federal Funds: 1/								
Agency for International Development..	1,832	7	2,802	11	2,792	11	2,792	11
Department of Commerce..................	132	1	-	-	-	-	-	-
Department of Defense.....................	5,641	22	5,945	24	5,924	24	5,924	24
Department of Energy......................	1,820	7	1,491	6	1,486	6	1,486	6
Department of Health & Human Services....................................	6,073	24	8,448	33	8,419	33	8,419	33
Department of Homeland Security........	3,565	14	3,519	14	3,507	14	3,507	14
Department of State.........................	538	2	1,181	5	1,177	5	1,177	5
Department of the Interior................	1,653	7	1,815	7	1,809	7	1,809	7
Department of Treasury....................	111	1	116	1	115	1	115	1
Environmental Protection Agency........	1,294	5	401	2	400	2	400	2
National Aeronautics & Space Administration............................	637	3	1,143	5	1,139	5	1,139	5
Strategic Environmental Research Development Program (SERDP)........	173	1	513	2	511	2	511	2
Misc., Other Federal Funds................	1,402	6	140	1	140	1	140	1
Total, Other Federal...........................	24,871	100	27,514	111	27,419	111	27,419	111
Non-Federal Funds: 1/								
Arizona, University of......................	240	1	106	1	105	1	105	1
Arkansas, University of..........................	184	1	155	1	155	1	155	1
Auburn University..................................	-	-	131	1	131	1	131	1
Baylor College of Medicine....................	171	1	146	1	145	1	145	1
Binational Agricultural Research Research & Development (BARD).....	293	1	224	1	223	1	223	1
California, State of.................................	1,022	4	1,366	5	1,361	5	1,361	5
California, University of.........................	764	3	1,558	6	1,553	6	1,553	6
Citrus Research & Development Foundation..................................	419	2	-	-	-	-	-	-
City of Sioux Falls Public Works.........	-	-	240	1	239	1	239	1
Cornell University..................................	442	2	483	2	481	2	481	2
Cotton Incorporated...............................	876	4	680	3	678	3	678	3
Danforth Plant Science Center................	-	-	167	1	166	1	166	1
Delaware, University of..........................	-	-	142	1	141	1	141	1
Delta Health Alliance.............................	361	1	-	-	-	-	-	-
District of Columbia Department of the Environment (DCDOE)	500	2	-	-	-	-	-	-
Florida Citrus Research and Development Foundation......................	-	-	1,465	6	1,460	6	1,460	6
Florida Citrus Packers Association.......	-	-	161	1	160	1	160	1
Florida Citrus Production Research Advisory Council.................................	157	1	110	1	109	1	109	1
Florida, State of......................................	1,074	4	1,133	4	1,129	4	1,129	4
Florida, University of..............................	336	1	407	2	406	2	406	2

AGRICULTURAL RESEARCH SERVICE
Available Funds and Staff Years
(Dollars in thousands)

Item	2010 Actual		2011 Actual		2012 Estimate		2013 Estimate	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Non-Federal Funds: (continued)								
Food and Agricultural Organization of United Nations (FAO)…………………	393	1	155	1	155	1	155	1
Georgia, University of............................	296	1	437	2	436	2	436	2
Hispanic Serving Institutions National Program...	1,704	7	1,275	5	1,271	5	1,271	5
Idaho, University of................................	232	1	255	1	254	1	254	1
Illinois, University of.............................	165	1	200	1	199	1	199	1
Iowa, State of...	-	-	122	1	121	1	121	1
Iowa State University.............................	344	1	490	2	488	2	488	2
Kansas Bioscience Authority.................	1,022	4	478	2	476	2	476	2
Kansas State University..........................	295	1	167	1	166	1	166	1
Maryland, University of.........................	120	1	189	1	189	1	189	1
Masschusetts, University of...................	-	-	110	1	110	1	110	1
Michigan State University......................	132	1	258	1	258	1	258	1
Minnesota, University of........................	448	2	550	3	548	3	548	3
National Cattlemen's Beef Association..	-	-	130	1	130	1	130	1
National Pork Board...............................	335	1	126	1	125	1	125	1
Nebraska Community Foundation...........	124	1	139	1	138	1	138	1
Nebraska, State of..................................	-	-	157	1	156	1	156	1
Nebraska, University of..........................	179	1	170	1	169	1	169	1
North Carolina State University.............	107	1	101	1	101	1	101	1
North Carolina, University of.................	-	-	285	1	284	1	284	1
North Dakota State University	232	1	275	1	274	1	274	1
Ohio State University.............................	-	-	133	1	133	1	133	1
Ocean Spray Cranberry..........................	-	-	180	1	179	1	179	1
Oregon State University.........................	139	1	126	1	126	1	126	1
Pennsylvania State University................	297	1	300	1	299	1	299	1
Revocable Permits & Easements............	345	-	1,045	-	1,041	-	1,041	-
Sale of Animals & Personal Property (Proceeds)……………………………	209	-	985	-	981	-	981	-
South Dakota State University................	529	2	674	3	671	3	671	3
South Florida Water Management District	420	2	395	2	394	2	394	2
Texas A&M University..........................	207	1	176	1	176	1	176	1
Texas Agrilife Research & Extension Center	408	2	484	2	482	2	482	2
Texas, State of..	164	1	-	-	-	-	-	-
Travel and Miscellaneous Reimbursements..................................	142	-	403	-	401	-	401	-
United Soybean Board...........................	4,254	17	4,836	18	4,820	18	4,820	18
Utah State University……………………	124	1	-	-	-	-	-	-
Vermont, State of………………………	175	1	-	-	-	-	-	-
Virginia Polytechnic Institute..................	-	-	116	1	116	1	116	1
Washington State University..................	238	1	315	1	314	1	314	1

AGRICULTURAL RESEARCH SERVICE

Available Funds and Staff Years

(Dollars in thousands)

Item	2010 Actual		2011 Actual		2012 Estimate		2013 Estimate	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Non-Federal Funds: (continued)								
Washington Tree Fruit Research............ Commission	-	-	239	1	238	1	238	1
Misc., Non-Federal Funds………………	4,421	18	3,964	12	3,950	12	3,950	12
Total, Non-Federal Funds...................	25,039	102	29,114	113	29,011	113	29,011	113
Miscellaneous Contributed Funds:	18,447	37	25,212	132	25,000	132	25,000	132
Total, ARS...	1,496,019	8,282	1,302,244	8,159	1,258,916	7,924	1,254,610	7,924

1/ All funding received is in support of agricultural research.

AGRICULTURAL RESEARCH SERVICE

Permanent Positions by Grade and Staff Year Summary

Grade	2010 Actual			2011 Actual			2012 Estimate			2013 Estimate		
	Head-quarters	Field	Total	Head-quarters	Field	Total	Head-quarters	Field	Total	Head-quarters	Field	Total
SES	11	26	37	10	24	34	10	24	34	10	24	34
GS/GM-15	51	621	672	50	623	673	47	601	649	47	601	649
GS/GM-14	63	620	683	64	643	707	61	620	681	61	620	681
GS/GM-13	138	614	752	133	557	690	126	537	664	126	537	664
GS-12	115	438	553	111	413	524	105	399	504	105	399	504
GS-11	39	616	655	37	601	638	35	580	615	35	580	615
GS-10	3	8	11	1	10	11	1	10	11	1	10	11
GS-9	40	1,045	1,085	46	1,035	1,081	44	999	1,042	44	999	1,042
GS-8	26	401	427	25	394	419	24	380	404	24	380	404
GS-7	57	750	807	48	719	767	46	694	739	46	694	739
GS-6	28	324	352	31	308	339	29	297	327	29	297	327
GS-5	24	210	234	14	187	201	13	180	194	13	180	194
GS-4	6	39	45	8	43	51	8	41	49	8	41	49
GS-3	3	17	20	0	17	17	0	16	16	0	16	16
GS-2	0	8	8	0	11	11	0	11	11	0	11	11
Other Graded Positions......	6	0	6	4	0	4	4	0	4	4	0	4
Ungraded Positions......	0	542	542	0	528	528	0	528	528	0	528	528
Total Permanent Positions......	610	6,279	6,889	582	6,113	6,695	553	5,918	6,471	553	5,918	6,471
Unfilled Positions end-of-year..	121	111	232	113	102	215	108	118	226	108	118	226
Total Permanent Full-Time Employment, end-of-year..	489	6,168	6,657	469	6,011	6,480	445	5,800	6,245	445	5,800	6,245
Staff Year Estimate.....	510	7,772	8,282	500	7,659	8,159	476	7,448	7,924	476	7,448	7,924

AGRICULTURAL RESEARCH SERVICE

SIZE, COMPOSITION AND COST OF MOTOR VEHICLE FLEET

The 2013 Budget Estimates propose the replacement of 3 passenger motor vehicles**.** These acquisitions will replace existing vehicles without additions to the fleet. Due to the timing of vehicle receipt and sales through the exchange/sale process, there may be an overlap in the vehicle receipt, replacement, and disposal inventory. However, we are not adding to the overall fleet.

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, and commercial firms, etc. 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 requires quarterly vehicle operational reports and makes periodic surveys to determine the extent of vehicle use. 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. 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 for light trucks are six years or 60,000 miles. All proposed replacement vehicles exceed minimum standards.

The composition of the ARS fleet is primarily light duty trucks. Multi-purpose vehicles enable research personnel to move equipment and transport personnel. Past practices have allowed ARS to decrease the number of passenger vehicles. However, it may be necessary to replace light duty vans with more fuel-efficient passenger vehicles to help reduce fuel costs. ARS will continue to review its fleet for opportunities to realign the fleet where it is necessary, without affecting the mission. The agency continues to review inventory information to accurately classify the fleet.

AGRICULTURAL RESEARCH SERVICE
Size, Composition, and Annual Operating Costs of Vehicle Fleet

Fiscal Year	Number of Vehicles by Type *								Annual Operating Costs ($ in 000) **
	Sedans and Station Wagons	Light Trucks, SUVs, and Vans		Medium Duty Vehicles	Ambu-lances	Buses	Heavy Duty Vehicles	Total Number of Vehicles	
		4x2	4x4						
2010	279	1,422	836	923	-	1	42	3,503	$3,905
Change**	-23	+300	-298	+20	-	+1	+13	+13	-355
2011	256	1,722	538	943	-	2	55	3,516	3,550
Change	-	-1	-6	-4	-	-	-	-11	+213
2012	256	1,721	532	939	-	2	55	3,505	3,763
Change	-1	+8	-4	-3	-	-	-	-	+226
2013	255	1,729	528	936	-	2	55	3,505	3,989

* These numbers include vehicles that are owned by the agency and leased from GSA.
** The result of a clean-up effort.

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AGRICULTURAL RESEARCH SERVICE
Proposed Language Changes

The estimates include appropriation language for this item as follows (new language underscored; deleted matter enclosed in brackets):

Salaries and Expenses:

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, [$1,094,647,000]$1,102,565,000: 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 $375,000, except for headhouses or greenhouses which shall each be limited to $1,200,000, and except for 10 buildings to be constructed or improved at a cost not to exceed $750,000 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 $375,000, whichever is greater: 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 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.

AGRICULTURAL RESEARCH SERVICE

Salaries and Expenses

Appropriations Act, 2012	$1,094,647,000
Budget Estimate, 2013	1,102,565,000
Change from 2012 Appropriation	+7,918,000

AGRICULTURAL RESEARCH SERVICE

Summary of Increases and Decreases
(Dollars in thousands)

	2010 Actual	2011 Change	2012 Change	2013 Change	2013 Estimate
Discretionary Appropriations:					
Product Quality/Value Added	$111,056	-$6,019	-$4,496	-$7,334	$93,207
Livestock Production	87,883	-6,495	-5,334	-4,647	71,407
Crop Production	240,124	-7,882	-3,235	-494	228,513
Food Safety	107,597	-808	-579	+2,044	108,254
Livestock Protection	90,216	-10,863	-3,187	+1,403	77,569
Crop Protection	205,710	-2,503	-9,397	-9,818	183,992
Human Nutrition	89,734	-4,294	-2	-1,128	84,310
Environmental Stewardship	207,583	-6,620	-11,929	+24,849	213,883
National Agricultural Library	22,233	-890	-424	+43	20,962
Repair and Maintenance	17,503	-35	-	+3,000	20,468
Total, Appropriation or Change	1,179,639	-46,409	-38,583	+7,918	1,102,565

AGRICULTURAL RESEARCH SERVICE

Project Statement
(On basis of appropriations)
(Dollars in thousands)

Program	2010 Actual		2011 Actual		2012 Estimate		Change			2013 Estimate	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years	Amount		Staff Years	Amount	Staff Years
Salaries and Expenses											
Discretionary Appropriations:											
Product Quality/Value Added.....	$111,056	866	$105,037	835	$100,541	796	-$7,334	(1)	-5	$93,207	791
Livestock Production...............	87,883	467	81,388	450	76,054	438	-4,647	(2)	-2	71,407	436
Crop Production.....................	240,124	1,511	232,242	1,743	229,007	1,719	-494	(3)	-	228,513	1,719
Food Safety..........................	107,597	787	106,789	787	106,210	783	+2,044	(4)	+6	108,254	789
Livestock Protection................	90,216	518	79,353	499	76,166	478	+1,403	(5)	+5	77,569	483
Crop Protection......................	205,710	1,324	203,207	1,276	193,810	1,220	-9,818	(6)	-4	183,992	1,216
Human Nutrition....................	89,734	279	85,440	279	85,438	279	-1,128	(7)	-	84,310	279
Environmental Stewardship........	207,583	1,891	200,963	1,539	189,034	1,460	+24,849	(8)	-	213,883	1,460
National Agricultural Library......	22,233	127	21,343	121	20,919	121	+43	(9)	-	20,962	121
Repair and Maintenance............	17,503	-	17,468	-	17,468	-	+3,000	(10)	-	20,468	-
Subtotal................................	1,179,639	7,770	1,133,230	7,529	1,094,647	7,294	+7,918		-	1,102,565	7,294
Funds included for											
Homeland Security.............	[39,170]	-	[35,715]	-	[35,721]	-	-		-	[35,721]	-
Total Adjusted Appropriation..	1,179,639	7,770	1,133,230	7,529	1,094,647	7,294	7,918	-	-	1,102,565	7,294
Rescissions and											
Transfers (Net).........................	-	-	2,271	-	-	-	-		-	-	-
Total Appropriation.................	1,179,639	7,770	1,135,501	7,529	1,094,647	7,294	+7,918		-	1,102,565	7,294
Transfers In:											
Congressional Relations...........	145	-	131	-	-	-	-		-	-	-
Health and Human Services.....	2,000	-	-	-	-	-	-		-	-	-
Subtotal................................	2,145	-	131	-	-	-	-		-	-	-
Rescission....................................	-	-	-2,271	-	-	-	-		-	-	-
Bal. Available, SOY....................	3,597	-	5,219	-	6,845	-	-6,845		-	-	-
Recoveries/Adj, Other (Net)........	1,205	-	3,122	-	-	-	-		-	-	-
Total Available.........................	1,186,586	7,770	1,141,702	7,529	1,101,492	7,294	+1,073		-	1,102,565	7,294
Lapsing Balances.........................	-3,081	-	-1,856	-	-	-	-		-	-	-
Bal. Available, EOY....................	-5,219	-	-6,845	-	-	-	-		-	-	-
Total Obligations.....................	1,178,286	7,770	1,133,001	7,529	1,101,492	7,294	+1,073		-	1,102,565	7,294

AGRICULTURAL RESEARCH SERVICE

Project Statement
(On basis of obligations)
(Dollars in thousands)

Program	2010 Actual Amount	2010 Actual Staff Years	2011 Actual Amount	2011 Actual Staff Years	2012 Estimate Amount	2012 Estimate Staff Years	Change Amount		Change Staff Years	2013 Estimate Amount	2013 Estimate Staff Years
Salaries and Expenses											
Discretionary Obligations:											
Product Quality/Value Added.	$110,551	866	$104,780	835	$100,541	796	-$7,334	(1)	-5	$93,207	791
Livestock Production……….	87,484	467	81,189	450	76,054	438	-4,647	(2)	-2	71,407	436
Crop Production…………….	239,032	1,511	231,804	1,743	229,007	1,719	-494	(3)	-	228,513	1719
Food Safety………………….	107,597	787	106,789	787	106,210	783	+2,044	(4)	+6	108,254	789
Livestock Protection………..	89,806	518	79,159	499	76,166	478	+1,403	(5)	+5	77,569	483
Crop Protection………………	204,829	1,324	202,710	1,276	193,810	1,220	-9,818	(6)	-4	183,992	1216
Human Nutrition……………	89,734	279	85,440	279	85,438	279	-1,128	(7)	-	84,310	279
Environmental Stewardship…	206,639	1,891	200,471	1,539	189,034	1,460	+24,849	(8)	-	213,883	1460
National Agricultural Library.	23,570	127	22,047	121	20,919	121	+43	(9)	-	20,962	121
Repair and Maintenance…….	17,461	-	17,116	-	17,468	-	+3,000	(10)	-	20,468	-
Subtotal...........................	1,176,703	7,770	1,131,505	7,529	1,094,647	7,294	+7,918		-	1,102,565	7,294
H1N1 Influenza…………….	1,416	-	-	-	-	-	-	-	-	-	-
Misc. Fees/Supplementals……	167	-	1,496	-	6,845	-	-6,845	-	-	-	-
Funds included for Homeland Security..........	[39,170]	-	[35,715]	-	[35,721]	-	-		-	[35,721]	-
Total Obligations................	1,178,286	7,770	1,133,001	7,529	1,101,492	7,294	1,073	-	-	1,102,565	7,294
Lapsing Balances...................	3,081	-	1,856	-	-	-	-	-	-	-	-
Bal. Available, EOY..............	5,219	-	6,845	-	-	-	-	-	-	-	-
Total Available...................	1,186,586	7,770	1,141,702	7,529	1,101,492	7,294	+1,073		-	1,102,565	7,294
Transfers In:	-2,145	-	-131	-	-	-	-		-	-	-
Rescission..............................	-	-	2,271	-	-	-	-		-	-	-
Bal. Available, SOY..............	-3,597	-	-5,219	-	(6,845)	-	+6,845		-	-	-
Other Adjustments (Net)........	-1,205	-	-3,122	-	-	-	-		-	-	-
Total Appropriation.............	1,179,639	7,770	1,135,501	7,529	1,094,647	7,294	+7,918		-	1,102,565	7,294

AGRICULTURAL RESEARCH SERVICE
Proposed FY 2013 Program Increases and Decreases
(Dollars in Millions)

	New Prod. Prod. Quality	Livestock Production	Crop Production	Food Safety	Livestock Protection	Crop Protection	Human Nutrition	Environ. Stewardship	NAL	Repair and Maintenance	Grand Total
FY 2012 Base	100.541	76.054	229.007	106.210	76.166	193.810	85.438	189.034	20.919	17.468	1,094.647
Reductions:											
Lower Priorities	-7.601	-3.356	-2.692	0.000	-2.676	-23.807	0.000	-8.778	-1.500	0.000	-50.410
Extramural	-0.033	-5.465	-2.214	-3.478	-0.221	-1.684	-4.115	-2.872	0.000	0.000	-20.082
Subtotal	-7.634	-8.821	-4.906	-3.478	-2.897	-25.491	-4.115	-11.650	-1.500	0.000	-70.492
Increases:											
Pay Cost	0.300	0.162	0.625	0.283	0.179	0.461	0.100	0.553	0.043	0.000	2.706
Enhance Livestock Production		4.012									4.012
Floral/Nursery Research			3.206								3.206
Crop Genetic Resources			0.581								0.581
Food Safety				5.239							5.239
Enhance Animal Health					4.121						4.121
Soil Microbial Ecology						7.600					7.600
Control Invasive Pests						2.978					2.978
Enhance Crop Protection						2.884					2.884
Crop Fungal Disease Protection						1.750					1.750
Human Nutrition Research							2.887				2.887
Enhance Crop Land Productivity								20.000			20.000
Enhance Natural Resources								10.946			10.946
Improve Water/Soil Quality								5.000			5.000
Digital Information Services									1.500		1.500
Maintenance Backlog										3.000	3.000
Subtotal	0.300	4.174	4.412	5.522	4.300	15.673	2.987	36.499	1.543	3.000	78.410
Total Changes	-7.334	-4.647	-0.494	2.044	1.403	-9.818	-1.128	24.849	0.043	3.000	7.918
Grand Total, FY 2013 Budget	93.207	71.407	228.513	108.254	77.569	183.992	84.310	213.883	20.962	20.468	1,102.565

JUSTIFICATION OF INCREASES AND DECREASES

The President's 2013 Budget recommends $1.103 billion for ARS' Salaries and Expenses account, an increase of $7.9 million from the 2012 operating level. Program increases of $72.7 million are proposed for expanded research initiatives in crop/animal breeding and protection, food safety, human nutrition, production systems for sustainable agriculture, and the National Agricultural Library. Pay costs of $2.7 million are also proposed. In addition, the President's Budget proposes an increase of $3 million for the repair and maintenance of ARS' laboratories and facilities. The proposed program increases will be financed from a reduction of $20.1 million in ongoing extramural research projects, and from the reallocation of $50.4 million in existing resources, which will involve the closure of six ARS laboratories/locations and the consolidation of those resources with other existing ARS laboratories and locations. The costs associated with the relocation or separation of the approximately 112 employees impacted by the closures/consolidations, and the disposal of associated property is estimated to range from $10 to $12 million.

(1) New Products/Product Quality/Value Added – A decrease of $7,334,000 ($100,541,000 available in 2012).

a) <u>An increase of $300,000 to fund increased pay costs</u>.

<u>Need for Change</u>

Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs and carrying out ARS' mission. Absorption of these costs reduces the number of scientists and support personnel essential for conducting the agency's research programs. If pay costs are not fully funded, ARS will be unable to fill critical positions and will have to reduce spending for much needed laboratory equipment, supplies, and other materials.

b) <u>A decrease of $7,601,000 from ongoing research projects to support higher priority research initiatives, and offset proposed pay cost increases</u>.

<u>Need for Change</u>

The 2013 Budget recommends selected high priority research initiatives which address the Administration's science and technology priorities and the Department's Strategic Goals. To finance these initiatives, within limited resources, some existing projects are proposed for reduction or termination given that they are: (1) considered by the Administration to be of lower priority; (2) mature where the research objectives have been mainly accomplished; (3) duplicative or can be accomplished more effectively elsewhere in ARS; (4) marginal or below threshold funding for program viability or sustainability; (5) conducted in substandard or inadequate infrastructure and future costs are prohibitive; (6) lacking a critical mass of scientists/support personnel for an effective program; or (7) are carried out by other research institutions. The savings achieved from these reductions/terminations will be redirected to finance the higher priority agricultural research initiatives identified in the 2013 Budget, and will improve program and operational efficiencies.

MD, Beltsville – Evaluation and Maintenance of Flavor, Nutritional, and Other Quality Attributes of Fresh and Fresh-Cut Produce (-$1,984,000)
MD, Beltsville – Genetic and Biochemical Mechanisms Determining Fresh Produce Quality and Storage Life (-$1,181,000)
MD, Beltsville – Optical and Mechanical Instrumentation for Quality Assessment of Small Grains (-$360,000)
PA, Wyndmoor – Biobased Industrial Products from Food Animal Processing By-Products (-$743,000)
PA, Wyndmoor – Environmentally Friendly Processes and New Applications for Animal Hides and Leather (-$1,892,000)
PA, Wyndmoor – Production and Value Enhancement of Biosurfactants and Biopolymers Derived from Agricultural Lipids and Coproducts (-$1,018,000)
PA, Wyndmoor – Wool and Keratin from Wool for Biobased Value-Added Products (-$423,000)

c) A decrease of $33,000 in ongoing extramural research projects.

Need for Change

Research projects under this program activity are proposed for termination given that they are considered by the Administration to be of lower priority, and/or the research conducted is carried out by other institutions. The savings achieved from these terminations will serve to permit resources to be reallocated to more critical needs.

NM, Las Cruces – Long Staple Cotton (-$33,000)

d) ARS' base funding for New Products/Product Quality/Value Added research in 2012 is $100,541,000.

ARS' research program is directed toward: (1) improving the efficiency and reducing the cost for the conversion of agricultural products into biobased products and biofuels; (2) developing new and improved products to help establish them in domestic and foreign markets; and (3) providing higher quality, healthy foods that satisfy consumer needs in the United States and abroad.

(2) Livestock Production – A decrease of $4,647,000 ($76,054,000 available in 2012).

a) An increase of $162,000 to fund increased pay costs.

Need for Change

Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs and carrying out ARS' mission. Absorption of these costs reduces the number of scientists and support personnel essential for conducting the agency's research programs. If pay costs are not fully funded, ARS will be unable to fill critical positions and will have to reduce spending for much needed laboratory equipment, supplies, and other materials.

b) An increase of $4,012,000 to Enhance Livestock Production in the United States.

Need for Change

World hunger is a major threat to global stability. Population increases over the next 40 years are projected to occur most rapidly in regions of the world that are currently the most food stressed. One of the keys to meeting the demands of the growing population will be improving the productivity of animals.

Improving productivity depends on having the tools to optimize the interaction between the genetic potential of animals and the production environment. Until recently it was impossible to directly study the genes responsible for important traits like productivity or nutrient efficiency. These challenges are beginning to be met by exploiting the inherent potential in genomes by enabling the unraveling of complex traits such as production efficiency. The development of high resolution genome sequences for animals are providing the necessary infrastructure to conduct genomic selection. Animal breeders have enhanced the genetic potential of key livestock, poultry, fish and shellfish. By matching animals with their environment through the best design for dairies, feedlots, and aquaculture systems, producers have some control over the environments imposed on the production system. Among the traits most important for addressing world hunger will be feed efficiency (i.e., the most efficient use of feed by livestock). This is because research to improve feed efficiency will increase productivity by reducing the level of inputs required and optimizing use of inputs to reduce outputs such as animal waste.

The funding requested for animal production projects will enhance current programs. Across all species genetic improvement is critical to improving production systems. This funding enhancement will strengthen the program in genetic improvement by enhancing selective breeding efforts through incorporation of genomic information. Optimizing nutrient utilization is key to reducing feed inputs and waste outputs. Building databases that connect DNA sequence and performance data are key to the next generation of production and efficiency advances. Developing systems, with animals reared in synchrony with their environments will maximize production efficiencies. For example, research is needed to increase the efficiency of ruminant forage utilization in concert with ecosystem services that conserve and enhance forage resources. Aquaculture, too, requires efforts to tailor fish to a water reuse type of system, with consistent water quality, low disease risk, and high efficiency of waste capture. These improvements will drive commercial growth of aquaculture and enhance sustainability of animal production generally.

Outcomes

The impact of improving the utilization of feed by livestock could result in $1.8 billion in savings to the beef cattle and swine industries. In addition, research to improve the efficiency of feed will help safeguard food security by improving the adaptability and sustainability of animals which will ensure the availability of agricultural products to consumers worldwide. Also, improvements in the nutritional value of animal products will provide higher quality food for all consumers.

Optimal matching of forage management to animal genetics and production systems will enable profitable and sustainable use of grasslands, erodible lands, and marginally productive lands. Integrated systems will increase the forage efficiency of ruminant species, leveraging these resources in sustainable programs that improve the efficiency of forage utilization and preserve and enhance ecosystem integrity.

Emerging genomic technologies will increase the efficiency of nutrient utilization of livestock, poultry, and aquatic animal production systems which will positively impact sustainability through reduced feed input, waste, and odor production.

Means to Achieve Change

- Develop Integrated Production Systems that Incorporate Enhanced Germplasm and Pest/Pathogen/Water/Nutrient Management Strategies to Improve Production Efficiencies and Product Quality in Farm Animals ($4,012,000). ARS will:
  - Identify germplasm that is suitable for pasture-raised beef and traditional feedlot production systems, and improve production efficiency and product quality in these animals.
  - Enhance Atlantic salmon germplasm to improve production efficiency, reproduction, resistance to pathogens, and product quality.
  - Identify and develop new value added catfish products.

c) A decrease of $3,356,000 from ongoing research projects to support higher priority research initiatives, and offset proposed pay cost increases.

Need for Change

The 2013 Budget recommends selected high priority research initiatives which address the Administration's science and technology priorities and the Department's Strategic Goals. To finance these initiatives, within limited resources, some existing projects are proposed for reduction or termination given that they are: (1) considered by the Administration to be of lower priority; (2) mature where the research objectives have been mainly accomplished; (3) duplicative or can be accomplished more effectively elsewhere in ARS; (4) marginal or below threshold funding for program viability or sustainability; (5) conducted in substandard or inadequate infrastructure and future costs are prohibitive; (6) lacking a critical mass of scientists/support personnel for an effective program; or (7) are carried out by other research institutions. The savings achieved from these reductions/terminations will be redirected to finance the higher priority agricultural research initiatives identified in the 2013 Budget, and will improve program and operational efficiencies.

LA, New Orleans – Bioremediation of Geosmin and MIB (-$748,000)
MI, East Lansing - Using the Genome to Understand Immunogenetics of Poultry (-$1,445,000)
OK, El Reno - Development and Assessment of a System to Produce Grass-Fed Beef for the Southern Great Plains (-$1,163,000)

d) A decrease of $5,465,000 in ongoing extramural research projects.

Need for Change

Research projects under this program activity are proposed for termination given that they are considered by the Administration to be of lower priority, and/or the research conducted is carried out by other institutions. The savings achieved from these terminations will serve to permit resources to be reallocated to more critical needs.

KY, Lexington – Improved Forage Livestock Production (-$922,000)
MD, Beltsville – Bovine Genetics (-$221,000)
MS, Stoneville – Warmwater Aquaculture (-$285,000)
MS, Stoneville – Biotechnology Research to Improve Crops and Livestock (-$697,000)
MS. Stoneville – National Warmwater Aquaculture Center (Catfish Health) (-$217,000)
NE, Clay Center – Livestock Genome Mapping Initiative (-$343,000)
WV, Leetown – Aquaculture Systems (Rainbow Trout) (-$467,000)
WV, Leetown – Aquaculture (Trout Genome) (-$503,000)
WV, Leetown – Coldwater Aquaculture (-$1,810,000)

e) ARS' base funding for Livestock Production research in 2012 is $76,054,000.

ARS' research program is directed toward: (1) safeguarding and utilizing animal genetic resources, associated genetic and genomic databases, and bioinformatic tools; (2) developing a basic understanding of the physiology of livestock and poultry; and (3) developing information, tools, and technologies that can be used to improve animal production systems. 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 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.

(3) Crop Production – A decrease of $494,000 ($229,007,000 available in 2012).

a) An increase of $625,000 to fund increased pay costs.

Need for Change

Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs and carrying out ARS' mission. Absorption of these costs reduces the number of scientists and support personnel essential for conducting the agency's research programs. If pay costs are not fully funded, ARS will be unable to fill critical positions and will have to reduce spending for much needed laboratory equipment, supplies, and other materials.

b) An increase of $3,206,000 to Enhance Floral and Nursery Research.

Need for Change

Floral and nursery crops collectively constitute the third largest value farm crop in the United States. It is a multi-billion dollar segment of the U.S. economy at wholesale, and about 15 percent of total U.S. crop receipts. But the profitability, sustainability, and economic vitality of this critical segment of U. S. crop agriculture is threatened by various factors. Improved product quality is needed to enhance the competitiveness of U.S. producers through improved nursery and floral products, production practices, and new approaches for mitigating environmental concerns. Virulent pests and diseases, including those imported as a result of increased global trade, cause great economic and environmental damage, and require effective control. Enhanced environmental stewardship requires reduced use of chemicals, increased biological pest controls, environmental remediation, reduced runoff, use of byproducts from production, and more sustainability in the use of materials and waste products.

Outcomes

An integrated, multi-locational floral and nursery crop research initiative will focus ARS multidisciplinary research teams – leveraged by complementary industry resources – on floral and nursery crops to: improve environmental and resource management strategies; develop superior pest (i.e., insect, disease, and weed) control strategies; and refine nursery and floricultural production system practices. A stronger floriculture and nursery crop industry will strengthen U.S. rural and suburban economies by providing better technologies to growers across the United States.

Means to Achieve Change

- Floral and Nursery Crop Research Initiative ($3,206,000). ARS will:
  - Develop more effective systems for producing disease free floricultural propagating material and for monitoring plant health status.
  - Devise innovative methods of minimizing run-off of nutrients and waste water from nursery crop production systems by optimizing water and nutrient inputs, application, and onsite management.
  - Improve integrated pest management systems for floricultural bedding plant production.
  - Characterize and develop the means to control major fungal and oomycete diseases which cause economic losses and quarantine restrictions for nursery crop production.
  - Identify, test, and optimize alternative substrates for pot production of nursery crops, especially in the southeastern United States.
  - Develop more effective means for detecting, diagnosing, and controlling major viral and bacterial diseases of floricultural crops.

c) An increase of $581,000 for Crop Genetic Resources to Underpin Food Security.

Need for Change

There are widespread concerns about the global capacity to furnish expanding human populations with adequate food, feed, fiber, and fuel at affordable prices. Crop breeding and genomics are key tools for enhancing crop productivity. They depend on ready access to raw and improved genetic resources for success. Genetic resources are the foundation of our agricultural future. The U. S. National Plant Germplasm System (NPGS) genebanks contain the sources of resistance to biotic and abiotic stresses and new genes to improve the quantity and quality of our crops. To ensure that those genes are available for research and breeding, ARS must continue to acquire and conserve germplasm that contain them; develop new screening methods for identifying favorable traits; distribute germplasm where and when it is needed; and safeguard these collections for future generations.

Outcomes

The proposed research and expanded genetic resource management capacities will enhance the NPGS' ability to conduct genetic resource regeneration, characterization, and documentation to safeguard genetic resources which are difficult to handle. Information associated with the genetic resources will be maintained and delivered through enhanced information management systems administered by highly trained information technologists. Additional researchers will conduct research on priority objectives, such as long-term storage of clonally propagated crops and new applications of genomic technology to genetic resource management.

Means to Achieve Change

- Crop Genetic Resources for Food Security ($581,000). ARS will:
  - Expand operational capacity to multiply plant genetic resources, and describe and document their key genetic traits.

- Enhance the capacity of the Germplasm Resources Information Network (GRIN-Global) to manage key data associated with the genetic resources.
- Expand research to develop new means for long-term, ultra cold storage of crops propagated by tubers, roots, or cuttings, and wild crop relatives.
- Increase capacity to apply leading edge genetic analyses to gene bank management.

d) A decrease of $2,692,000 from ongoing research projects to support higher priority research initiatives, and offset proposed pay cost increases.

Need for Change

The 2013 Budget recommends selected high priority research initiatives which address the Administration's science and technology priorities and the Department's Strategic Goals. To finance these initiatives, within limited resources, some existing projects are proposed for reduction or termination given that they are: (1) considered by the Administration to be of lower priority; (2) mature where the research objectives have been mainly accomplished; (3) duplicative or can be accomplished more effectively elsewhere in ARS; (4) marginal or below threshold funding for program viability or sustainability; (5) conducted in substandard or inadequate infrastructure and future costs are prohibitive; (6) lacking a critical mass of scientists/support personnel for an effective program; or (7) are carried out by other research institutions. The savings achieved from these reductions/terminations will be redirected to finance the higher priority agricultural research initiatives identified in the 2013 Budget, and will improve program and operational efficiencies.

GA, Dawson – Sustaining Peanut Cropping Systems Competitiveness (-$899,000)
MD, Beltsville – Binational Agricultural Research and Development (-$524,000)
MD, Beltsville – Staffing and Operation for National Clonal Repositories for Plant Germplasm (-$57,000)
MS, Mississippi State – Development of Precision Agriculture Systems in Cotton Production (-$1,212,000)

e) A decrease of $2,214,000 in ongoing extramural research projects.

Need for Change

Research projects under this program activity are proposed for termination given that they are considered by the Administration to be of lower priority, and/or the research conducted is carried out by other institutions. The savings achieved from these terminations will serve to to permit resources to be reallocated to more critical needs.

HI, Hilo – Sugarcane Research (-$433,000)
IA, Ames – Bioinformatics Institute for Model Plants (-$955,000)
IA, Ames – Michael Fields Agricultural Institute (-$176,000)
IN, West Lafayette – Genomics of Pest Resistance in Wheat (-$59,000)
MS, Stoneville – Kenaf and Medicinal Plants (-$501,000)
OR, Corvallis – Hops (-$90,000)

f) ARS' base funding for Crop Production research in 2012 is $229,007,000.

ARS' 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 effective 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 techniques, aids in detection/identification of invasive pests, and increases control through management tactics that restore habitats and biological diversity.

(4) Food Safety – An increase of $2,044,000 ($106,210,000 available in 2012).

a) An increase of $283,000 to fund increased pay costs.

Need for Change

Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs and carrying out ARS' mission. Absorption of these costs reduces the number of scientists and support personnel essential for conducting the agency's research programs. If pay costs are not fully funded, ARS will be unable to fill critical positions and will have to reduce spending for much needed laboratory equipment, supplies, and other materials.

b) An increase of $5,239,000 to Enhance Food Safety in the United States.

Need for Change

Food safety remains an essential priority in the U.S. and throughout the world. Despite continued food safety research and activities, foodborne outbreaks occur and changing pathogens emerge. Foodborne outbreaks remain as a major cause of morbidity, mortality, and economic devastation. In 2011, the Centers for Disease Control and Prevention released new estimates that show 47.8 million illnesses and 3,037 deaths were caused by contaminated food consumed in the U.S. The current estimates strongly underscore the continued need for further research in food safety. Further, the full cost/burden is estimated to be $152 billion per year. Recent activities within the World Health Organization and USDA's Economic Research Service are focusing on the burden of foodborne illness.

Recent outbreaks in Germany and the European Union, and in the United States highlight the complexity of foodborne outbreaks and the pathogens that cause them. Determining the cause of the outbreaks is time consuming, and the tracing of potential contaminated food is cumbersome. Issues of intensive food production, rapidly increasing international trade in foods, changes in consumption habits, and travel and immigration of people are important factors in food safety.

The research priorities relating to potential intervention and control strategies for foodborne pathogens have changed and become more focused. The implementation of the new Food Safety Modernization Act in 2011 emphasizes the importance of intervention and prevention strategies in U.S. grown and imported foods. This Act is supported by consumers, public health advocates, and major industry groups as a necessary advancement for mandatory recall powers and national/international inspections. Although the Act addresses the Food and Drug Administration's (FDA) needs and issues, ARS can provide critical research to guide FDA's policies and guidelines, particularly in fresh produce and related commodities.

New and alternative post-harvest food processing technologies have the ability to inactivate microorganisms to varying degrees. However, some interventions result in adverse functional and/or sensory properties, significantly reducing food quality. Quality and safety are intimately associated, especially considering the change in consumer demands for more fresh (minimally processed) and natural food products. Many new technologies used alone are too costly, too energy expensive, and cannot guarantee safety to be of practical use. Therefore, research involving processing technologies that are unlikely to be implemented by industry will have limited or no value and impact.

The need for more fresh (minimally processed) and natural food products could be achieved in part by revisiting the under-utilized “hurdle effect” which in and of itself is a minimal processing technology that exploits interactions between preservation treatments. Intelligent application of hurdle technology could readily be combined with current and alternative processing technologies.

The reduction of antimicrobial resistance remains a high priority for agriculture, veterinary medicine, and public health. Research emphases within the food safety program include alternatives to antibiotics; the development and evaluation of intervention strategies against foodborne pathogens and their effects on resistance; and understanding the mechanisms of resistance development, persistence, and transmission. These areas of emphasis address current action items in the Interagency Task Force on Antimicrobial Resistance Action Plan. Alternative approaches for the control and prevention of foodborne pathogens in food animals include vaccines (e.g., vaccine for *E .coli* in cattle and *Salmonella* spp., in swine and poultry), altered management practices, genetics, and immune modulators. The development and evaluation of novel products (such as pre- and pro-biotics, bacteriolysins, and natural, generally regarded as safe ingredients) in food animals began as an intervention for the reduction of foodborne pathogens. These approaches may reduce the need for antibiotic use in food animals.

A major focus of ARS’ research program is the role of management practices and the environment on the development, persistence, and transference of antimicrobial resistant organisms and resistance genes in food animals from production to processing. For example, producers are moving toward more free range and organic production, yet data are sparse on the effects of these production practices on foodborne pathogens and on antimicrobial resistance. Answers have remained elusive because of the complexity of risk factors and the population ecology that may increase the possibility of resistance. With the shift in production practices, this important research is timely.

<u>Outcomes</u>

Post-harvest operations of all sizes (i.e., large to very small) provide an opportunity to remove or inactivate pathogens and their toxins acquired during the production and processing phases. Pathogens may develop resistance to antimicrobials from traditional measures used for pathogen control. Successful technologies and strategies to eliminate, reduce, or suppress human pathogens are needed for foods and food types associated with foodborne illnesses, or at risk of becoming vehicles for human pathogens. Development of individual or combinations for new or innovative intervention technologies for minimal processing will be based on understanding their modes of action and effects on the microbial ecology of a food product. Inadequate suppression of spoilage could create an opportunity for human pathogen growth and toxin production. Interventions, control, and management strategies will be identified and evaluated to help facilitate better guidance and policy decisions by Federal regulatory agencies. This research will enable producers to implement changes that are cost effective and provide outcomes such as reduced risk of foodborne pathogen contamination.

The effects of the production practices (i.e., organic, free range, and conventional) will be evaluated on the prevalence of antimicrobial resistance pathogens and genes in food animals. The range of production practices also affects foodborne pathogen load. This information will provide critical information to FSIS on potential pre-harvest strategies, and on antimicrobial resistance for the FDA and industry.

<u>Means to Achieve Change</u>

- Identify and Evaluate Specific Intervention Strategies through the Food Production Chain ($4,076,000). ARS will:
  - Evaluate, develop, and validate through laboratory, pilot plant processing, and commercial processing facilities the effect of single and combinations of intervention technologies (multi-target approach) on pathogen reduction. Also, ensure that lethality/intervention treatments do not negatively impact product quality. In developing these post-harvest intervention options, ensure that they are viable for small and very small regulated plants.

- Antibiotic Resistance ($1,163,000). ARS will:
  - Evaluate the role of alternatives to antibiotics and the role of management practices and the environment on the prevalence of antimicrobial resistance and emerging pathogens in food animals.

c) A decrease of $3,478,000 in ongoing extramural research projects.

Need for Change

Research projects under this program activity are proposed for termination given that they are considered by the Administration to be of lower priority, and/or the research conducted is carried out by other institutions. The savings achieved from these terminations will serve to permit resources to be reallocated to more critical needs.

KY, Bowling Green – Waste Management (-$289,000)
LA, New Orleans – Hyperspectral Imaging Technique (-$494,000)
MS, Stoneville – Center for Food Safety and Postharvest Technology (-$1,012,000)
PA, Wyndmoor – Food Safety Engineering (Purdue) (-$1,683,000)

d) ARS' base funding for Food Safety research in 2012 is $106,210,000.

ARS' research 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 toxin producing and/or 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 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, that is, regulatory agencies, industry, and commodity and consumer organizations, in detecting, identifying, and controlling foodborne diseases that affect human health.

(5) Livestock Protection – An increase of $1,403,000 ($76,166,000 available in 2012).

a) An increase of $179,000 to fund increased pay costs.

Need for Change

Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs and carrying out ARS' mission. Absorption of these costs reduces the number of scientists and support personnel essential for conducting the agency's research programs. If pay costs are not fully funded, ARS will be unable to fill critical positions and will have to reduce spending for much needed laboratory equipment, supplies, and other materials.

b) An increase of $4,121,000 to Enhance Animal Health in the United States.

Need for Change

World hunger is a major threat to global stability. Population increases over the next 40 years are projected to occur most rapidly in regions of the world that are currently the most food stressed. One of the keys to meeting the demands of the growing population will be ensuring the health of livestock and preventing public health risks such as antibiotic resistance or the spread of zoonotic diseases.

Concerns over antibiotic resistance are driving policies to restrict the use of antibiotics on animal farms worldwide. The availability of alternative strategies to prevent and treat animal diseases on the farm will directly impact global food security and global health. The global increase in antibiotic resistance among bacterial pathogens is believed due, in part, to the sub-therapeutic use of antibiotics in animal feed as growth promoters. Consequently, there is a growing concern that the potential development of antibiotic resistant strains within food animal production facilities and among foodborne bacteria could seriously compromise current medical interventions and public health. Thus, continued reliance on antibiotics in animal production may result in new restrictions, including the international trade of food animal products.

The restriction of antibiotics is not limited to countries with intensive animal production system as these restrictions may also adversely affect the production of livestock and poultry in developing countries. There is also increasing scientific evidence that implicates certain antibiotics with disrupting the normal flora of the gut, yielding negative consequences on the innate immune system, disease resistance, and health. As we move into the 21st century and the demands for animal food products increase to meet the nutritional needs of a growing world population, alternative strategies to prevent and treat animal diseases is a global issue and a critical component of efforts to alleviate poverty and world hunger.

<u>Outcomes</u>

With the proposed funding increase, novel biocontrol approaches that employ strategies specifically geared to reduce or eliminate drug resistance development will be developed for reducing bacterial pathogens (and where applicable viral and parasitic pathogens) in food animal production.

<u>Means to Achieve Change</u>

- Develop Countermeasures and Alternatives to Antibiotics to Prevent and Treat Pathogens Affecting Poultry and Emerging Diseases Affecting Farm Animals ($4,121,000). ARS will:
  - Enhance research on viruses affecting U.S. poultry production, i.e., tumor viruses, and the detection and elimination of emerging enteric viruses.
  - Enhance research on exotic diseases of poultry to better understand the immunogenetics of host-pathogen interactions.
  - Develop biorational technologies/techniques to control ants and floodwater mosquitoes.
  - Develop detection methods and countermeasures to foreign animal diseases.

c) <u>A decrease of $2,676,000 from ongoing research projects to support higher priority research initiatives, and offset proposed pay cost increases</u>.

The 2013 Budget recommends selected high priority research initiatives which address the Administration's science and technology priorities and the Department's Strategic Goals. To finance these initiatives, within limited resources, some existing projects are proposed for reduction or termination given that they are: (1) considered by the Administration to be of lower priority; (2) mature where the research objectives have been mainly accomplished; (3) duplicative or can be accomplished more effectively elsewhere in ARS; (4) marginal or below threshold funding for program viability or sustainability; (5) conducted in substandard or inadequate infrastructure and future costs are prohibitive; (6) lacking a critical mass of scientists/support personnel for an effective program; or (7) are carried out by other research institutions. The savings achieved from these reductions/terminations will be redirected to finance the higher priority agricultural research initiatives identified in the 2013 Budget, and will improve program and operational efficiencies.

Headquarters – Emerging Animal Diseases that Exist Offshore (-$215,000)
MI, East Lansing – Genetic and Biological Determinants of Avian Tumor Virus Susceptibility (-$2,188,000)
MS, Stoneville – Biting and Stinging Pests: Ecology and Biologically-Based Control (-$273,000)

d) A decrease of $221,000 in ongoing extramural research projects.

Need for Change

Research projects under this program activity are proposed for termination given that they are considered by the Administration to be of lower priority, and/or the research conducted is carried out by other institutions. The savings achieved from these terminations will serve to permit resources to be reallocated to more critical needs.

MS, Stoneville – Red Imported Fire Ants (-$221,000)

e) ARS' base for Livestock Protection research in 2012 is $76,166,000.

ARS's 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. The research programs have ten strategic objectives: (1) establish ARS laboratories into a fluid, highly effective research network to maximize use of core competencies and resources; (2) access specialized high containment facilities to study zoonotic and emerging diseases; (3) develop an integrated animal and microbial genomics research program; (4) establish centers of excellence in animal immunology; (5) launch a biotherapeutic discovery program providing alternatives to animal drugs; (6) build a technology driven vaccine and diagnostic discovery research program; (7) develop core competencies in field epidemiology and predictive biology; (8) develop internationally recognized expert collaborative research laboratories; (9) establish a best-in-class training center for our Nation's veterinarians and scientists; and (10) develop a model technology transfer program to achieve the full impact of ARS research discoveries. ARS animal research program includes eight core components: (1) biodefense research, (2) animal genomics and immunology, (3) zoonotic diseases, (4) respiratory disease, (5) reproductive and neonatal diseases, (6) enteric diseases, (7) parasitic diseases, and (8) transmissible spongiform encephalopathies.

(6) Crop Protection - A decrease of $9,818,000 ($193,810,000 available in 2012).

a) An increase of $461,000 to fund increased pay costs.

Need for Change

Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs and carrying out ARS' mission. Absorption of these costs reduces the number of scientists and support personnel essential for conducting the agency's research programs. If pay costs are not fully funded, ARS will be unable to fill critical positions and will have to reduce spending for much needed laboratory equipment, supplies, and other materials.

b) An increase of $7,600,000 for Soil Microbial Ecology and Plant Disease Management.

Need for Change

Management of plant pathogenic microbes and nematodes that live in the soil is critical to the production of agronomic and horticultural crops. For more than 50 years, most diseases caused by these pathogens have been managed primarily through fumigation of soil with chemical biocides such as methyl bromide. The use of methyl bromide for soil fumigation has been banned (with limited exceptions) by international treaty, and additional fumigants and synthetic pesticides are under greater regulatory scrutiny. With the increased use of alternatives to methyl bromide, new soilborne disease problems have emerged.

The soil is an extremely complex environment with both biotic and abiotic components. Abiotic components include chemical and physical factors such as soil pH, nutrients, and texture. These often vary within a given field, and there is enormous variation in soils within the United States. The soil is also home to an abundance of microbes and nematodes. Most of these microbes live saprophytically, that is, they get their nourishment from dead or decaying organic matter thus contributing to nutrient cycling. Some microbes are beneficial to plants, including nitrogen fixing bacteria, mycorrhizae, and biocontrol microbes. Other microbes cause plant disease. In nature, disease is the exception, and most plants are not diseased. Disease management techniques such as crop rotation rely on maintenance of a stable microbial community that is conducive to plant production. Similarly, since the benefits of soil solarization last more than one season, the success of solarization has been attributed to soil microbes. While some soil dwelling nematodes are plant pathogens, others are saprophytic and some benefit plant growth by feeding on other nematodes.

Until recently, research in soil microbiology has been limited by techniques that could not evaluate roles of the large portion of the soil microflora that cannot be cultured on artificial media. New molecular tools and metagenomics greatly increase the ability to precisely quantify the size and ecological role of populations of nonculturable microbes, and their physiological functions, and allow precise tracking of specific microbes in soil. In addition, increased computational capacity and improved methodology facilitate dissection of the multitude of complex interactions among microbial populations, as well as their interactions with plants. The resulting holistic view of soil microbial ecology should enable us to foster stable microbial communities resistant to the establishment or persistence of soilborne plant pathogens.

<u>Outcomes</u>

The proposed research will enhance plant health by providing additional management tools for soilborne plant pathogenic microbes and nematodes. Increased knowledge of soil microbial ecology will be exploited to provide a soil environment optimized for plant growth and production. The means to create and maintain communities of soil microbes unfavorable to the establishment or persistence of soilborne plant pathogens and plant pathogenic nematodes will be established in a wide variety of soil types. Site specific knowledge of microbial communities in localized soil type, or even areas of a single field, can be combined with new technologies for site specific application technologies.

<u>Means to Achieve Change</u>

- Soil Microbial Ecology ($7,600,000). ARS will:
  - Determine mechanisms of microbial biocontrol to increase the effectiveness and consistency of biocontrol of soilborne pathogens in a variety of soils and cropping systems.
  - Identify and exploit mechanisms by which plant disease suppressing microbes become established in a variety of soils.
  - Identify physical, chemical, and biological factors that drive soil ecosystem changes and use this information to optimize microbial community stability that is unfavorable to disease development.
  - Identify and exploit soil microbes and their interactions to impair activities of soilborne plant pathogenic nematodes in a variety of soils and cropping systems.
  - Develop site specific soilborne disease management strategies.

c) <u>An increase of $2,978,000 to Enhance Control of Invasive Pests in the United States.</u>

<u>Need for Change</u>

Invasive weeds, arthropods, and plant pathogens that threaten our food, fiber, and natural ecosystems continue to increase by species and distribution as world trade and travel continue to expand. Economic losses of agricultural crops and natural ecosystems due to these pests are considerable with estimates in the tens of billions of dollars each year to agriculture, landscapes, and forests in the United States (e.g., cost estimates for crop pests, $14 billion; imported fire ants, $1 billion; Gypsy moths, $1 billion; lawn/garden pests, $1.5 billion; forest pests including the Asian Longhorned beetle and emerald ashborer, $2 billion; Asian tiger mosquito, $1 billion; etc.) Pest control continues to depend heavily on chemical controls. For instance, in 2007 over 850 million pounds of pesticides (i.e., herbicides, insecticides, fungicides, and nematicides) were applied to agricultural crops to protect them from pests and pathogens. In some major cropping systems, pest management strategies may rely on a single chemistry to control a given pest group, which has resulted in the development of pesticide resistance. There is a need to develop an integrated pest management (IPM) approach that uses multiple tactics as appropriate to the specific pest or pest complex. Such efficacious protocols would encourage adoption by producers and land managers.

For invasive weeds, the use of repeated chemical controls within a given management system may have unintended consequences on the sustainability of that system. For example, an overdependence on glyphosate in glyphosate resistant cropping systems has resulted in the development of glyphosate resistant weeds that can be highly invasive. Nontarget effects may be altering soil microbial communities that could have negative impacts on crop development and productivity. Such combined effects may significantly reduce the benefits and sustainability of modern cropping systems and make them more vulnerable to plant invasions. Consequently, a better understanding of the impacts of the long-term use of one or a limited number of herbicides to control weeds under a given cropping system is needed to identify and mitigate any unanticipated deleterious effects on their sustainability.

Invasive insect management has become particularly challenging because of the large number of recent invasions by insects, such as: the brown marmorated stink bug; glass-winged sharpshooter vector of Pierce's disease; Asian citrus psyllid vector of citrus greening; Asian tiger mosquito (which bites farmers and gardeners during daylight); Asian long-horned beetle and emerald ash borer beetle (pests of nursery stock and forests); spotted wing Drosophila fruit fly and European grape berry moth (pests of orchards); and bed bugs (which have become an emergent pest due to development of insecticide resistance). A more fundamental approach for managing all such pests is needed. Fortunately, new tools are being developed that can be used to provide clues to control many of these pests, with approaches delivered through host resistance, new therapeutics such as RNAi, or biological control. A key new source of information for this effort will be the ARS led international "i5k project" which will sequence the genomes of 5,000 insects. This promises to provide basic genetic information that can be used by a broad spectrum of researchers who, with comparative genomics approaches, can identify genes and gene regulatory systems that can be studied to target insect vulnerabilities.

For invasive plant pathogens, rapid and accurate diagnostic tests and the means to cultivate "fastidious microbes" (i.e., those that require special conditions to grow in the laboratory) that cannot currently be cultured are needed to help curtail the spread of invasive plant pathogenic bacteria and fungi. Genome analysis of such pathogens can provide information to develop diagnostics used in international trade of agricultural products, as well as the regulated movement of quarantined agricultural commodities within the United States. Fundamental information is needed on emerging plant pathogens for accurate risk assessment and effective rapid response control methods.

Outcomes

In general, the proposed research will lead to pest management approaches that will use knowledge-based intensive strategies on physiological and ecological insights to reduce or replace chemical-based strategies.

For weeds, the proposed research will ensure the sustainability and productivity of modern cropping systems and their resilience against weed invasions, and will provide insight into weed physiology and microbial ecology necessary for more effective weed management.

For insects, the major benefits of the research will be improved, environmentally safe control of key pests, protection of beneficial insects such as the honey bee, and more cost effective use of biological control agents. Comparative genomics approaches will lead to emergent advances such as improved targets for pesticide discovery, including interruption of pest immune pathways, and ease in finding RNAi targets. Novel advances will likely include control of vectored plant diseases which are the most difficult to control. Transformative advances will likely include better understanding of insect brain function and behavior, and molecular-based systems for beneficial insect enhancement.

For plant pathogens, the proposed research will provide improved prevention and early detection, and rapid response methods for potential or newly emerging invasive microorganisms.

Means to Achieve Change

- Strengthen Research to Develop Technologies to Protect Crops from Invasive Species ($1,867,000). ARS will:
  - Develop effective control methods for key invasive arthropod pests of row crops, fruits, and vegetables that utilize molecular and state-of-the-art technologies.
  - Disrupt insect vectored plant diseases caused by invasive insects through the development of new technologies that reduce arthropod survival and/or their ability to transmit disease.
  - Expand the capacity of the Overseas Biological Control Laboratories to discover, assess, and export agents of invasive species that can be integrated into agricultural systems.
  - Develop novel weed management solutions based on an expanded knowledge of the biochemical and physiological processes critical in the development and reproduction of invasive and weedy plants.
  - Develop biologically-based invasive plant control strategies that are cost effective, safe for the environment and people, and able to be maintained permanently as a useful component of IPM or as standalone strategies.

- Strengthen the Nation's Capacity to Protect Against New and Potential Pest Invasions ($1,111,000). ARS will:
  - Develop technologies to prevent new species invasions that could reduce crop production and profitability or disrupt our natural resources.
  - Develop methodologies to improve early detection and rapid response to newly emerging species invasions.

d) An increase of $2,884,000 to Enhance Protection of Small Fruit and Nursery Crops, and Potatoes and Wheat from Disease in the United States.

Need for Change

Plant diseases cause billions of dollars in economic losses each year to agriculture, landscape, and forests in the United States. These diseases reduce yields, lower product quality or shelf life, decrease aesthetic or nutritional value, and sometimes contaminate food and feed with toxic compounds. Control of plant diseases is essential for providing an adequate and consistent supply of food, feed, fiber, and aesthetics. In addition, the presence of plant diseases can halt international trade. Strategies for managing plant diseases involve a coordinated approach that includes development and use of disease resistant varieties, modified cultural practices, pesticide development and application technologies, and integrated management strategies that include biological controls. New resistant crop varieties and new management strategies are constantly needed because pathogens continually develop new variants to overcome current resistance genes or management strategies. Further, new exotic pathogens are introduced through travel, trade, or major weather events, such as hurricanes.

Small fruit and nursery crops currently face significant losses from endemic pathogens including powdery mildew, grey mold, and several species of *Phytophthora*, as well as a relatively new disease, sudden oak death, caused by *Phytophtora ramorum*. The sudden oak death pathogen is of particular concern because it can attack an unusually large number of plants in unrelated families. Also, of concern is *Botrytis*, a fungal disease that assaults wine grapes.

Potatoes are an important food staple globally. Economic losses due to plant pathogens occur in the field, or can become evident after harvest and are caused by a wide variety of organisms including fungi, fungal like organisms such as the late blight pathogen, bacteria, viruses, and nematodes. Because potatoes are grown in many different geographical areas, varieties resistant to disease must be developed that are adapted to local growing conditions. National coordination of developing disease resistant potatoes is needed. For some emerging diseases where resistance is not yet available, alternative disease management methods are needed.

Wheat is the primary grain grown in the United States which is grown in 42 States, with half for domestic use and half exported. Recently a resurgence of stripe rust, also called yellow rust, has caused economic losses in wheat. The resurgence of this disease has been correlated with unusually mild winters and susceptible wheat varieties. Wheat varieties adapted to local growing conditions that are resistant to the stripe rust pathogen are needed.

Outcomes

The proposed research will lead to improved control of diseases attacking small fruit and nursery crops, and potatoes and wheat in the United States using multiple coordinated approaches.

With the proposed research, new crop plants resistant to plant diseases will be available. Resistant varieties will provide continual protection from plant diseases (such as *Botrytis*) and greatly reduce the need for synthetic pesticides. Alternative disease management systems will be developed when resistant varieties are not available.

Means to Achieve Change

- Improve Potato Production though Resistant Varieties and New Disease Management Techniques ($1,454,000). ARS will:
  - Discover and deploy genes for resistance to economically important potato diseases including late blight and common scab.
  - Develop management strategies for emerging and re-emerging potato diseases.

- Improve Disease Management of Small Fruits and Nursery Crops ($1,213,000). ARS will:
  - Develop new pathogen detection methods to optimize timing of the application of management tools.
  - Improve management of the *Phytophthora* species in nursery environments.
  - Improve the forecasting of grape powdery mildew disease.

- Improve Management of Stripe Rust of Wheat with Resistant Varieties ($217,000). ARS will:
  - Discover genes for resistance to stripe rust in wheat and introgress these into wheat adapted for local conditions.

e) An increase of $1,750,000 to Enhance Fungal Disease Protection in Beans, Sunflowers, and Other Crops.

Need for Change

Sclerotinia is a serious fungal disease that affects most broad leaf plants, including canola, dry edible beans, soybeans, sunflowers, peas, lentils, and chickpeas. The collective annual losses from *Sclerotinia* for the crops listed have been as high as $252 million, including $100 million for sunflowers; $70 million for soybeans; $46 million for dry edible beans; $24 million for canola; and $12 million for pulse crops. The disease is very difficult to control or minimize. The fungus generates hard, black bodies called sclerotia that can remain in the soil for many years. Under the right weather conditions, the sclerotia produce spores that spread for miles and can infect a susceptible crop. A coordinated research strategy is needed to minimize the devastating effects of *Sclerotinia,* which causes serious economic losses by negatively impacting crop quality and yields.

Outcomes

The proposed research will be used to enhance fungal disease protection in beans, sunflowers, and other crops. Comprehensive genomics/bioinformatics centered germplasm improvement efforts will target *Sclerotinia* and other important fungal pathogens.

Genomics/bioinformatics research is a serious bottleneck to the development of marker assisted selection strategies for improving germplasm in sunflower, canola, and pulse and dry beans. Stakeholders have long identified the rapid development of plant germplasm with resistance to devastating fungal diseases as a critical need for their industry. This change will result in plant genomic/bioinformatic approaches that will enhance the production of these crops.

Means to Achieve Change

- Enhance Fungal Disease Protection in Beans, Sunflowers, and Other Crops ($1,750,000). ARS will:
  - Develop crop germplasm resources and improve genetics.
  - Improve pathogen biology and study mechanisms of disease resistance.
  - Develop crop genome analysis and genomic and bioinformatic tools.
  - Study disease management and pathogen epidemiology.

f) A decrease of $23,807,000 from ongoing research projects to support higher priority research initiatives and offset proposed pay cost increases.

Need for Change

The 2013 Budget recommends selected high priority research initiatives which address the Administration's science and technology priorities and the Department's Strategic Goals. To finance these initiatives, within limited resources, some existing projects are proposed for reduction or termination given that they are: (1) considered by the Administration to be of lower priority; (2) mature where the research objectives have been mainly accomplished; (3) duplicative or can be accomplished more effectively elsewhere in ARS; (4) marginal or below threshold funding for program viability or sustainability; (5) conducted in substandard or inadequate infrastructure and future costs are prohibitive; (6) lacking a critical mass of scientists/support personnel for an effective program; or (7) are carried out by other research institutions. The savings achieved from these reductions/terminations will be redirected to finance the higher priority agricultural research initiatives identified in the 2013 Budget, and will improve program and operational efficiencies.

CA, Davis – Integrated Strategies for Advance Management of Fruit, Nut, and Oak Tree Diseases (-$496,000)
CA, Parlier – California Cropping Systems/Soil Health (-$1,406,000)
CA, Salinas – Control of Pathogens in Strawberry and Vegetable Production Systems (-$602,000)
DC, Washington – Biologically-Based Management Strategies for Control of Soil-Borne Pathogens (-$250,000)
FL, Fort Pierce – Vegetable and Floriculture Production/Soil Health (-$1,724,000)
FL, Fort Pierce – Vegetable Grafting for Resistance to Soilborne Diseases (-$341,000)
Headquarters – Potato Research (-$1,454,000)
Headquarters – Small Fruit and Nursery Research (-$1,213,000)
Headquarters – Wheat Stripe Rust Initiative (-$217,000)
MD, Beltsville – Areawide Management of Agricultural Pests (-$5,684,000)
MD, Beltsville – Floriculture and Nursery Research Initiative (-$3,206,000)
MD, Beltsville – Improved Knowledge of Virulence Factors to Develop Postharvest Decay Control Strategies (-$803,000)
MD, Beltsville – Integration of Biologically-Based Technologies for Suppression of Soilborne Plant Pathogens (-$545,000)
MD, Beltsville – Molecular Approaches to Understanding Host Resistance and Pathogen Variability for Improving Potato and Tomato (-$486,000)
MO, Columbia – Development of High Quality, Cost Effective, Mass Reared Biocontrol Agents for Small and Urban Farms, Organic (-$1,070,000)
MO, Columbia – Eicosanoid Mediated and Molecular Immune Signaling Inhibitors in Piercing/Sucking Insect Pests of Small and Urban Vegetable Farms (-$810,000)
ND, Fargo – Sclerotinia Diseases (-$1,750,000)

OR, Corvallis – Biology and Management of Soilborne Diseases of Horticultural Crop (-$609,000)
OR, Corvallis – Exotic, Emerging, Re-Emerging, and Invasive Plant Diseases of Horticultural Crops (-$428,000)
WA, Wenatchee – Biologically-Based Systems for Soilborne Disease Control in Tree Fruit Agro-Ecosystems (-$713,000)

g) A decrease of $1,684,000 in ongoing extramural research projects.

Need for Change

Research projects under this program activity are proposed for termination given that they are considered by the Administration to be of lower priority, and/or the research conducted is carried out by other institutions. The savings achieved from these terminations will serve to permit resources to be reallocated to more critical needs.

FL, Ft. Lauderdale – Invasive Species (-$225,000)
HI, Hilo – Fruit Fly Eradication (-$102,000)
HI, Hilo – Minor Crop Pest Control (-$202,000)
HI, Hilo – Papaya Ringspot (-$199,000)
IN, West Lafayette – Oat Virus (-$67,000)
MD, Beltsville – Weed Management Research (-$45,000)
MS, Stoneville – Cotton Genomics and Breeding (-$514,000)
NY, Ithaca – Golden Nematode (-$212,000)
NY, Ithaca – Pear Thrips (-$55,000)
OR, Corvallis – Eastern Filbert Blight (-$63,000)

h) ARS' base funding for Crop Protection research in 2012 is $193,810,000.

ARS' research program is directed toward epidemiological investigations 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 agency's research priorities include: (1) identification of genes that convey virulence traits in pathogens and pests; (2) factors that modulate infectivity, gene functions, and mechanisms; (3) genetic profiles that provide specified levels of disease and insect resistance under field conditions; and (4) mechanisms that facilitate 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.

(7) Human Nutrition – A decrease of $1,128,000 ($85,438,000 available in 2012).

a) An increase of $100,000 to fund increased pay costs.

Need for Change

Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs and carrying out ARS' mission. Absorption of these costs reduces the number of scientists and support personnel essential for conducting the agency's research programs. If pay costs are not fully funded, ARS will be unable to fill critical positions and will have to reduce spending for much needed laboratory equipment, supplies, and other materials.

b) An increase of $2,887,000 to Enhance Human Nutrition in the United States.

Need for Change

Obesity is at a record level in the United States. Heart disease remains the number one cause of death, diabetes rates are increasing, and cancer incidence remains high. All of these conditions are linked in part to nutrition. Substantial research suggests that changes in diet may benefit public health by preventing the onset or severity of these conditions. An overarching message from nutrition professionals has been that we need diets that include more fruits, vegetables, and whole grains; are lower in sodium and solid fat; and include healthful beverages such as dairy. Moreover, an increasing body of evidence suggests that various “phytochemicals” in plant foods play a major role in chronic disease prevention, especially cancer and heart disease. However, observational studies often give conflicting results and many high dosage, single nutrient intervention studies have shown more harm than benefit.

There are numerous possibilities for this conundrum, but one factor is that we have not adequately addressed the complexity of the food system and the nutritive and non-nutritive components that it provides. Food production is inexact and leads to variability in the nutritional composition of raw agricultural products and multiple formulations of retail food products increases compositional heterogeneity. Moreover, the sciences of genomics, epigenetics, and metabolomics show the human organism to be complex in its response to dietary inputs. Thus we need to adopt a systems approach characterized by linking food production and processing practices, and all its inherent variability, with human health outcomes (e.g., do phytochemicals in cruciferous vegetables decrease the risks of cancer?). This begins with characterizing the breadth and variability of food components in the food supply (e.g., there is a huge range of phytochemical compounds in crucifers, affected by factors as diverse as climate, date of harvest, and post-harvest processing).

The Federal government establishes dietary policy guidelines. The USDA/ARS also conducts nutrition surveillance through the food consumption survey portion of the National Health and Nutrition Examination Survey (NHANES). To implement Federal food and nutrition policy, the food surveillance program needs to develop new tools and databases, such as the Food Patterns Equivalent Database (FPEDS) to link the NHANES and food composition data to Federal dietary guidance, namely the *Dietary Guidelines for Americans*. These tools do not presently exist.

Why don’t more people follow the *Dietary Guidelines*, such as eating more fruits and vegetables? Behavior change is being studied widely, but in spite of great scientific effort, it has not been possible to demonstrate a connection between education and positive nutritional behaviors.

Outcomes

The proposed initiative will strengthen the nutrition monitoring programs conducted by ARS. It will result in technology enhancements to the infrastructure of the USDA’s “gold-standard” food nutrient database and national food consumption survey. The initiative will also facilitate the development of tools that link ARS nutrition surveillance data with Federal dietary guidance and associated policies.

Means to Achieve Change

- Enhance Nutrition Monitoring Capability by Adding Functionality to the Food Composition Database ($1,887,000). ARS will:
  - Enhance the food composition database to enable tracking over time and differentiation by brand name of foods and nutrients of concern to public health.

- Enhance Nutrition Surveillance Capability to Link USDA/ARS Food Consumption Survey Data with Federal Dietary Policy Guidance ($1,000,000). ARS will:
    - Develop new tools to link USDA's food composition and consumption data to Federal nutrition policy implementation tools such as "MyPlate." An example is development of the FPEDS database.

c) A decrease of $4,115,000 in ongoing extramural research projects.

Need for Change

Research projects under this program activity are proposed for termination given that they are considered by the Administration to be of lower priority, and/or the research conducted is carried out by other institutions. The savings achieved from these terminations will serve to permit resources to be reallocated to more critical needs.

Headquarters – Delta Obesity Prevention Initiative/Human Nutrition Delta Initiative (-$3,929,000)
MA, Boston – Geriatric Nutrition Research (-$186,000)

d) ARS' base funding for Human Nutrition research in 2012 is $85,438,000.

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 important public health concerns. 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 requirement but have health promoting activities. Four specific areas of research are emphasized: (1) nutrition monitoring and the food supply, e.g., a national diet survey and the food composition databank; (2) dietary guidance for health promotion and disease prevention, i.e., specific foods, nutrients, and dietary patterns that maintain health and prevent disease; (3) prevention of obesity and related diseases, including research as to why so few of the population follow the *Dietary Guidelines for Americans*; and (4) life stage nutrition and metabolism, in order to better define the role of nutrition in pregnancy and growth of children, and for healthier aging.

(8) Environmental Stewardship – An increase of $24,849,000 ($189,034,000 available in 2012).

a) An increase of $553,000 to fund increased pay costs.

Need for Change

Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs and carrying out ARS' mission. Absorption of these costs reduces the number of scientists and support personnel essential for conducting the agency's research programs. If pay costs are not fully funded, ARS will be unable to fill critical positions and will have to reduce spending for much needed laboratory equipment, supplies, and other materials.

b) An increase of $9,500,000 to Enhance the Productivity of Crop Land.

Need for Change

As the 21st century unfolds, agriculture will face a series of challenges—in the United States and globally—in providing sufficient food, fiber, and fuel to support a growing global population while our natural resources, environmental health, and available arable land decline and climate changes. The unprecedented nature of these challenges creates a growing sense of urgency for transformative changes in agriculture to accelerate progress towards achieving sustainable agricultural systems that maximize production and economic return for producers, minimize environmental degradation, and adapt to changing climate. While genetic improvements to crop cultivars and germplasm are part of the answer to solving these problems, fully achieving such a transformation requires an improved understanding of the complexities of how agro-ecosystems function at multiple scales (i.e., fields to watersheds or landscapes). Long-term research and data collection are essential to achieving this understanding and to fully realizing our potential to double crop production at the landscape scale. At stake are the security and safety of our food production systems, our natural resources, and our environment.

Over the past 10 years, there have been frequent calls in the public agricultural research sector for the creation of an infrastructure to provide a sophisticated platform for research on the sustainability of U.S. agricultural systems. In the literature, this has often been conceptualized as a “Long-Term Agro-Ecosystem Research” (LTAR) network, similar to the National Science Foundation’s (NSF) Long-Term Ecological Research (LTER) network. ARS currently maintains approximately 22 benchmark experimental watersheds and ranges that conduct research and collect long-term data on agricultural sustainability, climate change, ecosystem services, and the status and trends of natural resource conservation at the watershed or landscape scale (some that have been collecting data for nearly a hundred years). Through this initiative, ARS proposes to build on existing infrastructure and apply some of these 22 sites to form the core of a LTAR network that will link ARS sites with partner sites operated by universities, other research institutions, and/or other Federal agencies. This enhanced network, collaborating with these other organizations and reaching out for partnerships in other land-based research networks, will enable multidisciplinary research and funding efforts addressing regional and national scale questions of maintaining or enhancing agricultural sustainability, environmental quality, and ecosystem goods and services in agricultural landscapes using shared research protocols. Such a long-term agro-ecosystem research network would provide the knowledge needed to substantially improve both agricultural sustainability and the delivery of ecosystem services to a society that demands that agriculture be safe, environmentally sound, and socially responsible, in addition to being productive and economically viable.

<u>Outcomes</u>

Enhancing USDA’s ongoing research in watersheds/rangelands, operating as a long-term agro-ecosystem research network will transform existing research infrastructure, both within and outside of USDA, into a sophisticated research platform to support investigations into the very nature of how to sustain and/or increase (i.e., double) the production of ecosystem goods and services, particularly food, feed, fiber, and fuel, in agricultural landscapes, addressing all of the various components of sustainability (i.e., productivity, economics, environmental quality, ecosystems services, and human and social well-being). This investment has the potential to transform the nature of USDA research and significantly raise the visibility of USDA in the scientific community. All facets of modern agriculture, from plant and animal production (including the evaluation of new crop types and genotypes), to food safety and security, to natural resource concerns, have the potential to be significantly enhanced by this effort. Such a network has the potential to put an end to “stovepipes” among agricultural science disciplines.

Beyond the obvious benefits to USDA, this network will leverage key existing and/or developing infrastructure supported by other Federal agencies, most notably the NSF –supported LTER and NEON (National Ecological Observatory Network) efforts. Partnerships are at the core of proposed network activities, which would be expected to expand as the network develops. NOAA, with whom ARS has collaborated in the past on the Jobos Bay, and Puerto Rico CEAP project would be a primary target for initial outreach.

<u>Means to Achieve Change</u>

- Enhance ARS Research on Watersheds and Rangelands to Strengthen a Network for Long-Term Agro-Ecosystem Research ($5,000,000). ARS will Organize and Enhance Existing Research Infrastructure into a Coordinated Network of Research Platforms in Representative Agricultural Landscapes in the U.S. to Develop an Understanding of how to:

- Sustain or enhance agricultural production at the watershed/landscape scale to meet increasing demands for agricultural goods and services (including the doubling of agricultural productivity) against a background of climate change.
- Simultaneously maintain or enhance environmental quality (i.e., water, soil, air) in these agricultural landscapes.
- Simultaneously maintain, enhance, or restore the provision of ecosystem goods and services in agricultural landscapes, including damages accruing from reductions in lost services and provide an understanding of the cost of replacing services with technology.
- Provide a research platform to field test agricultural germplasm engineered for maximum productivity with minimal inputs to evaluate their performance in and influences on agricultural ecosystems and landscapes.
- Manage competing demands for arable land and fresh water for the production of food, fiber, biofuels, and ecosystem services based on sustainability and biodiversity.
- Provide support for doctoral students or post-doctoral scientists to pursue research within the network. ARS will establish Ph.D. student assistantships or post-doctoral fellowships to train the next generation of agricultural scientists in using the network to answer questions related to the various facets of agricultural sustainability, developing research questions that are shared and coordinated across sites; providing the capacity to address issues across sites through shared research protocols; collecting compatible datasets across sites, and providing the capacity and infrastructure for cross-site analysis and synthesis; facilitating and fostering shared engagement in network thinking.

- Link the Research Network to NSF's NEON ($4,000,000). ARS will:
  - Establish key NEON infrastructure (e.g., towers and instrumentation for: soil and water observatories), designed specifically to focus on parameters of interest in and instrumentation for: agricultural landscapes, at each of the 10 coordinated watershed/rangeland locations.
  - Link this infrastructure to NEON cyber infrastructure to facilitate data publication, access, storage, and analysis, thereby integrating the LTAR network with state-of-the-art informatics capabilities supported by NEON.

- Use the Research Network to Support the Quadrennial Ecosystems Services Trends (QuEST) Assessment ($500,000). ARS will:
  - Use the watershed/rangeland network and associated NEON infrastructure to develop up-to-date syntheses of research findings on how ecosystem structure and condition are linked to ecosystem functions that contribute to societal important ecosystem services in agricultural ecosystems and landscapes.
  - Provide integrated information on the condition of U.S. agro-ecosystems, the measures of ecosystem services flowing from them, and their contributions to human health, economies, and other aspects of well-being.
  - Assess trends in these factors under a range of assumptions about driving forces, management strategies, and policies.
  - Apply the information to identify and characterize challenges to the sustainability of agro-ecosystems and agricultural landscapes, the benefits they provide, and ways to make policy responses to these changes more effective.

c) An increase of $4,000,000 to Advance the Capacity for Assessing the Impacts of Climate and Environment on Food, Feed, and Fiber Production and Adapt to those Impacts and Changes.

Need for Change

Demand for agricultural products is increasing worldwide, yet the amount of land used for agriculture is decreasing and is subject to increasing pressures from changing climate. The trend of intensified agriculture that is subjected to greater environmental stress generates a critical need for yield and sustainability assessments domestically and worldwide. Assessments of the trends of yields, the conditions of agro-ecosystems, and ecosystem services based on observations and numerical simulation models are needed to prioritize and guide adaptation of crops and production systems to climate change by developed and developing countries. Crop growth and yield simulation models are in need of updating to the sophistication level of General Circulation Models (GCM) linked with economic models and the weather and climate GCMs. The crop simulation models need to account for the interactions of climate change with new agronomic technologies and practices; the spatial and temporal resolution and estimates of uncertainty need to be commensurate with GCMs. Data and expertise of the Group on Earth Observations (GEO) provide new opportunities to enhance the power of crop simulation models.

Outcomes

Characterization of the risks of hunger and world food security due to climate change will be significantly enhanced. Agro-ecosystem vulnerabilities and opportunities for adaptation to climate change will be identified in crop systems in both developing and developed countries. This supports the U.S. Global Change Research Program (USGCRP) strategy to build adaptation science. An integrated, interdisciplinary framework will be available for continuing assessments of climate impacts on the agricultural sector in fulfillment of the USGCRP National Climate Assessment (NCA) mandated by Congress. Findings of the NCA will subsequently strengthen the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). National and international data networks linked by the GEO will be accessed and exploited, thus increasing return on these investments. The ability to project regional changes in agricultural land use and production will reveal new trading opportunities, imbalances, and shortages in world markets resulting from climate change and other driving forces of agricultural supply and demand. International collaboration and model analyses conducted during regional workshops will lead to commonly established protocols, identification of key regional questions, and building capacity nationally and internationally.

Means to Achieve Change

- Partner with other Federal Agencies, Universities, and International Scientists to Improve Projections of Global Crop Yields and Sustainability Under Different Climate Scenarios and Environments ($4,000,000). ARS will:
  - Enhance an ongoing global agricultural modeling intercomparison and improvement project in collaboration with the Federal, university, and international climate modeling community to develop improved estimates of global crop yields, uncertainties of these estimates, and related economic values.
  - Incorporate existing and new data from research, monitoring, and observational systems such as ARS long-term watershed/rangeland research sites, NSF's NEON, and new earth observing satellites into the crop models.
  - Modernize and expand ARS specialized research facilities to improve, validate, and quantify uncertainty for crop growth models, and generate data needed to improve crop growth models.
  - Incorporate new information from improved crop models into estimates of national crop yields for the National Climate Assessment for agriculture.

d) An increase of $1,500,000 to Equip Producers in the Major Grain Production States with the Most Current Climate Change Adaptation Science and Information Needed to Enhance the Productivity of Crop Lands under Changing Climate.

Need for Change

The impacts of climate variability and change on agriculture are becoming more acute, threatening yields, economic viability, and environmental quality needed for sustained production of crops and ecosystem services. A highly interdisciplinary approach is required to work with farmers, ranchers, industry, and government and nonprofit organizations to identify their information and technology needs, enhance their decision making capabilities, and acquire new information on how climate variability and change may impact agro-ecosystems and production systems. Continuous assessment of climate impacts on agricultural production and ecosystem services addresses complex climate sensitive issues of concern to decision makers and policy planners at a regional level. Tools to help agriculture make day-to-day and long-term planning decisions are needed that take full advantage of the latest advances of climate science and agricultural sciences.

NOAA's Regional Integrated Science and Assessments (RISA) program is a demonstrably successful approach to establishing research teams that conduct innovative, interdisciplinary, user inspired, and regionally relevant research that informs resource management and public policy. RISA teams help build the nation's capacity to prepare for and adapt to climate variability and change by providing cutting edge scientific information to public and private user communities, working closely with decision makers to meet regional information needs.

RISA teams currently investigate climate impacts on fisheries, water, wildfire, agriculture, public health, transportation, and coastal zones. Because climate variability cuts across sectors, RISA teams are expected to analyze connections between sectors and provide assessments of integrated issues to create and enhance adaptation support tools. Current RISA regions generally cover two or three States, large watershed boundaries, or issue focused areas (e.g., the urbanized, heavily populated corridor between Boston, New York, and Philadelphia).

<u>Outcomes</u>

Links between climate science and society will be strengthened to ensure sustained yields, economic viability, environmental enhancements, and improved quality of life for rural populations and society at large for the critically important grain production region of the central United States. Information from climate adaptation science will be provided to stakeholders, customers, and collaborators to enable better decision making for day-to-day management of agricultural production systems, and strategic decisions affecting policy formulation and implementation.

<u>Means to Achieve Change</u>

- ARS/NOAA Collaboration to Expand Agricultural Adaptation Research by Funding one RISA Team, Comprised of Scientists from ARS, Universities, and Other Partner-Stakeholder Organizations in the Major Agricultural States of the Central United States ($1,500,000). ARS will:
    - Partner with NOAA's RISA Program, along with other Federal organizations and universities, to develop and deliver information to ensure continued crop yields and other ecosystem goods and services in the face of climate variability and change, using teams of scientists and non-scientist stakeholders.

e) <u>An increase of $5,000,000 to Improve Plants for Maximum Productivity with Minimal Inputs (i.e., Water, Nitrogen, Phosphorous) and Increased Tolerance to Environmental Stress.</u>

<u>Need for Change</u>

U.S. agro-ecosystems face formidable challenges to achieve crop production goals that are sustainable and minimize off site environmental impacts such as reduced water quality and quantity, nutrient runoff, and erosion. Moreover, some of the most difficult challenges involve successfully adapting these systems to the accelerating rates of change in factors affecting agricultural productivity, including climate change, weather variability and extremes, and higher costs of other inputs. The challenges identified can only be met by technologies that optimally harness the biodiversity of plant germplasm. Such technologies will enable those production systems to maximize profits as well as add to the security of supply, price stability, and market competitiveness. In addition, they will reduce crop losses from genetic vulnerabilities to environmental conditions, such as climate and weather variation that can constrain agro-ecosystem productivity.

Researchers are increasingly aware of the importance of plant root systems for crop traits such as nutrient and water uptake and use. Deeper roots provide more drought tolerance and efficient water use in annual and perennial plants. However, very little has been known about the regulation of root systems because it is difficult to study whole root systems in the soil. Recently, USDA researchers have developed methods to grow root systems of cereal roots in transparent gellan gum tubes that allow them to digitally image the root system in great detail. Multiple images of the roots can be reconstructed into three dimensional models of the entire root system of individual plants. This new technology now enables root system architecture to be assessed by high throughput methods, and to identify the key traits that control water and nutrient uptake under limiting conditions. Combining this advance with new DNA sequencing and computational methods (i.e., genomic selection and association mapping) will provide powerful new tools for plant breeders to speed up crop improvement. Plant breeders will be able to carry out "root-based breeding" to generate higher yielding cereal varieties based on superior root traits.

Outcomes

Existing crop types and those modified via this crop improvement research will be evaluated in the field in ARS' network of long-term agro-ecosystem research sites. This will enable the assessment of water and nutrient use as well as changes in erosion or nutrient loss associated with modified crop plant architecture. Conversely, assessments of the plant environment interactions will enable identification of key traits needed for further modification to achieve sustainability and crop production goals.

Means to Achieve Change

Investment in three key platforms will enable sustained improvements in maize, rice, wheat germplasm for yield, drought tolerance, heat and cold tolerance, and improved nutrient use efficiency.

- Crop Genetic Resource Analysis ($2,000,000). ARS will:
  - Inventory crop germplasm biodiversity by sequencing U.S. maize, rice, and wheat germplasm (in the National Plant Germplasm System) and collaborate on genotyping key germplasm from international collaborators (CG Centers) to better enable translation of genotype to phenotype.
  - Research, model, and exploit rare alleles needed for environmental challenges from National germplasm collections.
  - Provide improved genotyping tools for access to rare but valuable alleles.

- High Throughput Phenotyping Platform ($2,000,000). ARS will:
  - Utilize USDA's new high throughput 3-D imaging and software platform for maize, rice, and wheat root phenotyping. Identify the genetic components for root system architecture, physiology, development, and the acquisition of limiting resources, e.g., water, nitrogen, and phosphorous.
  - Phenotype new nested association mapping populations to provide the genetic means for mapping and identifying alleles responsible for target traits.
  - Lead and collaborate on field trials for diverse maize, rice, and wheat on yield, abiotic stress tolerance, flowering, and quality at multiple locations and under multiple environments.

- Germplasm Improvement Using NexGen Theory and Methods for Translating Genotype to Phenotype ($1,000,000). ARS will:
  - Create bioinformatic tools that unite Genomic Selection (GS) and Genome Wide Association Analysis (GWAS) approaches with molecular biology (MaizeGDB, Gramene, and GrainGenes that integrate and maintain diverse datasets) to identify useful and bad alleles, and to accelerate germplasm improvement.
  - Create bioinformatic tools to curate maize, rice, and wheat diversity data for use by plant breeders.
  - Initiate the development of perennial maize, rice, and wheat.

f) An increase of $5,000,000 to Improve Water and Soil Quality Outcomes of USDA Conservation Programs.

Need for Change

Conservation effectiveness is commonly reported as "acres treated." Watershed scale models are then used to translate this metric to mass amounts of nitrogen and phosphorus retained. Watershed models and simulations estimate the potential benefits, but not necessarily the true outcomes of conservation efforts. When long-term trends in water quality data are analyzed they often show little or no improvement in water quality at larger watershed or landscape scales. Four potential causes of this dissociation between practice focused and watershed scale assessments have been identified (*Tomer and Locke*, 2011). ARS will use this knowledge to improve conservation strategies, helping environmental managers to set realistic timelines for water quality improvement goals, and maintaining soil quality by reducing erosion and enhancing carbon sequestration.

Monitoring is necessary to validate the projected impacts of targeted conservation, but large scale monitoring efforts are expensive and clearly not sustainable under current fiscal circumstances. At some point, 21st century technology must be brought to bear to more effectively quantify the water and soil quality outcomes of USDA conservation efforts (i.e., more cost effective; less labor intensive). Prior ARS research has used remote sensing to quantify at the watershed scale nitrogen and phosphorus retained by cover crops and water saved by the adoption of conservation tillage. Combining remote sensing with new developments in sensor technology and state-of-the-art modeling has the potential to facilitate cost effective, large scale assessments of water and soil quality outcomes directly linked to USDA conservation efforts.

Outcomes

Quantifying the actual (rather than estimated) benefits of USDA conservation efforts, combined with developing new or improved practices, and new methods of practice placement will lead to improved water and soil quality at the watershed scale, helping to reduce the impacts of agriculture on important U.S. water resources (e.g., the Mississippi River, the Gulf of Mexico, and the Chesapeake Bay), while enhancing soil fertility in agricultural landscapes. More careful targeting has the potential to achieve greater environmental benefits at the same level of expenditures while providing a mechanism to prioritize expenditures based on cost efficiency. Through these efforts, USDA conservation efforts will become more effective at preventing nutrient and sediment losses from agricultural landscapes, increasing conservation benefits. Improved nutrient and sediment retention will increase soil fertility, reducing fertilizer costs for farmers while improving the economic bottom line for farmers in rural communities. Developing and deploying 21st century technology to quantify the benefits of USDA's targeted conservation efforts will provide more accurate validation of the conservation outcomes of USDA conservation programs at key watershed and landscape scales, while reducing the costs of obtaining this information. This combined approach will maximize conservation benefits while minimizing conservation investments.

Means to Achieve Change

- Assess the Actual Water and Soil Quality Impacts of Targeted Conservation ($2,800,000). ARS will use its Conservation Effects Assessment Project (CEAP) in benchmark watersheds to:
  - Measure (rather than model) water and soil quality impacts of targeted conservation, including how conservation practices affect ecologically important soil organisms (e.g., fungi and bacteria) that influence soil fertility, promote nutrient cycling, or consume wastes.
  - Develop new or improved practices to improve conservation benefits.
  - Develop new or improved methods of practice placement to improve conservation outcomes at the watershed scale.

- Develop More Cost Effective and Less Invasive Methods to Quantify Water and Soil Quality Outcomes of Targeted Conservation ($2,200,000). ARS will:
  - Use 21st century technology (i.e., remote sensing, geospatial modeling, and state-of-the-art sensor technologies) to develop new or improved methods to quantify the water and soil quality outcomes of USDA conservation efforts.

g) An increase of $10,946,000 to Enhance Natural Resources and the Environment for Agriculture.

Need for Change

During the last 30 years, new technologies, changing demographics and social values, and the globalization of markets, cultures, and competition have produced dramatic changes in the world's food and agricultural systems. Agriculture is shifting from a solely commodity driven system to one at least partly driven by a global consumers who value the quality, safety, and nutrition of their food, and the way it is produced. Today, consumer concerns about food prices, food safety, nutrition, product quality, energy use and cost, and the environmental footprint of agriculture are driving demands for high quality, sustainable agricultural products. At the same time, weather extremes and climate variability introduce uncertainties into production decision-making, projecting yields, and improving food security.

Most recently, the global economic downturn, rising energy costs, spikes in food prices, and growing food insecurity, particularly in the developing world, have highlighted the challenges that agriculture faces to meet the food, feed, fiber, and biofuel needs of a growing global population. These and other factors have shifted public policy towards the creation of more sustainable agricultural systems. This is evidenced by a renewed emphasis on the role of rural lands to provide essential ecosystem services and mitigate climate change, and a movement towards managing natural resources such as water at the landscape scale.

Reflecting a growing sense of urgency, these policy shifts signal a transformative change in agricultural production, accelerating progress towards achieving the four goals of sustainability as defined by the National Research Council: 1) satisfying human needs; 2) enhancing environmental quality and the resource base; 3) sustaining the economic viability of agriculture; and 4) enhancing the quality of life for farmers, ranchers, forest managers, workers, and society as a whole.

In agricultural ecosystems, physical and biological processes such as cycling of carbon, water, and nutrients are linked with social and economic processes. To achieve sustainability, it is essential that we understand how these processes interact, and their impacts on the environment through space and time. Agricultural research must explicitly identify and address these linkages so that progress in one agricultural sector does not inadvertently create or exacerbate problems in another. Such an approach calls for increasing integrative research by bringing together multi-disciplinary teams of scientists from the government, academic, and private sector research communities to increase synergies, accelerate progress, and improve cost effectiveness.

ARS' natural resources and sustainable agricultural systems program provides research to benefit the American public with water, soil, and air resources that are the essential foundation to agricultural production. Funding requested in 2013 targets three initiatives to develop new integrative research strategies, knowledge, management strategies, and technologies to sustain agricultural production on a landscape scale in a constantly changing environment, while enhancing water quality benefits, carbon and nutrient storage, and other ecosystem goods and services.

Outcomes

Long-term, landscape level, interdisciplinary research will improve our understanding of how key agricultural system components interact at the whole system level. Environmental field research will lead to better management of the physical, chemical, and biological aspects of agro-ecosystems. Critical insights from scientific teams involving experts in fields such as agronomy, biogeochemistry, ecology, hydrology, and soil science, in collaboration with social scientists such as economists, will lead to better resource management at scales from fields to river basins. Results will enable anticipating the environmental impacts of shifting agricultural practices, improving the effectiveness of conservation programs, adapting to climate variability and weather extremes, and identifying the broader societal benefits of modern agriculture, such as bioenergy production, carbon sequestration, improved water quality and water use efficiency, and wildlife habitat.

Means to Achieve Change

- Enhance the Quantity and Quality of Water Resources for Agriculture and Agriculture Dominated Landscapes ($5,288,000). ARS will:
  - Use a systems approach to integrate agricultural and municipal objectives for maximum benefits sustaining the long-term productivity of agriculture in urbanizing landscapes and along urban-to-rural gradients.
  - Develop new management tools based on geospatial information in crop condition, soil moisture, drought monitoring, and hydrologic models which lead producers, land managers, and communities to efficient and cost effective water use.

- Sustain Agricultural Production Capacity for Food and Energy Security and Ecosystem Services Over Long Periods at Landscape Scales ($3,568,000). ARS will:
  - Develop landscape scale conservation strategies to maximize multiple environmental benefits while minimizing costs.
  - Develop flexible, economically viable agricultural production systems for food, feed, and bioenergy crops that enhance ecosystem services and support existing markets.
  - Manage range and pasturelands to sustain agricultural production, control invasive species, and enhance ecosystem services in a changing climate.

- Adapt Agricultural Systems to Climate Variability and Weather Extremes ($2,090,000). ARS will:
  - Improve crop genetic and physiological models to interface with new models for climate variability, other environmental conditions such as water availability, and economies/markets to predict crop responses to changing conditions and enhance projections of food insecurity around the world (in support of U.S. involvement in the international Agricultural Model Intercomparison and Improvement Project, AgMIP).
  - Develop practices that enable agricultural systems to manage water supply; adapt to extremes in precipitation that affect soil moisture, runoff, and erosion; conserve soil and water resources; and maintain or enhance biodiversity and ecosystem services.

h) A decrease of $8,778,000 from ongoing research projects to support higher priority research initiatives, and offset proposed pay cost increases.

Need for Change

The 2013 Budget recommends selected high priority research initiatives which address the Administration's science and technology priorities and the Department's Strategic Goals. To finance these initiatives, within limited resources, some existing projects are proposed for reduction or termination given that they are: (1) considered by the Administration to be of lower priority; (2) mature where the research objectives have been mainly accomplished; (3) duplicative or can be accomplished more effectively elsewhere in ARS; (4) marginal or below threshold funding for program viability or sustainability; (5) conducted in substandard or inadequate infrastructure and future costs are prohibitive; (6) lacking a critical mass of scientists/support personnel for an effective program; or (7) are carried out by other research institutions. The savings achieved from these reductions/terminations will be redirected to finance the higher priority agricultural research initiatives identified in the 2013 Budget, and will improve program and operational efficiencies.

AR, Booneville – Management of Temperate Pastures and Silvopastures for Small Farm Livestock Production (-$1,961,000)
GA, Dawson – Develop and Transfer Irrigated and Non-Irrigated Peanut Management Technologies (-$730,000)
Headquarters – Air Quality Associated with Agricultural Operations (-$680,000)
Headquarters – Combined Water Quality Initiative (-$104,000)
Headquarters – Global Change Research (-$136,000)
ME, Orono – Enhancing Sustainability of Food Production Systems in the Northeast (-$1,118,000)

MN, Morris – Advancing Sustainable and Resilient Cropping Systems for the Short Growing Seasons and Cold, Wet Soils of the Upper Midwest (-$1,454,000)
MN, Morris – Multi-Scale Evaluation of Land Use Management Systems in the Upper Midwest (-$777,000)
TX, Bushland – Sustaining Rural Economies through New Water Management Technologies (-$1,658,000)
WI, Madison – Alternative Crop and Forage Production Systems for Improved Nutrient Management (-$162,000)

i) A decrease of $2,872,000 in ongoing extramural research projects.

Need for Change

Research projects under this program activity are proposed for termination given that they are considered by the Administration to be of lower priority, and/or the research conducted is carried out by other institutions. The savings achieved from these terminations will serve to permit resources to be reallocated to more critical needs.

IA, Ames – Air Quality (-$552,000)
KY, Bowling Green – Waste Management (-$536,000)
MS, Oxford – Acoustics (-$806,000)
MS, Oxford – National Center for Computational Hydroscience and Engineering (-$882,000)
UT, Logan – Locoweed (-$96,000)

j) ARS's base funding for Environmental Stewardship research in 2012 is $189,034,000.

ARS' research program supports scientists at more than 70 locations. Emphasis is given to developing technologies and systems that support profitable 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' air resources research is 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 ARS research program. ARS range and grazing land research includes the conservation and restoration of the Nation's range lands 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.

(9) Library and Information Services – An increase of $43,000 ($20,919,000 available in 2012).

a) An increase of $43,000 to fund increased pay costs.

Need for Change

Funding for pay costs is critical for recruiting and retaining top level scientists and staff, conducting viable research programs and carrying out ARS' mission. Absorption of these costs reduces the number of scientists and support personnel essential for conducting the agency's research programs. If pay costs are not fully funded, ARS will be unable to fill critical positions and will have to reduce spending for much needed laboratory equipment, supplies, and other materials.

b) An increase of $1,500,000 for the National Agricultural Library for Digital Information Services.

Need for Change

The National Agricultural Library (NAL) is the largest and most accessible agricultural research library in the world. NAL offers free Web-based access to agricultural information through its core site, www.nal.usda.gov.

NAL's specialized Information Services provide access to comprehensive and essential information resources focusing on specific aspects of agricultural subjects. In addition to general reference services, NAL provides other Internet access to key digital information. Examples of special emphasis services include: Alternative Farming; Animal Welfare; Food and Nutrition; Food Safety; Invasive Species; Rural; and Water Quality. Currently, information on biomass, biofuels, and sustainability is lacking.

Outcomes

Solving complex problems related to long-term agricultural productivity and environmental stewardship requires large, comprehensive data sets on carbon sequestration and greenhouse gas emissions, tillage and management studies, and conservation program benefits accessible to the entire scientific community. The proposed increase will provide the necessary information.

Means to Achieve Change

- Provide Access to Sustainability and Environmental Data Sets for the Scientific Community ($1,500,000). ARS will:
  - Develop unified accessible sources of databases developed from research on agriculture and the environment, such as research on carbon sequestration and greenhouse gas emissions, tillage and management studies, and conservation program benefits.

c) A decrease of $1,500,000 in ongoing operations or activities to provide savings to finance higher priority research initiatives.

Need for Change

In its 2013 Budget, ARS is proposing the termination or decreasing of selected ongoing programs or activities within the Library and Information Services. This will include the termination of new monograph acquisition; the end of library association memberships; the decline of digital journal subscription (DigiTop); the reduction of reference and document delivery services; and the cutback on cataloging. The savings achieved from these terminations or decreases will be redirected to finance increases needed in digital information services.

MD, Beltsville – NAL, downsize programs/operations (-$1,500,000)

d) ARS' base funding for Library and Information Services in 2012 is $20,919,000.

NAL 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 in 1962 a national library 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 National's agricultural heritage, the provider of world class information, and the wellspring for generating new fundamental knowledge and advancing scientific discovery. It is a priceless national resource that, through it services, programs, information products, and web-based tools and technologies, serves anyone who needs agricultural information.

(10) Repair and Maintenance – An increase of $3,000,000 ($17,468,000 available in 2012).

a) An increase of $3,000,000 for the repair and maintenance of ARS' laboratories/facilities.

Need for Change

The backlog of ARS' repair and maintenance (R&M) needs exceeds $250 million and continues to grow. The annual R&M funds ARS has received has typically been about $17 million which has been inadequate to maintain the agency's laboratories/facilities or prevent the growth of deferred maintenance. Industry standards suggest an annual investment of two to four percent of facilities' plant replacement value ($3.7 billion for ARS) for sustainability.

The agency's R&M funding is distributed on a priority basis across ARS' entire facility inventory. Projects are funded usually in the $50,000 to $500,000 range to address specific equipment or system failures.

The proposed additional $3 million will be used to address specific R&M needs, such as the replacement of air handling units, boilers, chillers, etc., that have reached the end of their service life. Many of the agency's laboratories/facilities were built in the 1950s and 1960s and are over 50 years old.

The American Recovery and Reinvestment Act (ARRA) funds that ARS received ($176 million) were used for major renovations to critical laboratories/facilities. The backlog of R&M needs were reduced for those ARS laboratories/facilities that received ARRA funds.

AGRICULTURAL RESEARCH SERVICE
Geographic Breakdown of Obligations and Staff Years
(Dollars in thousands)

Location	2010 Actual Amount	2010 Actual Staff Years	2011 Actual Amount	2011 Actual Staff Years	2012 Estimate Amount	2012 Estimate Staff Years	2013 Estimate Amount	2013 Estimate Staff Years
ALABAMA, Auburn	$7,904	55	$6,622	53	$5,907	53	$5,907	53
ALASKA, Fairbanks	5,100	24	4,584	18	- -	- -	- -	- -
ARIZONA								
Maricopa	9,615	78	9,936	80	9,725	80	9,950	80
Tucson	5,150	43	5,138	46	4,946	46	5,883	46
Total	14,765	121	15,074	126	14,671	126	15,833	126
ARKANSAS								
Booneville	5,082	21	2,244	22	1,765	22	- -	- -
Fayetteville	1,746	15	1,737	13	1,628	13	1,628	13
Little Rock	10,225	11	9,794	11	6,349	11	6,349	11
Stuttgart	8,494	71	7,287	64	8,254	77	8,704	77
Total	25,547	118	21,062	110	17,996	123	16,681	101
CALIFORNIA								
Albany	40,620	285	37,657	268	37,847	269	37,847	269
Davis	11,928	93	11,706	97	10,954	97	10,965	97
Parlier	12,584	103	12,387	105	11,777	105	11,777	105
Riverside	5,766	46	5,513	42	5,574	42	5,584	42
Salinas	5,027	48	4,881	48	4,907	48	4,907	48
Shafter	1,457	14	1,458	16	- -	- -	- -	- -
Total	77,382	589	73,602	576	71,059	561	71,080	561
COLORADO								
Akron	2,027	22	2,094	21	2,049	21	2,519	21
Fort Collins	15,596	141	16,035	145	15,298	145	16,931	145
Total	17,623	163	18,129	166	17,347	166	19,450	166
DELAWARE								
Newark	2,112	17	2,081	15	2,070	15	2,070	15
DISTRICT OF COLUMBIA								
National Arboretum	12,060	77	12,084	80	11,413	80	11,413	80
Headquarters Federal Administration	84,527	510	83,365	500	73,891	476	73,891	476
Total	96,587	587	95,449	580	85,304	556	85,304	556
FLORIDA								
Brooksville	2,188	11	1,688	10	- -	- -	- -	- -
Canal Point	2,900	36	2,926	34	2,888	34	2,888	34
Fort Lauderdale	2,629	27	2,512	27	2,552	27	2,349	27
Fort Pierce	13,394	127	19,048	147	14,270	147	14,270	147
Gainesville	14,315	128	13,473	123	12,075	123	12,300	123
Miami	4,860	49	4,793	49	4,570	49	4,570	49
Winter Haven	2,786	23	- -	- -	- -	- -	- -	- -
Total	43,072	401	44,440	390	36,355	380	36,377	380

AGRICULTURAL RESEARCH SERVICE
Geographic Breakdown of Obligations and Staff Years
(Dollars in thousands)

	2010 Actual		2011 Actual		2012 Estimate		2013 Estimate	
Location	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
GEORGIA								
Athens	27,932	221	27,155	217	25,569	199	28,839	209
Byron	3,624	37	3,432	36	3,651	36	3,651	36
Dawson	4,646	42	4,239	39	3,879	39	3,879	39
Griffin	2,434	21	2,445	20	2,319	20	2,476	20
Tifton	10,191	100	10,258	96	9,694	96	11,414	96
Total	48,827	421	47,529	408	45,112	390	50,259	400
HAWAII, Hilo	11,172	60	9,727	65	9,544	65	8,712	65
IDAHO								
Aberdeen	6,214	57	6,275	56	6,012	56	6,447	56
Boise	2,316	23	2,365	21	2,143	21	2,613	21
Dubois	2,597	21	2,431	19	2,149	19	2,149	19
Kimberly	3,464	36	3,631	36	3,585	36	3,945	36
Total	14,591	137	14,702	132	13,889	132	15,154	132
ILLINOIS								
Peoria	35,329	258	34,475	246	35,271	247	35,271	247
Urbana	5,957	44	5,831	41	5,731	41	6,406	41
Total	41,286	302	40,306	287	41,002	288	41,677	288
INDIANA, W. Lafayette	8,041	70	7,675	66	7,753	66	7,999	66
IOWA, Ames	52,393	438	51,016	428	51,086	428	55,067	440
KANSAS, Manhattan	16,063	103	14,917	99	13,798	99	14,248	99
KENTUCKY								
Bowling Green	2,640	16	2,608	17	2,584	17	1,841	17
Lexington	2,685	16	2,580	15	2,636	15	1,806	15
Total	5,325	32	5,188	32	5,220	32	3,647	32
LOUISIANA								
Baton Rouge	2,840	25	2,736	24	2,581	24	2,581	24
Houma	4,347	49	4,008	49	4,069	49	4,069	49
New Orleans	30,176	197	25,482	192	22,093	182	21,648	182
Total	37,363	271	32,226	265	28,743	255	28,298	255
MAINE, Orono	3,433	26	2,992	22	2,200	22	2,200	22
MARYLAND								
Beltsville	145,243	943	139,344	940	137,025	940	141,403	950
Frederick	5,769	46	5,672	44	5,630	44	6,630	44
Total	151,012	989	145,016	984	142,655	984	148,033	994
MASSACHUSETTS, Boston	15,568	9	15,009	9	15,258	9	15,091	9
MICHIGAN, East Lansing	5,043	42	4,919	41	4,597	41	1,327	19

AGRICULTURAL RESEARCH SERVICE
Geographic Breakdown of Obligations and Staff Years
(Dollars in thousands)

Location	2010 Actual Amount	2010 Actual Staff Years	2011 Actual Amount	2011 Actual Staff Years	2012 Estimate Amount	2012 Estimate Staff Years	2013 Estimate Amount	2013 Estimate Staff Years
MINNESOTA								
Morris	2,864	27	2,909	26	2,643	26	2,643	26
St. Paul	7,822	67	7,430	67	6,793	67	6,793	67
Total	10,686	94	10,339	93	9,436	93	9,436	93
MISSISSIPPI								
Mississippi State	9,331	76	8,675	75	9,216	75	9,216	75
Oxford	14,303	94	14,060	96	14,040	96	12,881	96
Poplarville	5,313	39	5,218	35	5,169	35	5,169	35
Stoneville	38,678	303	36,537	289	38,195	289	35,093	289
Total	67,625	512	64,490	495	66,620	495	62,359	495
MISSOURI, Columbia	9,003	73	9,039	81	9,104	81	10,622	81
MONTANA								
Miles City	3,531	28	3,510	26	3,337	26	3,337	26
Sidney	5,214	52	5,075	51	5,136	51	5,361	51
Total	8,745	80	8,585	77	8,473	77	8,698	77
NEBRASKA								
Clay Center	19,309	115	19,395	120	19,580	120	19,714	120
Lincoln	6,047	63	5,954	66	5,982	66	5,982	66
Total	25,356	178	25,349	186	25,562	186	25,696	186
NEVADA								
Reno	- -	- -	2,126	7	2,366	7	2,366	7
NEW MEXICO								
Las Cruces	6,060	50	6,033	51	6,032	51	6,857	51
NEW YORK								
Geneva	4,045	33	3,961	32	3,926	32	3,936	32
Greenport	5,920	31	4,177	30	3,840	30	4,034	30
Ithaca	11,193	58	10,697	55	10,594	55	11,794	55
Total	21,158	122	18,835	117	18,360	117	19,764	117
NORTH CAROLINA								
Raleigh	9,767	82	9,615	83	9,402	83	10,077	83
NORTH DAKOTA								
Fargo	15,501	132	15,683	132	15,780	132	15,780	132
Grand Forks	9,705	50	10,018	48	9,560	48	9,560	48
Mandan	3,910	41	3,630	37	3,441	37	4,296	37
Total	29,116	223	29,331	217	28,781	217	29,636	217
OHIO								
Columbus	1,579	17	1,613	15	1,478	15	1,838	15
Coshocton	1,421	14	1,328	13	- -	- -	- -	- -
Wooster	6,261	51	6,015	49	5,059	49	5,059	49
Total	9,261	82	8,956	77	6,537	64	6,897	64

AGRICULTURAL RESEARCH SERVICE
Geographic Breakdown of Obligations and Staff Years
(Dollars in thousands)

Location	2010 Actual		2011 Actual		2012 Estimate		2013 Estimate	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
OKLAHOMA								
El Reno	5,412	47	5,444	42	5,361	42	7,056	48
Lane	2,097	20	2,075	20	- -	- -	- -	- -
Stillwater	3,691	33	3,654	33	3,661	33	3,661	33
Woodward	1,692	17	1,691	17	1,645	17	1,645	17
Total	12,892	117	12,864	112	10,667	92	12,362	98
OREGON								
Burns	3,120	25	3,255	28	2,727	28	2,727	28
Corvallis	13,671	119	13,742	123	11,860	123	12,825	123
Pendleton	1,879	17	1,946	18	1,961	18	1,961	18
Total	18,670	161	18,943	169	16,548	169	17,513	169
PENNSYLVANIA								
University Park	4,866	39	4,670	37	4,216	37	5,431	37
Wyndmoor	35,240	215	33,783	216	34,920	217	33,405	217
Total	40,106	254	38,453	253	39,136	254	38,836	254
SOUTH CAROLINA								
Charleston	4,445	42	4,518	42	4,435	42	4,435	42
Clemson	2,361	25	2,296	25	- -	- -	- -	- -
Florence	4,224	34	4,037	33	4,149	33	4,149	33
Total	11,030	101	10,851	100	8,584	75	8,584	75
SOUTH DAKOTA								
Brookings	4,066	38	3,468	37	2,967	37	2,967	37
TEXAS								
Beaumont	1,360	14	1,331	13	- -	- -	- -	- -
Bushland	6,952	47	6,862	48	6,960	48	5,468	48
College Station	16,670	148	16,139	138	16,027	138	16,027	138
Houston	14,138	7	13,533	8	13,678	8	13,678	8
Kerrville	5,697	46	5,589	46	5,664	46	5,664	46
Lubbock	9,039	101	8,917	99	9,039	99	9,039	99
Temple	3,570	32	3,545	31	3,586	31	4,860	37
Weslaco	10,369	107	9,963	106	1,616	72	1,616	72
Total	67,795	502	65,879	489	56,570	442	56,352	448
UTAH, Logan	9,366	84	9,153	82	9,007	82	8,921	82
WASHINGTON								
Prosser	3,779	28	3,761	30	3,319	30	3,319	30
Pullman	16,932	129	16,789	129	16,514	129	17,924	129
Wapato	4,546	50	4,557	50	4,550	50	4,550	50
Wenatchee	2,110	23	2,130	25	2,108	25	2,108	25
Total	27,367	230	27,237	234	26,491	234	27,901	234
WEST VIRGINIA								
Beaver	7,257	51	6,957	50	- -	- -	- -	- -
Kearneysville	7,847	65	7,296	65	7,186	65	7,186	65
Leetown	7,112	35	7,039	34	7,157	34	4,655	34
Total	22,216	151	21,292	149	14,343	99	11,841	99

AGRICULTURAL RESEARCH SERVICE
Geographic Breakdown of Obligations and Staff Years
(Dollars in thousands)

Location	2010 Actual Amount	2010 Actual Staff Years	2011 Actual Amount	2011 Actual Staff Years	2012 Estimate Amount	2012 Estimate Staff Years	2013 Estimate Amount	2013 Estimate Staff Years
WISCONSIN, Madison	18,472	114	17,627	122	16,088	122	16,524	122
WYOMING, Cheyenne	2,366	24	2,302	21	2,313	21	2,313	21
PUERTO RICO								
Mayaguez	2,852	33	2,798	34	2,837	34	2,837	34
OTHER COUNTRIES								
Argentina,								
Buenos Aires	578	- -	818	- -	532	- -	532	- -
France, Montpellier	3,087	2	3,047	1	3,078	1	3,078	1
Total	3,665	2	3,865	1	3,610	1	3,610	1
Extramural and Funds								
Administered from								
Headquarters-Held Funds	22,978	- -	16,189	- -	52,624	- -	34,714	- -
Repair & Maintenance								
of Facilities	17,461	- -	17,116	- -	17,468	- -	20,468	- -
Obligations	1,178,286	8,282	1,133,001	8,159	1,101,492	7,924	1,102,565	7,924
Lapsing Balance	3,081	- -	1,856	- -	- -	- -	- -	- -
Bal. Available, EOY	5,219	- -	6,845	- -	- -	- -	- -	- -
Total, Available or Est	1,186,586	8,282	1,141,702	8,159	1,101,492	7,924	1,102,565	7,924

AGRICULTURAL RESEARCH SERVICE

Classification by Objects
(Dollars in thousands)

		2010 Actual	2011 Actual	2012 Estimate	2013 Estimate
Personnel Compensation:					
Washington D.C.		$20,785	$41,528	$40,562	$40,721
Field		543,209	523,798	511,619	513,625
11	Total personnel compensation	563,994	565,326	552,181	554,346
12	Personal benefits	168,179	171,675	169,367	169,908
13.0	Benefits for former personnel	776	984	-	-
	Total, personnel comp. and benefits	732,949	737,985	721,548	724,254
Other Objects:					
21.0	Travel and transportation of persons	18,403	13,185	20,390	12,969
22.0	Transportation of things	854	595	552	604
23.1	Rental payments to GSA	47	52	48	53
23.2	Rental payments to others	1,389	897	831	910
23.3	Communications, utilities, and misc. charges	48,391	46,192	42,794	42,513
24.0	Printing and reproduction	1,483	1,311	1,078	1,195
25	Other contractual services	-	-	-	-
25.1	Advisory and assistance services	1,034	956	887	971
25.2	Other services from non-Federal sources	16,250	8,707	8,670	9,804
25.3	Other purchases of goods and services from Federal sources	468	291	269	295
25.4	Operation and maintenance of facilities	35,942	37,515	34,776	34,465
25.5	Research and development contracts	165,058	148,107	138,891	137,592
25.6	Medical care	617	552	512	560
25.7	Operation and maintenance of equipment	7,576	14,900	16,980	14,207
25.8	Subsistence and support of persons	162	12	11	13
26.0	Supplies and materials	86,418	74,676	69,591	68,580
31.0	Equipment	39,873	29,088	26,996	35,524
32.0	Land and structures	4,956	5,223	4,842	5,103
41.0	Grants	16,416	12,757	11,826	12,953
	Total, Other Objects	445,337	395,016	379,944	378,311
99.9	Total, new obligations	1,178,286	1,133,001	1,101,492	1,102,565
Position Data:					
Average Salary (dollars), ES Position		$163,404	$170,399	$166,437	$166,437
Average Salary (dollars), GS Position		$68,092	$68,022	$68,419	$68,419
Average Grade, GS Position		10.4	10.5	10.5	10.5

AGRICULTURAL RESEARCH SERVICE

Status of Program

The Agricultural Research Services (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 accomplishments for 2011 and current research activities, including the National Agricultural Library, are detailed below.

New Products/Product Quality/Value Added

Current Activities:

ARS has active research programs directed toward (1) improving the efficiency and reducing the cost for the conversion of agricultural products into biobased products and biofuels, (2) developing new and improved products to help establish them in domestic and foreign markets, and (3) providing higher quality, healthy foods that satisfy consumer needs in the United States and abroad.

Selected Examples of Recent Progress:

Improved emergency aid food. The nutritional and sensory quality of ready-to-eat foods made for emergencies can be compromised when delivered for use in hot, tropical climates unless storage conditions are adequate. ARS scientists from Wyndmoor, Pennsylvania, developed a new instant corn and soy blend with superior properties and a one year shelf life. Twenty metric tons of this new emergency aid food was shipped to Haiti in 2011 through a grant from the National Institute for the Severely Handicapped. The emergency food is feeding more than 3,000 malnourished children and provides jobs for 128 disabled employees in the United States.

Quality testing method developed for cake flour with zero *trans* fat. Standard methods for assessing the quality of baking flours have been based on the use of partially hydrogenated *trans* fats in baked goods. The baking industry is phasing out the use of unhealthy *trans* fats. ARS researchers from Wooster, Ohio, developed a new method for testing baked goods that do not contain *trans* fats. The new method has already been adopted by flour testing and industrial baking laboratories.

Elite germplasm for fuel production. Pennycress (*Thlaspi arvense*) is an annual winter cover crop that produces superior oil for renewable diesel or biodiesel production (i.e., it has a lower cloud point and is more oxidatively stable than soy-based biodiesel). Because pennycress can be double cropped with soybeans, it does not compete with food production. ARS scientists in Peoria, Illinois, selected an elite germplasm line exhibiting germination rates of greater than 90 percent versus rates as low as 20 percent for varieties that were previously used. The new variety also yields up to 30 percent more seed with six percent greater oil content than current lines, thus, its oil yield per acre is about twice that of soybeans. ARS is currently working with companies to commercialize the production of this new pennycress variety for conversion into bio-based jet fuel.

Biodiesel provides a five-to-one return on fossil energy. The relative value of different biofuels is often based on their total life cycle net energy return. For instance, the net energy return for corn ethanol is estimated to be 0.5 BTU/BTU; the net energy return of petroleum-based fuels is about 0.9. ARS researchers along with other USDA and university collaborators completed a life cycle analysis of soybean biodiesel production and showed that for every BTU of fossil energy used to produce biodiesel, 5.5 BTUs of biodiesel are produced. A previous assessment based largely on pre-1990 data estimated a net return of 3.2. The new study also determined that the new, higher energy return for biodiesel results from three major improvements since the earlier assessment: soybean crushing facilities and biodiesel production plants have become increasingly energy efficient; soybean farmers have adopted energy saving farm practices such has minimum tillage; and soybean yields have increased.

USDA and the Federal Aviation Administration (FAA) develop the feedstock readiness level tool. Air industry experts recognized that there were problems related to the availability of plant-based feedstocks for producing aviation biofuels. The commercial air transportation industry requested that USDA develop a Feedstock Readiness Level (FSRL) Tool to complement the internationally recognized Commercial Air Alternative Fuel Initiative (CAAFI) Fuel Readiness Tool. A USDA/FAA team created the FSRL to track progress on the development of agricultural and forest-based feedstocks needed to produce alternative jet fuel. USDA and FAA completed the FSRL tool on November 30, 2011.

Corn gene enhances switchgrass biofuel production potential. ARS scientists have increased starch production from switchgrass by up to 250 percent using a novel form of the corn gene *cg1* (*corngrass1*). Starch produced by *cg1* switchgrass was converted into simple sugars such as glucose, without energy intensive and expensive pretreatment of biomass. The *cg1* switchgrass represents a new model for genetically enhanced feedstocks for the biofuel industry. This research was the result of a collaborative project among USDA and scientists at the Department of Energy's Energy Biosciences Institute and the Joint BioEnergy Institute.

More sustainable fruit and vegetable peeling technology. Reduced water use has become a high priority in agriculture and food processing. ARS scientists from Albany, California, worked with a large fruit processing company and the California League of Food Processors to develop an infrared dry peeling technology for peaches, pears, and tomatoes. The novel peeling technology is patented and under commercial implementation. It is estimated that this novel peeling process will eliminate the use of more than 10 million gallons of water and the treatment of more than 10,000 tons of caustic water material during each fruit processing season.

Use of wool-based natural materials in personal care products. Using green chemistry, ARS researchers from Wyndmoor, Pennsylvania, extracted keratin from wool and converted it into a variety of creams and emollients for applications in personal care products. A Cooperative Research and Development Agreement partner has already utilized this technology to develop and commercialize "green" and "natural" hair conditioners.

Improved food security in Tajikistan. Central Asian countries have struggled economically during the past 20 years following the fall of the Iron Curtain. Many former Soviet biological weapon scientists in this region have been unemployed. With funding from the State Department, ARS scientists from Wyndmoor, Pennsylvania, and former Soviet scientists, developed new native plant-based food and non-food products that will benefit the local economy in Tajikistan, making the country more self-reliant. In addition, this effort supported U.S. anti-terrorist objectives by redirecting 12 former biological weapon scientists into agricultural research.

High value products from *Cuphea*. ARS scientists from Peoria, Illinois, developed a catalyst that efficiently converts the oil from *Cuphea* seeds (*Cuphea* is a common perennial plant) into a high value specialty chemical. ARS filed for a U.S. patent and is working with an industrial partner to commercialize the *Cuphea*-derived chemical as a natural fragrance. The chemical is also an effective mosquito repellant and may find applications in commercially viable, natural, and less toxic alternatives to DEET insecticide.

Livestock Production

Current Activities:

ARS' livestock production program is directed toward (1) safeguarding and utilizing animal genetic resources, associated genetic and genomic databases, and bioinformatic tools; (2) developing a basic understanding of the physiology of livestock and poultry; and (3) developing information, tools, and technologies that can be used to improve animal production systems. The research is heavily focused on the development and application of genomics technology to increase the efficiency and product quality of beef, dairy, swine, poultry, aquaculture, and sheep systems. Current areas of emphasis include increasing 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, natural), and evaluating and conserving animal genetic resources.

Selected Examples of Recent Progress:

Potential major cause of reproductive failure in beef cattle. Feed and care for unproductive cows that fail to achieve pregnancy is a major cost in beef production. A test capable of identifying young cows with a low likelihood to conceive and produce a live calf would greatly benefit the beef industry. During a study to identify genes that produce a variation in reproductive efficiency, ARS researchers at Clay Center, Nebraska, discovered that as many as 30 percent of cows that had low success achieving pregnancy appeared to carry portions of the male specific Y chromosome. Because only bulls are expected to have the Y chromosome, this research suggests that transmission of a Y chromosome to female offspring (via a chromosomal crossover event) may be a significant contributor to reproductive failures. This discovery will now be used to develop a test that identifies beef heifers and cows that should not be used for breeding. A robust test for Y chromosome in breeding herds of beef cattle that improves reproductive efficiency will lead to better reproductive efficiency and lower production costs which will increase economic returns to producers, bring down beef prices, and enhance beef exports.

Rapid chilling of pork carcasses reduces the tenderness of pork loin chops. Very rapid chilling of pork carcasses has been widely adopted by the pork industry as a means to improve the quality, food safety, and color attributes of pork products. Decreased tenderness has been identified as a source of consumer dissatisfaction with pork products. ARS scientists in Clay Center, Nebraska, have demonstrated that pork loins produced in plants that use rapid chilling systems are significantly less tender and subject to much larger variations of tenderness than those produced in plants that use conventional chilling systems. This research identified very rapid chilling as a major contributor to variations in pork tenderness. These results have led the National Pork Board and the pork industry to collaborate with ARS to find solutions to this problem.

Faster growing Atlantic salmon developed and germplasm released to commercial producers. Increasing harvest size and reducing the time to harvest of Atlantic salmon are two goals of the salmon producers in North America. ARS researchers at the National Cold Water Marine Aquaculture Center in Franklin, Maine, evaluated the growth of salmon from their breeding program in commercial sea cages in collaboration with industry. A salmon line selected for faster growth and greater weight was produced and germplasm was released to commercial producers. Utilization of improved germplasm will reduce the time to harvest, increase the profitability and sustainability of coldwater marine aquaculture in the U.S., and provide consumers with a quality seafood product.

Sows which were not previously housed beside one another make better group mates. The largest single challenge of keeping sows in groups is their aggressive behavior. Increased aggression increases the incidence of injury, increases costs, and reduces production efficiencies and profitability for producers. The swine industry must address this issue as more sows are being housed in groups rather than individual stalls in commercial production facilities. ARS researchers in West Lafayette, Indiana, studied a method which relies on "pre-exposure," in which sows are housed side by side, but prevented from fighting with each other. Contrary to expectation, the study found that pre-exposure prior to mixing sows together in a group caused the sows to fight more, not less, when group housed. It appears that the inability of sows to resolve aggressive dominance interactions prior to mixing, but after side by side association, actually promotes more aggressive behavior. Future research should use a different approach to resolve sow aggression prior to mixing.

Increasing ewe prolificacy for sheep producers. A high priority of the sheep industry is to increase the number of lambs weaned per ewe exposed for breeding. The use of Romanov crossbred ewes is increasing in the United States because the Romanov breed is the most prolific breed available. It was hypothesized that Romanov crossbred sheep may differ in reproductive performance when produced using Romanov rams or Romanov ewes because Romanov ewes produce much larger litters than ewes of other breeds. Therefore, the relative performance of Romanov crossbred ewes sired by Romanov rams compared to those born to Romanov ewes is an important industry issue. ARS researchers at Clay Center, Nebraska, determined that Romanov crossbred ewes produced by either method were similar in their high levels of productivity—there was no significant maternal dam effect. Consequently, producers can mate Romanov rams to ewes of locally adapted breeds to lower the cost of producing Romanov crossbreds and still realize improved fecundity and reproductive performance of the resulting Romanov crossbred ewe. This practical information will further increase use of Romanov superior genetics, resulting in greater productivity and profitability for sheep producers.

Genetic variation associated with important diseases of beef cattle. Respiratory disease, foot rot, and pinkeye are important diseases of beef cattle that increase the cost of production and reduce animal well-being. New DNA technology makes it possible to identify genes in cattle associated with susceptibility or resistance to these diseases. ARS researchers in Clay Center, Nebraska, used this technology to identify six different chromosomes associated with these common and expensive diseases of cattle. This discovery will enable development of specific DNA tests targeting susceptibility to these diseases and determine whether DNA-based selection can reduce the incidence of these diseases in beef cattle. Breeding for reduced susceptibility to these common diseases would enhance animal well-being and production efficiencies while reducing the need for antibiotic use in beef cattle.

Five new lethal recessive defects that reduce dairy cow fertility. Lethal recessive defects that cause embryo loss are difficult to detect without genomic data even with very large sets of phenotypic and pedigree data because of too few observations per estimated mating interaction. Based on genomic testing, a method was developed to discover lethal defects by detecting the absence of haplotypes (a set of single nucleotide polymorphisms associated on a single chromosome) that had high population frequency but were never homozygous in the population. Haplotype testing revealed five new, as well as two previously known defects, (three in Holsteins, one in Jerseys, and one in Brown Swiss) consistent with the presence of a lethal recessive. The carrier genotypes exist in the three populations at levels from 2.7 percent to more than 20 percent indicating that there is opportunity to significantly improve conception rates and reproductive efficiency in dairy cattle. This research was the first ever documented in human or animal genomics, utilizing deep Mendelian sampling of commercial data for biological discovery, and a combined use of high density genotyping, haplotyping, resequencing, and low density validation genotyping technologies. Once animals have been genotyped, dairy farmers can avoid mating carrier animals, thus increasing profitability and reducing those defects in the population. The results of this research are already being incorporated by the dairy industry to inform breeding programs and improve reproductive performance.

Crop Production

Current Activities:

ARS' crop production program focuses on developing and improving ways to reduce crop losses while protecting and ensuring a safe and affordable food supply. The research program concentrates on effective 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.

Current 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. ARS 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.

Selected Examples of Recent Progress:

New wheat germplasm for resistance to stem rust race Ug99 distributed globally. Stem rust race Ug99 is capable of causing widespread global crop losses. ARS researchers in Raleigh, North Carolina, developed 53 winter wheat lines having stem rust genes combined in two, three, and four gene combinations. These same wheat lines also have two- and three-gene combinations for resistance to yellow (stripe) rust and leaf rust. It was possible to identify and select these multiple rust resistant lines only through the close coordination of traditional breeding, field phenotyping, and molecular marker genotyping. This germplasm was distributed to winter wheat researchers in the United States and 23 other countries. These wheat lines will greatly aid wheat breeders throughout the world in developing rust resistant varieties to significantly enhance global food security. In addition, wheat varieties chosen from these germplasm lines for U.S. production will enable deployment of resistance to Ug99 stem rust in advance of the pathogen arriving in the United States.

Elucidation of key physiological genetic factors for the cryopreservation of vegetatively propagated plants. For many elite vegetatively propagated genebank accessions, cryopreservation of shoot tips or dormant buds is often the most secure and cost effective means for long-term conservation. Cryopreservation protocols have traditionally been developed empirically, because the underlying physiological genetic process of regrowth following cryopreservation has been poorly understood. ARS researchers in Fort Collins, Colorado, discovered some of the first physiological genetic details of how plant shoot tips recover from cryopreservation treatments. Shoot tips dehydrated with cryoprotectants, exposed to liquid nitrogen, and allowed to recover expressed stress related genes such as heat shock proteins, antioxidants, dehydrins, and other physiological "housekeeping genes." This research is a key breakthrough in understanding the genetic and biological bases of variation among genotypes in their response to cryopreservation treatments, as well as their response to therapeutic treatments for recovering germplasm from cryogenic storage.

Grape powdery mildew genes. Although powdery mildew is economically the most important fungal pathogen of grapevines, the causal organism cannot be grown in pure culture, thereby limiting knowledge about its genetics. To identify and target weaknesses in powdery mildew biology, ARS researchers in Geneva, New York, sequenced and described all of the genes expressed by grape powdery mildew. Researchers discovered powdery mildew genes required for reproduction, cold survival, and fungicide tolerance. This improved knowledge of powdery mildew genetics provides new targets for disease management of a fungus that costs grape growers up to $400 per acre per year.

Deregulation of genetically engineered Rainbow papaya in Japan. To date, Japan has not marketed U.S. fresh products derived from genetic engineering. The United States is losing a major market for Hawaiian papayas due to the difficulty in supplying non-genetically engineered papaya. In a cooperative effort led by ARS researchers in Hilo, Hawaii, biosafety and other formal regulatory requirements of the Japanese government were completed, paving the way for the import of virus resistant, genetically engineered Rainbow papaya fruit into Japan. The import and marketing of the genetically engineered Rainbow papaya will increase the U.S. market share of papayas, and support the Hawaiian papaya industry. It will also represent one of the first fresh genetically engineered products from the United States to be accepted and marketed in Japan.

Twenty thousand new deletion mutants released for analyzing soybean gene functions. Advances in the genetic and molecular understanding of soybean gene functions are critical for the continued improvement in soybean agronomic and quality traits. Mutant populations are indispensable sources of genetic variation for geneticists and breeders. ARS researchers in St. Paul, Minnesota, used fast neutron radiation to create more than 20,000 new soybean gene knockout and gene disruption mutants that display variation in key soybean traits including seed protein and seed oil composition, maturity, morphology, pigmentation, roots, and nitrogen fixation. This important new resource is accessible through the USDA SoyBase and Soybean Breeder's Toolbox database.

Comprehensive application technology and strategy to reduce pesticide use. Pesticide applications are critical to ensure healthy, unblemished ornamental nursery plants. Conventional spray application practices recommend the modification of carrier volume for preparations of spray mixtures, but not the amount of active ingredients per unit area. ARS researchers in Wooster, Ohio, demonstrated that growers could use their existing spray equipment to reduce pesticide and water use by 50 percent by properly changing spray nozzles at no extra cost and still achieve effective pest and disease control. This equates to doubling the pesticide application efficiency while reducing pesticide costs, reducing health risk to applicators, and diminishing negative effects to the environment. Other benefits accrued with this approach included greater operational efficiency (the area sprayed is doubled, thus the frequency, travel, and time needed for tank refilling are reduced), lower costs for energy consumption and new equipment, and a reduced risk of pesticide exposure to workers. By using the half rate practice, growers reported savings of more than $200 to $500 per acre.

Developing peanuts with improved fatty acid composition and disease resistance. Fatty acid composition is an important characteristic for oil seed crops such as the peanut. High oleic fatty acid composition is favored because it confers health benefits and improved oil stability. Using marker assisted selection in an accelerated backcross breeding program, ARS researchers in Tifton, Georgia, completed the development of "Tifguard High O/L" in less than three years. Growers will benefit from the high yields of this new variety combined with excellent resistance to the peanut root-knot nematode and tomato spotted wilt virus. Other segments of the peanut industry and consumers will benefit from the high oleic trait, which results in a longer shelf life and healthier food quality.

The first varieties of the native Hawaiian ōhelo berry are released. The fruit of ōhelo berry, a native Hawaiian shrub related to blueberry, is gathered by local residents who use it to make jams, jellies, and pie fillings. Increasingly intensive harvesting of fruit from the wild has raised concerns of habitat disturbance and damage, increased vulnerability to invasive weeds, and reduced food supplies for the endangered native nēnē goose. ARS researchers from Hilo, Hawaii; Corvallis, Oregon; and their university collaborators selected two varieties of ōhelo berry—'Red Button' and 'Kīlauea'—as dual purpose plants with edible berries and ornamental merit. These are the first varieties of this species to be bred. They represent a key first step for long-term conservation and sustainable management of this species for ornamental and berry production. They will provide an alternative to wild harvesting of this endemic species, and a new crop for small scale, edible berry production.

Corn germplasm lines with resistance to aflatoxin accumulation released. Two new corn germplasm lines (Mp718 and Mp719) developed by ARS researchers in Mississippi State, Mississippi, which were field tested, showed a 90 percent reduction in aflatoxin accumulation. These germplasm lines exhibit resistance to accumulation of both the toxin and the fungus that causes the disease, *Aspergillus flavus*. Because of this unique resistance to both the fungus and the toxin, corn hybrids with genetic resistance can be developed, and losses to aflatoxin contamination can be reduced by breeders selecting for either reduced aflatoxin accumulation or reduced fungal infection. Commercial hybrids with genetic resistance can now be developed that reduce or even eliminate grain losses to aflatoxin contamination in corn.

Food Safety

Current Activities:

Assuring that the United States has the highest levels of affordable, safe food requires that the food system be protected at each stage from production through processing and consumption from pathogens, toxins, and chemical contaminants that cause diseases in humans. The U.S. food supply is very diverse, extensive, easily accessible, and thus vulnerable to the introduction of biological and chemical contaminants through natural processes, intentional means, or by global commerce.

ARS' current food safety research 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 toxin producing and/or 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 Food Safety and Inspection Service (FSIS), APHIS, FDA, CDC, Department of Homeland Security (DHS), and the EPA. ARS 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, that is, regulatory agencies, industry, and commodity and consumer organizations, in detecting, identifying, and controlling foodborne diseases that affect human health.

Selected Examples of Recent Progress:

Stabilizer to improve sanitizing efficiency of chlorine. The produce industry currently faces a major potential food safety problem, namely, that chlorine levels needed to prevent pathogen survival in wash water are depleted during commercial operations. Working closely with the produce industry, ARS scientists in Beltsville, Maryland, evaluated a novel chlorine stabilizer, T128, in maintaining free chlorine efficacy on pathogen survival and cross contamination during commercial wash operating conditions. In plant studies, the scientists demonstrated that the patented compound significantly increases the efficacy of chlorine wash against bacterial cross contamination while maintaining the quality of leafy green vegetables under real world fresh cut processing conditions. This research is supported and conducted in collaboration with New Leaf Food Safety Solutions Inc., to optimize the application of T128 in the postharvest processing system.

Detection of veterinary drugs in animal tissues. Currently, the FSIS uses a seven plate microbial growth inhibition assay to screen for antimicrobial drug residues in beef samples from slaughter establishments throughout the United States. The assay has several drawbacks including that it takes 24 hours to yield a result; the responses do not identify the drug (only the antibiotic class); and it is unable to detect many common drugs of regulatory interest. ARS researchers in Wyndmoor, Pennsylvania, developed, validated, and transferred to FSIS a better screening method that also can identify individual drug residues in meat samples. The technology targets 60 of the most important drugs of regulatory concern and is able to screen at concentrations below current regulatory tolerance levels. A single analyst can perform preparation of 60 samples with the method in an eight hour day for a series of sequential 10 minute analyses. Implementation of the method in the FSIS National Residue Program will improve the monitoring and enforcement of veterinary drug residues, assuring better animal husbandry practices, reducing environmental contamination, decreasing microbial antibiotic resistance, and increasing food safety.

Nanoparticles to inactivate foodborne pathogens. Nanoparticles can be effective antimicrobial agents against foodborne pathogens. ARS researchers at Wyndmoor, Pennsylvania, investigated the antimicrobial activities of two nanoparticles (magnesium oxide and zinc oxide) against three major foodborne pathogens: *Escherichia coli* O157, *Salmonella* spp., and *Campylobacter jejuni.* The results demonstrated that these nanoparticles dramatically killed those pathogens and, therefore potentially can be added directly in foods or incorporated in packaging materials to improve microbiological safety. This research explores a new application of nanotechnology and inorganic antimicrobial compounds in food safety, and provides useful information to the food and packaging industries. The effect of nanoparticles on the environment and human health is not clear. Currently nanotechnology is being evaluated in the FDA Critical Path Initiative. Further toxicological studies are needed to determine the potential risks to humans, a concern that has been expressed by various international bodies.

Detection and typing of non-O157 Shiga toxin producing *E. coli.* It has become evident that certain Shiga toxin producing *E. coli* (STEC) serogroups, including *E. coli* O26, O45, O103, O111, O121, and O145 cause an illness in humans similar to that of *E. coli* O157:H7. Because these "top six" non-O157 STEC serogroups can be as dangerous as *E. coli* O157:H7, the FSIS recently declared these STEC as adulterants in beef similar to that of *E. coli* O157:H7. At the request of the FSIS, ARS researchers at Wyndmoor, Pennsylvania, developed a method consisting of food enrichment, detection of the genes involved in the disease process, and serogroup specific genes by using polymerase chain reaction and strain isolation protocols to detect and identify these non-O157 STEC pathogens in beef. Further, ARS developed, evaluated, and transferred latex agglutination tests (LATs) for detection and confirmation of the STECs. The detection, isolation, and confirmation protocols will be useful to the food industry; in early 2012, they will be employed by FSIS to monitor for these important emerging pathogens in beef.

Survival and virulence mechanisms in *Salmonella*. *Salmonella typhimurium* is a human foodborne pathogen and is one of the most prominent *Salmonella* serovars isolated from swine production farms. Unfortunately, *Salmonella typhimurium* can undetectably reside in pigs without causing noticeable infection. These *Salmonella* carrier pigs are a food safety problem for humans through contamination of penmates, the environment, and slaughter plants that process pork for consumption. In searching for improved intervention strategies against Salmonella on the farm, ARS researchers in Ames, Iowa, have identified a gene (poxA) in *Salmonella typhimurium* that, when mutated, dramatically reduces the ability of the bacterium to survive numerous stress conditions as well as antibiotic and chemical exposures. Furthermore, the gene mutation decreased the ability of *Salmonella typhimurium* to colonize the pig.

Livestock Protection

Current Activities:

ARS' animal health 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.

The research program has ten strategic objectives: (1) establish ARS' laboratories into a fluid, highly effective research network to maximize use of core competencies and resources; (2) access specialized high containment facilities to study zoonotic and emerging diseases; (3) develop an integrated animal and microbial genomics research program; (4) establish centers of excellence in animal immunology; (5) launch a biotherapeutic discovery program providing alternatives to animal drugs; (6) build a technology driven vaccine and diagnostic discovery research program; (7) develop core competencies in field epidemiology and predictive biology; (8) develop internationally recognized expert collaborative research laboratories;

(9) establish a best-in-class training center for our Nation's veterinarians and scientists; and (10) develop a model technology transfer program to achieve the full impact of ARS' research discoveries.

ARS' current animal research program includes eight core components: (1) biodefense research, (2) animal genomics and immunology, (3) zoonotic diseases, (4) respiratory disease, (5) reproductive and neonatal diseases, (6) enteric diseases, (7) parasitic diseases, and (8) transmissible spongiform encephalopathies.

Selected Examples of Recent Progress:

Alternatives to antibiotics. Probiotics or direct fed microbials (DFMs) are live microorganisms that provide alternatives to antibiotics. They are also known to confer health benefits on the host by influencing the host immune system via increased antibody production, up regulation of cell mediated immunity, and augmenting innate defense mechanisms. ARS scientists in Beltsville, Maryland, examined the role of *Bacillus subtilis*–based DFMs on macrophage functions such as nitric oxide production and phagocytosis, the two most important innate immune functions of macrophages. Macrophage, a key component of host innate immunity, participates in host defense by secreting cytokines and nitric oxide, which modulates inflammation and kill microbes. In controlled studies, ARS scientists demonstrated that certain strains of *B. subtilis* increase macrophage function in broiler chickens. These studies provide the scientific basis for future studies to investigate DFMs as immunopotentiating agents to enhance host protective immunity against enteric pathogens in broilers chickens.

Swine influenza. Swine influenza is a highly contagious viral infection in pigs that significantly affects the pork industry due to weight loss and secondary infections. There is also the potential of a significant threat to public health, as occurred in 2009 when the pandemic H1N1 influenza virus strain emerged from reassortment events among avian, swine, and human influenza viruses within pigs. As classic and pandemic H1N1 strains now circulate in swine, an effective vaccine may be the best strategy to protect the pork industry and public health. Current inactivated virus vaccines available for swine influenza protect only against viral strains closely related to the vaccine strain, and egg-based production of these vaccines is insufficient to respond to large outbreaks. DNA vaccines are a promising alternative because they can potentially induce broad-based protection with more efficient production methods. ARS scientists in Ames, Iowa, working together with scientists at the National Institutes of Health, evaluated the potential of monovalent and trivalent DNA vaccine constructs to elicit immunological responses and protect pigs against viral shedding and lung disease after challenge with pandemic H1N1 or classic swine H1N1 influenza virus. Scientists also compared the efficiency of a needle free vaccine delivery method to that of a conventional needle/syringe injection. The results of these studies demonstrated that DNA vaccination elicits robust serum antibody and cellular responses after three immunizations and confers significant protection against influenza virus challenge. Needle free delivery elicited improved antibody responses with the same efficiency as conventional injection and may be considered for development as a practical alternative for vaccine administration.

Mastitis in dairy cattle. Mastitis is both the most prevalent infectious disease in dairy herds and the most costly disease for dairy producers. Older cost estimates for mastitis are in the neighborhood of $2 billion per year for producers. Antibiotics are the mainstay for mastitis treatment and control. Dairy cattle with mastitis receive more antibiotic therapy for its prevention and treatment than for all other dairy cattle diseases combined. Valid concerns by consumers regarding antibiotic usage need to be addressed by research on nonantibiotic alternatives. A significant proportion of clinical mastitis cases occur in cows in the weeks shortly after calving when the cow's innate immune system is compromised, highlighting the important role of a fully functional immune system in the fight against mastitis. The physiological role of the vitamin D system continues to evolve beyond calcium and skeletal homeostasis to include significant roles in modulating innate and adaptive immune function. It has long been recognized that vitamin D deficiency, as reflected in serum $25(OH)D_3$ concentrations, causes decreased resistance to infection. Recently, vitamin D has been shown to play a role in regulating the ability of immune cells to kill pathogens. There is a lack of $25(OH)D_3$ in the milk compartment of the mammary. In preliminary data, $25(OH)D_3$ was infused into an infected mammary quarter of cows. There was a reduction of mastitis severity with use of vitamin D by impacting the molecular and cellular pathways of immune cells in the mammary gland and may be an important non-antibiotic option for mastitis treatment. Vitamin D is a simple and natural immune stimulator which, in combination with current antibiotics, could become an effective therapy for mastitis. In addition, the ability of vitamin D to stimulate the immune system could reduce the time and amount of antibiotics needed to treat mastitis. This combination therapy may cure mastitis infections that are currently resistant to antibiotic treatment alone. The results of reduced antibiotic use would be a reduction in antibiotic residues that may get into the food supply, a reduced potential of antibiotic resistance, and an increase in consumer confidence and international trading opportunities.

Saving military lives. One of the challenges facing American Armed Forces personnel overseas is the threat of serious disease (e.g., malaria, dengue, and leishmaniasis) transmitted by insects. The Department of Defense depends on ARS to continue to provide and refine solutions. For example, protection from sand flies that transmit leishmaniasis in the Middle East, Afghanistan, Pakistan, and East Africa was improved by ARS by providing a new formulation of insecticide which was more effective as a fog than older products. A method for treatment of camouflage netting provided protection from sand flies for more than 18 months, even under harsh desert conditions. ARS continued to provide treated uniforms designed to protect military personnel from bites of mosquitoes, sand flies, ticks, and chiggers using techniques based on scientific evidence. The new methods of repelling sand flies and mosquitoes from tents and uniforms were developed by combining two chemical components in nanoparticle matrices. Genomic analysis of sand flies resulted in the discovery of new targets for insecticidal action, as well as methods for biochemical detection of insecticide resistance. These technologies improve protection of American military personnel when they are deployed overseas and give our armed forces an advantage over potential enemies.

Bovine tuberculosis. The mainstay of the bovine tuberculosis (TB) eradication program has been the tuberculin skin test, combined with slaughter of both infected and exposed animals. Although this traditional test and slaughter policy has been effective in lowering the prevalence of disease, eradication of bovine TB in the United States has not been achieved in spite of almost 93 years of concerted effort. Additionally, new obstacles have emerged with changes in the livestock industry, trade policies, and the increasing popularity of the captive cervid industry. In particular, the current obstacles are: importation of cattle from Mexico infected with tuberculous; a reservoir of infection found in free-ranging white-tailed deer in Michigan; continued detection of TB in captive cervids with transmission to cattle; and persistence of *Mycobacterium bovis* infection in large dairy herds. Farmed deer represent a significant alternative livestock industry, with numbers exceeding two million in New Zealand, one million in China, 500,000 in the United States, 400,000 in Russia, and 100,000 in Canada. Farmed deer are exposed to various other livestock and to free-ranging wildlife, and are moved between herds and across borders. Thus, there is an increased risk disease infection among and between farmed deer, traditional livestock, and free-ranging wildlife. Free-ranging and captive deer are implicated in the spread of *M. bovis* to cattle and to humans in Canada, New Zealand, and the United States. The only approved test for use in deer and elk has been the tuberculin skin test. Skin test procedures are problematic in captive cervid species because of the variable accuracy of the test, and injury risks due to handling of the animals (i.e., skin test requires two handling events). Each of these obstacles demonstrates the diversity of issues relating to bovine TB control in the United States. The use of a serologic test for the detection of TB in elk and fallow deer naturally infected with *M. bovis* was elucidated. Using samples from a heavily infected captive elk and fallow deer herd (approximately 70 percent prevalence), ARS scientists demonstrated that two serum-based tests, which detect TB-specific antibodies, provided much improved accuracy as compared to that achieved with the skin test. In association with prior studies, the collective impact is that a blood-based test is now available for use in captive cervids, pending approval by United States Animal Health Association/TB committee and USDA TB program staff for official use in the eradication program. The proposed research results will have a positive benefit for livestock and captive cervid producers, wildlife agencies, the general public, and USDA action agencies such as the Animal and Plant Health Inspection Service in controlling the spread of TB in humans and animals.

Viruses in turkeys. The discovery of novel viruses in turkeys may help veterinarians unravel some of the mysteries of viral enteric diseases that affect poultry. Each year, enteric disorders such as Poult Enteritis Mortality Syndrome (PEMS) in young turkeys and Runting Stunting Syndrome (RSS) in chickens cause tremendous economic losses to the poultry industry worldwide due to increased mortality rates, decreased weight gain, and treatment costs. Decades of research indicate that certain viruses may be the culprit for viral enteric diseases, but no single agent has been identified. ARS scientists in Athens, Georgia, used a new powerful tool called metagenomics to detect and sequence nucleic acid of all the ribonucleic acid viruses present in the gut of turkeys affected by enteric syndromes. Metagenomics, a molecular technique, is the study of a collection of genetic material from a mixed community of organisms. The technology enables scientists to look at a complex environmental sample, sequence all the viral nucleic acid in the sample, and analyze it as a single genome. ARS scientists extracted and analyzed nucleic acid from poultry intestine samples collected from five different turkey flocks affected by enteric diseases. The intestinal virus metagenome contained thousands of pieces of nucleic acid representing many groups of known and previously unknown turkey viruses. As suspected, avian viruses such as astrovirus, reovirus, and rotavirus—common in the gut of birds and implicated in some enteric diseases—were verified. The detection of numerous small, round RNA viruses, such as the members of the *Picornaviridae* family, long thought to be a major constituent in the turkey gut also was confirmed. However, ARS scientists found many previously unknown turkey viruses such as picobirnavirus, a small double stranded RNA virus implicated in enteric disease in other agricultural animals. A calicivirus also was identified in poultry for the first time. Caliciviruses are found in different animals and have been implicated for years in enteric diseases in humans. Discovering this treasure trove of virus sequences puts researchers a step closer to understanding viral communities in poultry, and will help scientists determine which viruses are associated with enteric diseases and which organisms are not.

Crop Protection

Current Activities:

ARS research on crop protection is directed toward epidemiological investigations 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. Currently, ARS research priorities include: (1) identification of genes that convey virulence traits in pathogens and pests; (2) factors that modulate infectivity, gene functions, and mechanisms; (3) genetic profiles that provide specified levels of disease and insect resistance under field conditions; and (4) mechanisms that facilitate 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.

Selected Examples of Recent Progress:

Genome of the wheat stem rust pathogen sequenced. Wheat stem rust, which is caused by the fungus *Puccinia graminis f.* sp. *tritici,* is a devastating disease that re-emerged as a global problem in East Africa after the new strain termed Ug99 was recognized in Uganda. Knowing the sequence of the pathogen's genome will enable researchers to develop new ways of controlling the pathogen. ARS researchers in St. Paul, Minnesota, collaborating with researchers at the Broad Institute at the Massachusetts Institute of Technology and Harvard University, sequenced the wheat stem rust pathogen's genome and found that the genome is one of the largest and most complex of any fungus studied to date, containing more than 17,000 predicted proteins. This represents the first complete genome sequencing of any rust fungus. It provides important resources for the scientific community working on fungal plant pathogens and host resistance in cereal crops. In addition, these sequence data are being used to develop rapid diagnostic methods for detection of new mutant strains of the wheat stem rust fungus (such as Ug99).

A new, naturally occurring hybrid virus of sweet potato is more severe than known viruses. In sweet potato field trials where germplasm is routinely screened for resistance to economically limiting viruses, a new member of the whitefly transmitted Begomovirus group was detected that is more severe than common sweet potato viruses. Viruses in the Begomovirus group sometimes produce natural hybrids in the field. This was shown to be a case of two Begomoviruses, sweet potato leaf curl virus and sweet potato leaf curl Georgia virus. In collaboration with Alcorn State University, ARS scientists in Charleston, South Carolina, discovered that these viruses hybridized to form a new, more destructive virus for which resistance is not currently available. This new virus can result in a 20 to 80 percent yield reduction in U.S. sweet potato cultivars. A broad spectrum diagnostic test was developed that will now detect all members of the sweet potato Begomovirus group that will be used in screening germplasm for new sources of disease resistance.

Guidelines for safe bioenergy crop production developed. Herbaceous perennial grasses grown for bioenergy purposes can provide huge amounts of biomass, but they also have the potential to become invasive if not managed carefully. ARS scientists in Urbana, Illinois, in collaboration with University of Illinois scientists, measured vital rates and dispersal characteristics of *Miscanthus* and used this information to develop guidelines for the design of bioenergy plantations to ensure against unwanted plant invasions. The guidelines included safe siting of production plantations, specifications for the width of buffer zones surrounding production fields, and eradication of plantings. These suggestions were used by the Farm Services Agency in support of its Biomass Conversion Assistance Program Miscanthus (*Miscanthus* X *giganteus*) Establishment and Production projects.

Improved boll weevil detection method enhances eradication program. Boll weevil eradication has been achieved in all parts of the United States cotton belt, except in southern and central Texas. Progress toward complete eradication of weevils from these areas depends upon better weevil detection with pheromone traps to ensure timely insecticide applications. With current pheromone trap techniques, substantial weevil infestations go undetected, even in those known infested areas. ARS scientists in College Station, Texas, discovered that a substantial proportion of lures contained an insufficient dose of pheromone, and that a single weevil can release significantly more pheromone than was previously believed. This discovery led ARS researchers to recommend protocols of doubling the lure quantity and decreasing the lure replacement interval; these protocols were immediately adopted by the Texas Boll Weevil Eradication Foundation. Adoption of these protocols has been instrumental in significantly advancing eradication progress in a chronically infested eradication zone.

Cloning of a gene responsible for susceptibility of wheat to fungal diseases. Fungal diseases of crops are an insidious threat to the production of food crops like wheat, a major food crop worldwide, because of the range of toxins they can produce. Wheat varieties that carry a gene called *Tsn1* or *Snn1* are particularly susceptible to fungal pathogens that cause economically limiting leaf diseases like tan spot and glume blotch. The *Tsn1* and *Snn1* genes control wheat's sensitivity to a toxin produced by these pathogens. ARS researchers in Fargo, North Dakota, isolated the genes from wheat and determined its DNA sequence. They were then able to resolve how these toxin producing pathogens acquired the ability to subvert wheat's disease defense mechanisms. This work provides significant understanding of how these wheat pathogens interact with the crop to cause disease, and is expected to lead to novel methods for developing disease resistant food crops that are critical to world food security. This research has identified an important susceptibility gene present in wheat lines that, if removed or altered, has the potential to increase yield and economic returns to U.S. wheat growers.

Three new golden nematode-resistant potato varieties released. Effective control and management of golden nematode, *Globodera rostochiensis*, depends on the availability of golden nematode resistant potato varieties. ARS researchers at Ithaca, New York, in collaboration with scientists at Cornell University, have recently released three new golden nematode resistant potato varieties. The availability of resistant varieties is invaluable for helping to maintain a viable potato industry in the golden nematode quarantine area of New York and ensuring the viability of that local U.S. potato industry. These varieties will provide a source of resistance if golden nematode becomes widespread in New York or elsewhere in the United States.

Epidemiology and management of zebra chip disease and its vector. Zebra chip (ZC) disease of potato is causing millions of dollars in losses to the potato industry. The disease is caused by a new species of the bacterium *Liberibacter*. ARS scientists in Wapato, Washington, determined that ZC is transmitted by the potato psyllid. ARS scientists also discovered that high temperatures during the potato growing season prevent development of the bacterium and resulting ZC. It was determined that zebra chip infected potato seeds do not germinate, thus the disease could not spread through the distribution of potato seeds. In addition, advanced potato breeding lines that show some resistance to ZC were identified. Information from this research improves our understanding of ZC epidemiology, benefits potato seed certification agencies, promotes national and international trade of potato seed, and facilitates development of effective and sustainable management strategies for this serious disease.

Discovery of ten new species for biological control. During the field explorations for the target pests and their natural enemies in their native land, a number of organisms are usually found and collected for testing as potential candidates for biological control of the invasive target pests in the United States. Prior to the testing process, the accurate taxonomic identification of the natural enemies by classical procedures and/or by more sophisticated molecular methods is a key aspect for the success of the projects. During the extensive field explorations in FY 2011, ARS-SABCL scientists in Argentina discovered 10 species of insects that were new to science: one natural enemy of water hyacinth, one of Brazilian water weed, one of water primrose, one of cactus moth, one of the *Parkinsonia* weed, four of cactus mealybug, and one ant species closely related to the target little fire ant. Some of these new species have been recently described and named by expert taxonomists with the close collaboration of SABCL scientists. The descriptions of the remaining ones are in progress. These accomplishments will greatly increase the chances of success of the respective biological control programs in the United States, and will contribute to the knowledge of the biological diversity in Argentina and globally.

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 important public health concerns. 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. ARS' research program also actively studies bioactive components of foods that have no known requirement but have health promoting activities.

Four specific areas of research are currently emphasized: (1) nutrition monitoring and the food supply, e.g., a national diet survey and the food composition databank; (2) dietary guidance for health promotion and disease prevention, i.e., specific foods, nutrients, and dietary patterns that maintain health and prevent disease; (3) prevention of obesity and related diseases, including research as to why so few of the population follow the *Dietary Guidelines for Americans*; and (4) life stage nutrition and metabolism, in order to better define the role of nutrition in pregnancy and growth of children, and for healthier aging.

Selected Examples of Recent Progress:

Epigenetic changes demonstrated in humans for the first time. Epigenetic changes result in inherited characteristics that are not due to altered DNA but to methylation or other changes that affect the three dimensional conformation of genes. For years, this phenomenon has been observed in a variety of animal models for human health and disease. Now, ARS supported scientists in Houston, Texas, have proof that this occurs in humans. This finding was borne out rural Gambia, where DNA methylation of specific genes was elevated in children conceived during the rainy season when food availability was considerably reduced and remained altered as such through the first 9 years. These results prove that epigenetic changes need to be considered in evaluating the risk for many diseases and documenting the effects of early environment on the establishment of heritable changes that are likely permanent.

The human serum metabolome is revealed. Metabolomics is the study of small molecules that have biological activity in an organism. The first systematic catalog of all identifiable metabolites in human blood serum was published by an international consortium that included ARS scientists from Davis, California, who measured the lipid metabolites in serum that make up about three-fourths of all identifiable molecules. This information was published in a scientific journal and made freely available on the World Wide Web at http://www.serummetabolome.ca. It enables researchers to link dietary and environmental changes with alterations in serum metabolites and prevention of chronic diseases including heart disease, obesity, and diabetes.

Folate in tissue predicts reduction of colon polyps. Colon polyps are precursors to cancer in most people. There has been concern that the required fortification of flour with the B vitamin, folate, might increase the risk of cancer. ARS supported researchers from Boston, Massachusetts, analyzed almost 1,500 samples obtained during colonoscopy and found that people with the highest levels of folate in colon tissue had a 76 percent reduction in risk for advanced adenomas and a 46 percent reduction in hyperplastic polyps or proximal adenomas. Consumption of adequate folate should reduce the risk of colon cancer, the number two cause of cancer deaths in the U.S.

Whey protein supplements result in decreased weight and body fat. Research by ARS scientists at Beltsville, Maryland, found that about two ounces of whey protein but not soy protein or carbohydrate in the diets of overweight or obese volunteers for five months resulted in significant loss of weight, fat mass, and waist circumference. These research findings signify differences in the ability of different types of protein to affect metabolism, and the potential to reduce the prevalence of obesity.

Maternal obesity affects energy metabolism in offspring. It is known that children of obese mothers are more likely to be obese. While shared behaviors contribute to this, there are inherited biological differences that also affect energy balance. Using a rat model, ARS supported scientists at Little Rock, Arkansas, found that obesity in mothers led to epigenetic changes in some genes, dysfunction of the mitochondria, organelles that control energy metabolism in the cell, and to impairment of burning fatty acids for fuel. These data help explain how and why maternal obesity can be passed on to offspring who are more likely to develop obesity, insulin resistance, and nonalcoholic fatty liver disease.

Continuous monitoring of the nutritional content of common U.S. foods. Monitoring the nutritional content of the U.S. food supply has been a USDA priority since 1891. The compiled nutrient data is used as the basis for national and international food policy decisions that link food or nutrient intake to health or disease risk and is also the basic data used for many private food databases. ARS researchers from Beltsville, Maryland, have released the 24th version of the *National Nutrient Database for Standard Reference*. In addition to a focus on 7,500 foods and up to 140 nutrients, a special interest database on flavonoid content of foods was released that will enable researchers to study the potential health benefits of these compounds found in fruits, vegetables, tea, and cocoa. These databases will update nutritional assessment of the U.S. food supply and will ensure that nutritional policy is made using the most up-to-date information.

Environmental Stewardship -- Water Quality; Air/Soil Quality; Global Climate Change; Range/Grazing Lands; Agricultural Systems Integration

Current Activities:

ARS' research programs in environmental stewardship support scientists at approximately 70 locations. Emphasis is given to developing technologies and systems that support profitable production and enhance the Nation's vast renewable natural resource base.

ARS 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' air resources research is 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 ARS' research program.

ARS' range and grazing lands research includes the conservation and restoration of the Nation's range lands 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:

Using remote sensing to significantly improve agricultural drought detection. Drought-related reductions in agricultural productivity have profound effects on regional food security and global agricultural commodity markets. Our ability to mitigate these effects is frequently limited by difficulties in accurately detecting the onset and severity of agricultural drought, particularly in underdeveloped regions of the world prone to food insecurity. To address this limitation, ARS scientists in Beltsville, Maryland, examined the microwave and thermal radiative signature of agricultural landscapes undergoing drought, and developed a series of satellite remote sensing tools to assess the availability of soil water in the root zone over large geographic regions. Compared with existing drought detection strategies that are based primarily on rainfall observations, these satellite-based strategies enable both the earlier detection of agricultural drought and a more detailed spatial description of its extent and severity. Eventually, these improvements will enhance our ability to mitigate the effects of agricultural drought on global food markets, and to anticipate the social/political consequences of changes in food availability and price. Currently, these technologies, and/or the data sets they create, are being shared with operational drought monitoring activities at the Foreign Agricultural Service, the National Oceanic and Atmospheric Administration, the National Environmental Satellite Data and Information Service, and the National Drought Mitigation Center. This research is already having international effects in helping to quantify drought conditions as related to food insecurity in the Horn of Africa.

Improved model simulating water quality in large river basins helps to guide USDA conservation policy and inform the Farm Bill debate. The EPA and State environmental agencies have identified approximately 15,000 water quality impaired water bodies in the United States. USDA is mandated to: 1) conduct a thorough analysis of the risks and benefits of USDA's conservation programs to human health, safety, and the environment; 2) determine alternative ways of reducing risk; and 3) conduct cost benefit assessments of these programs and alternatives. To help address these issues, ARS scientists in Temple, Texas, developed a number of new algorithms for the river basin scale model, the Soil and Water Assessment Tool (SWAT), to simulate onsite septic systems, stream sediment routing, urban management practices, improved phosphorus fate and transport, and stream health. As part of the Conservation Effects Assessment Project (CEAP) National Cropland Assessment, SWAT was validated at more than 70 U.S. Geological Service stream gauges across the country to assure realistic simulation of stream flow, sediment, nutrient, and pesticide (atrazine) loads. Final SWAT validation and scenario analyses were completed for the Upper Mississippi River basin, the Chesapeake Bay watershed, the Ohio-Tennessee River basin, and the Great Lakes watershed. Final draft reports are under review by the National Resources Conservation Service (NRCS) and are available on the CEAP Web site (http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/nra/ceap). Validation and scenario analyses have also been completed for the Missouri, Arkansas-Red, and Lower Mississippi River basins, with reports currently being developed. Scenario runs from this model are being used by NRCS to identify places where conservation practices such as conservation tillage, terraces, and the Conservation Reserve Program will be most efficient and provide the greatest benefits. The results of these activities will help guide USDA conservation policy and the Farm Bill debate. The model is also being used by the EPA in more than 30 States to select land management alternatives to resolve water quality concerns.

Carbon dioxide eliminates desiccation in warmed semiarid range lands. Climate change is expected to bring warmer, desiccating conditions to many world range lands. However, many analyses have not considered the direct effect of rising CO_2, which ARS scientists hypothesized would positively improve plant water use efficiency, thereby offsetting the negative effects of warming induced desiccation. ARS scientists in Cheyenne, Wyoming; Fort Collins, Colorado; and Maricopa, Arizona; plus collaborators from the University of Wyoming created and experimented with higher CO_2 and slightly warmer temperature conditions expected to occur during the second half of this century. They discovered that combined elevated CO_2 and warmer temperatures favored growth of warm season, perennial grasses, and that the additional CO_2 completely reversed the desiccating effects of the warmer temperature in a typical native semiarid prairie environment. These results are helping climate change scientists make better predictions about how rising CO_2 will affect the responses of range lands to climate change, and are being used to develop climate change adaptive management strategies for ranchers and public land managers.

Herbicide volatilization exceeds herbicide runoff losses. Surface runoff was believed to be the major offsite transport mechanism for herbicide. However, until recently, no field investigations monitored both surface runoff and turbulent volatilization fluxes simultaneously. An eight year, field scale experiment in Beltsville, Maryland, was conducted where herbicide (atrazine and metolachlor) volatilization and surface runoff losses were simultaneously monitored and evaluated. Results demonstrated that regardless of weather conditions, volatilization losses consistently exceeded surface runoff losses. Surprisingly, herbicide volatilization losses were up to 25 times larger than herbicide surface runoff losses. The research will affect USDA and EPA policies with regard to herbicides. The data will be used to develop or improve pesticide models that can be used to help guide herbicide application decisions to reduce herbicide losses to the environment.

Seasonal and annual ammonia emissions from southern High Plains beef cattle feedyards. Ammonia gas escaping from beef cattle feedyards is a loss of valuable fertilizer nitrogen that can negatively affect sensitive ecosystems and degrade air quality. The quantity of ammonia emitted from feedyards and the factors controlling losses are not understood. ARS researchers from the Conservation and Production Research Laboratory in Bushland, Texas, in collaboration with researchers at West Texas A&M University and Texas AgriLife Research, measured ammonia emissions from two feedyards over a two year period to identify the sources and fate of ammonia gas losses. The major factors affecting emissions were ambient temperature and dietary crude protein concentration in feeds, with more than 52 percent to 59 percent of fed nitrogen lost as ammonia at the two feedyards over the two year study. These results are the most extensive measures available of ammonia emission from feedlots. They provide an important database that can be used by scientists to validate and verify process models of emissions, provide the cattle industry with accurate science-based information to meet regulatory requirements, and give regulators more comprehensive real world data to build ammonia emissions inventories.

<u>First alfalfa gene index assembled</u>. ARS scientists in St. Paul, Minnesota, conducted an in-depth analysis of the genes active during cell wall development and assembled the first alfalfa gene index that identifies a majority of alfalfa genes. Two major components of alfalfa stems are cellulose, a sugar molecule that is easily converted to ethanol, and lignin, a cross linking molecule that interferes with conversion of cellulose to ethanol. Several genes associated with the regulation of lignin and cellulose biosynthesis were identified that along with the new gene index can provide ways for plant breeders to increase cellulose and decrease lignin expressed in cell walls, thereby increasing the value of alfalfa as a bioenergy crop.

<u>Oilseed crops for biofuel in crop rotations</u>. Sustainable biodiesel and jet fuel production will require widespread planting of oilseed crops. The several million acres of alternate year summer fallowed wheat land in Montana is commonly identified for growing oilseed crops. ARS researchers in Sidney, Montana, in collaboration with researchers at South Dakota State University, have conducted a long-term study using cool-season *Brassica juncea*, camelina, and crambe oilseeds in two year rotations with durum wheat. They discovered that *B. juncea* had significantly superior seed and oil yield compared with the other oilseed crops, out yielding both crambe and camelina by more than 100 and 360 pounds per acre, respectively, and oil yield by 145 percent and 175 percent, respectively. Most importantly, durum wheat yields in rotations with the three oilseed crops were about 25 to 35 percent lower than durum wheat in summer fallow rotations due to greater soil water use by the oilseed crops than if the alternate year fallow were used. This dispels the common notion that alternate year fallow land is available at no cost to food crop production. The study also showed that insertion of the most productive oil seed crop into an every other year rotation would earn the farmer a greater overall return despite reduced durum wheat yields. Taken as a whole, this research demonstrates that the superior yield of *B. juncea* and oil producing qualities make it a promising candidate to meet future U.S. biofuel production needs by altering crop rotations in semiarid areas of the northern Great Plains.

<u>Increasing yield and economic returns from intensive cropping under no-tillage</u>. Under intermediate 14 to 18 inch rainfall conditions in northeastern Oregon, growers are interested in using spring crops to intensify their cropping system options. ARS scientists in Pendleton, Oregon, developed an intensive four year rotation system that utilizes no-tillage with chemical weed control that does not include the commonly used minimal tillage practices of cultivation by chiseling, sweeping, and rod weeding. The intensified rotation system was as follows: fallow; winter wheat; dry spring; then winter wheat. In the spring, a broadleaf such as rapeseed is included to help control winter annual weeds and reduce pathogen levels of soilborne cereal diseases. The no-tillage system was significantly more effective at reducing runoff and soil erosion, with no reduction in yield, and substantially less costly for labor and fuel requirements than production using minimum tillage. These results indicate that no-tillage has the potential to be economically viable for intensive cropping in the intermediate rainfall region of northeastern Oregon and provides one way to diversity cropping options with added benefits to wheat production.

<u>New hydrology and erosion model will improve future management of western range lands</u>. Because existing erosion models were developed for croplands, where hydrologic and erosion processes differ from those found on range lands, accurate prediction of soil loss on western range lands requires an erosion model specifically designed for range land applications. In a landmark paper on range land soil erosion modeling, ARS scientists from Tucson, Arizona, describe the new Range land Hydrology and Erosion Model (RHEM). RHEM models erosion processes under both undisturbed and disturbed range land conditions; adopts a new splash erosion and thin sheet flow transport equation developed specifically from range land data; and links model hydrologic and erosion parameters with range land plant communities by providing a new system of parameter estimation equations based on 204 plots in 49 range land sites distributed across 16 western States. RHEM estimates runoff, erosion, and sediment delivery rates and volumes at the hillslope spatial scale, and at the temporal scale of individual rainfall events. Subsequent experiments conducted to generate independent data for model validation indicate the ability of RHEM to provide reasonable runoff and soil loss prediction capabilities for range land management and research needs, helping to sustain productive range lands in the western United States in the face of changing land use and climatic fluctuations.

Soil solarization as a viable nonchemical commercial alternative for cut flower growers. Soil solarization is a nonchemical approach to managing soilborne pests using clear plastic and high soil moisture to heat soil to lethal temperatures. Unfortunately, very few pest management specialists have understood the concept well enough to integrate it into commercial crop production applications. A clear plastic film with ultraviolet light stabilizers, antifogging, and infrared retentive compounds was formulated for solid tarp applications then evaluated by ARS researchers on commercial cut flower farms in Fort Pierce, Florida for three years. Soil solarization was shown to be effective in managing damage from soilborne pests up to two years when used behind effective soil fumigation programs. ARS research led to the recommendation that solid tarp solarization be used by commercial cut flower growers to extend the interval between the annual soil fumigation to every other year.

Switching from grass to corn does not mean more greenhouse gases. Many USDA Conservation Reserve Program contract acres are scheduled to end soon, and there are concerns over what effects the conversion from grassland to cropland would have on soil carbon reserves. ARS scientists in Lincoln, Nebraska, and Fort Collins, Colorado, followed changes in the soil under switchgrass and no-till corn over a nine year period. The team demonstrated that organic carbon was sequestered down to a five foot depth, and that more than 50 percent of the soil organic carbon was found below the one foot level—below the depth at which most modeling work has been based. Both switchgrass and corn sequestered 0.9 tons of carbon per year. Nitrogen fertility rates and harvest management affect the net increase in soil carbon. Previous soil carbon modeling work was conducted assuming uniform responses to management and a shallow one foot soil sampling depth. This research demonstrates soil carbon storage benefits of switchgrass and no-till corn production. Just like switchgrass, with proper management under the right conditions, no-till corn can also sequester significant amounts of CO_2.

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 the NAL Web site, http://www.nal.usda.gov. NAL was created with USDA in 1862 and was named in 1962 a national library 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 the Nation’s agricultural heritage, the provider of world class information, and the 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."

Selected Examples of Recent Progress:

LCA Digital Commons. NAL launched a prototype life cycle database in the first quarter of 2012, following a September 2011 alpha release and additional usability testing. Built on the open source openLCA Framework, the database contains more than 600 production crop unit processes based primarily on USDA data peer reviewed under guidance of the National Institute of Food and Agriculture (NIFA). NAL is coordinating with other Federal agencies to link database development efforts and is working with NIFA to require that research data be uploaded as part of its bioenergy grants. Interest in submitting data to the LCA Digital Commons is growing among commodity and other industrial organizations.

Digital Collections. NAL Digital Collections is being developed to provide easy access to digital content available via NAL. NAL is unifying and simplifying access and discovery by migrating existing digital collections from different platforms; streamlining production processes and procedures; opening the database to relevant research collections; and positioning NAL to accept the outcomes of Federally funded agricultural research.

VIVO. NAL is coordinating and providing technical support to bring VIVO to USDA. VIVO, a semantic, open source system, enables networking of scientists—their research, grants, publications, and more. Launched for internal USDA review in mid-August 2011, VIVO currently contains content from five agencies: ARS, ERS, NASS, NIFA, and the Forest Service. Next steps include working to connect USDA VIVO to the larger research community and possibly to Star Metrics to enhance discovery and networking among researchers across agriculture; create a data ingestion process; and develop self editing mechanisms.

NAL Web site. Page views and searches on the NAL Web site exceeded 100 million for the first time in FY 2011. NAL is re-engineering the site to increase usability and usage.

AGRICOLA. NAL developed a crawlable version of AGRICOLA and released it to Web search engines, increasing visibility and usage. NAL is further improving AGRICOLA by implementing automated indexing. This initiative will increase the number of articles indexed, expand comprehensiveness, and improve consistency and quality. To support this effort, NAL has established fourteen publisher agreements that will yield citation information for over 3,000 journal titles, dramatically boosting the indexing output.

Scientific data management. NAL is leading the development of a USDA scientific data management policy to guide the creation, collection, organization, management, dissemination and preservation of scientific data. This effort is being carried out through the USDA Office of the Chief Scientist's Scientific Data Management Committee.

Start2Farm.gov Clearinghouse and Database. In partnership with the American Farm Bureau Federation, NAL's Alternative Farming and Rural Information Centers launched a beta version of the Start2Farm Web-based educational clearinghouse and expect to launch a production version by early 2012. The project is funded through a grant from the NIFA Beginning Farming and Ranching Development Program, designed to assist people new to or with less than 10 years' experience in farming or ranching. All curriculum and training materials developed through the grant will reside in the Start2Farm.gov database.

Food Safety Research Projects Database. NAL's Food Safety Research Information Office increased the number of records in the Food Safety Research Projects Database by 27 percent. The database exceeded 7,000 records at the end of FY 2011.

AGRICULTURAL RESEARCH SERVICE

BUILDINGS AND FACILITIES

Appropriations Act, 2012	0
Budget Estimate, 2013	0
Change in Appropriations	0

AGRICULTURAL RESEARCH SERVICE

Summary of Increases and Decreases
(Dollars in thousands)

Item of Change	2010 Actual	2011 Change	2012 Change	2013 Change	2013 Estimated
Alabama: ARS Research & Development Center	$3,500	-$3,500	0	0	0
California: Center for Advanced Viticulture and Tree Crop Research, Davis	3,000	-3,000	0	0	0
U. S. Agricultural Research Center, Salinas	3,654	-3,654	0	0	0
Connecticut: Center of Excellence for Vaccine Research, Storrs	3,654	-3,654	0	0	0
Florida: U. S. Agricultural Research Service Laboratory, Canal Point	3,422	-3,422	0	0	0
Hawaii: U. S. Pacific Basin Agricultural Research Center, Hilo	5,000	-5,000	0	0	0
Kentucky: Animal Waste Management Research Laboratory, Bowling Green	2,000	-2,000	0	0	0
Forage Animal Production Laboratory, Lexington	2,000	-2,000	0	0	0
Louisiana: ARS Sugarcane Research Laboratory, Houma	3,654	-3,654	0	0	0
Maryland: Beltsville Agricultural Research Center (BARC), Beltsville	3,000	-3,000	0	0	0
Mississippi: Biotechnology Laboratory, Lorman	1,500	-1,500	0	0	0
Jamie Whitten Delta States Research Center, Stoneville	4,000	-4,000	0	0	0
Missouri: National Plant & Genetics Security Center, Columbia	3,500	-3,500	0	0	0
Montana: Animal Bioscience Facility, Bozeman	3,654	-3,654	0	0	0
Nebraska: Systems Biology Research Facility, Lincoln	3,760	-3,760	0	0	0
New York: Center for Grape Genomics, Geneva	3,654	-3,654	0	0	0
Ohio: Greenhouse Production Research, Toledo	3,654	-3,654	0	0	0
Utah: ARS Agricultural Research Center, Logan	4,527	-4,527	0	0	0
Washington: ARS Research Laboratory, Pullman	3,740	-3,740	0	0	0
West Virginia: Appalachian Fruit Laboratory, Kearneysville	2,000	-2,000	0	0	0
Wisconsin: Dairy Forage Agricultural Research Center, Prairie du Sac	4,000	-4,000	0	0	0
Total Available	70,873	-70,873	0	0	0

AGRICULTURAL RESEARCH SERVICE

Project Statement
(On basis of obligations)
(Dollars in thousands)

Program	2010 Actual Amount	2010 Actual Staff Years	2011 Actual Amount	2011 Actual Staff Years	2012 Estimate Amount	2012 Estimate Staff Years	Change Amount	Change Staff Years	2013 Estimate Amount	2013 Estimate Staff Years
Discretionary Obligations:										
Buildings and Facilities....	$17,953	-	$18,594	-	$7,424	-	-$5,379	-	$2,045	-
Subtotal.........................	17,953	-	18,594	-	7,424	-	-5,379	-	2,045	-
Supplemental Obligations:										
Recovery Act....................	163,375	-	-	-	-	-	-	-	-	-
Subtotal.........................	163,375	-	-	-	-	-	-	-	-	-
Total Obligations..............	181,328	-	18,594	-	7,424	-	-5,379	-	2,045	-
Lapsing Balances.................	4,826	-	-	-	-	-	-	-	-	-
Bal. Available, EOY............	257,961	-	10,098	-	2,674	-	-2,045	-	629	-
Total Available.................	444,115	-	28,692	-	10,098	-	-7,424	-	2,674	-
Rescission............................	-	-	229,582	-	-	-	-	-	-	-
Bal. Available, SOY............	-371,947	-	-257,961	-	-10,098	-	+7,424	-	-2,674	-
Other Adjustments (Net)......	-1,295	-	-313	-	-	-	-	-	-	-
Total Appropriation..........	70,873	-	-	-	-	-	-	-	-	-

AGRICULTURAL RESEARCH SERVICE

Project Statement
(On basis of appropriations)
(Dollars in thousands)

Program	2010 Actual Amount	2010 Actual Staff Years	2011 Actual Amount	2011 Actual Staff Years	2012 Estimate Amount	2012 Estimate Staff Years	Change Amount	Change Staff Years	2013 Estimate Amount	2013 Estimate Staff Years
Discretionary Appropriations:										
Building and Facilities.....	$70,873	-	$-229,582	-	-	-	-	-	-	-
Subtotal.........................	70,873	-	-229,582	-	-	-	-	-	-	-
Total Adjusted Approp....	70,873	-	-229,582	-	-	-	-	-	-	-
Rescissions and Transfers (Net).................	-	-	229,582	-	-	-	-	-	-	-
Total Appropriation..........	70,873	-	-	-	-	-	-	-	-	-
Rescission.............................	-	-	-229,582	-	-	-	-	-	-	-
Bal. Available, SOY............	371,947	-	257,961	-	$10,098	-	$-7,424	-	$2,674	-
Recoveries, Other (Net)........	1,295	-	313	-	-	-	-	-	-	-
Total Available.................	444,115	-	28,692	-	10,098	-	-7,424	-	2,674	-
Lapsing Balances.................	-4,826	-	-	-	-	-	-	-	-	-
Bal. Available, EOY............	-257,961	-	-10,098	-	-2,674	-	+2,045	-	-629	-
Total Obligations..............	181,328	-	18,594	-	7,424	-	-5,379	-	2,045	-

AGRICULTURAL RESEARCH SERVICE
Buildings & Facilities

Classification by Objects
(Dollars in thousands)

		2010 Actual	2011 Actual	2012 Estimate	2013 Estimate
Other Objects:					
23.2	Rent Paid to Others	$14			
25.2	Other Services	29,132		$7,424	$2,045
25.4	Operation and Maintenance of Facilities	147,811	$18,594		
25.5	Research and Development Contracts	4			
25.7	Operation and Maintenance of Equipment	8			
26.0	Supplies and Materials	2			
31.0	Equipment	1,037			
32.0	Land and Structure	3,314			
43.1	PPA - Interest	6			
	Total, Other Objects	181,328	18,594	7,424	2,045
	Total, New Obligations	181,328	18,594	7,424	2,045

AGRICULTURAL RESEARCH SERVICE
Status of Construction Projects as of January 2012

Status of research facilities authorized or funded in prior years and reported as uncompleted in the 2012 Explanatory Notes, are as follows:

NOTE: POR: 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% - or a complete design designated as 100%.

Location and Purpose	Year	Amount of Funds Provided	Description
California, Albany	2000 Planning and Design	$2,600,000	Construction of Phases 1 and 2 of the Research and Development Facility is complete. Construction of Phase 3A was completed 1st Qtr 2009. The re-design of the remaining work (Phases 3b, 4, 5, and 6) was completed in the 1st Qtr 2010. The construction contract award for the final phases 3 thru 6 was awarded 3rd Qtr 2010 with ARRA funding and will be completed 2nd Qtr 2013.
Western Regional	2001 Construction	4,889,220	
Research Center	2002 Construction	3,800,000	
(R&D Facility)	2009 ARRA	15,624,460	
	Total	26,913,680	
California, Davis	2004 Planning and Design	$2,684,070	POR was completed in the 2nd Quarter, 2007. Lease agreement with University is in progress.
Center for Advanced	2005 Construction	2,976,000	
Viticulture and Tree Crop Research	2006 Construction	3,588,750	
	2008 Construction	1,869,819	
	2009 Construction	2,192,000	
	2010 Construction	3,000,000	
	2011 Rescission	($16,062,114)	
	Total	248,525	
California, Salinas	2004 Planning and Design	$4,473,450	Design (100%) was completed in the 2nd Quarter, 2007.
Agricultural Research Station	2005 Planning and Design	2,976,000	
	2006 Construction	3,588,750	
	2008 Construction	1,869,819	
	2009 Construction	2,192,000	
	2010 Construction	3,654,000	
	2011 Rescission	($14,937,644)	
	Total	3,816,375	
Connecticut, Storrs	2008 Planning and Design	$1,869,819	POR was completed in 4th Qtr 2010. Lease agreement with the University has been finalized.
Center of Excellence for Vaccine Research	2009 Design & Construction	2,192,000	
	2010 Construction	3,654,000	
	2011 Rescission	($7,221,296)	
	Total	494,523	
District of Columbia	2000 Planning and Design	$500,000	Design (100%) of Bladensburg Road Entrance was completed 1st Qtr, 2006. The Administrative Building Modernization design was completed 1st Qtr, 2006. The construction of Phase 2, greenhouse and mechanical support space, was completed 1st Qtr, 2009. ARRA funds were used to award a construction contract for Administrative Building Modernization in the 4th quarter of 2010.
U.S. National Arboretum	2001 Design & Construction	3,322,674	
	2002 Design & Construction	4,600,000	
	2003 Design & Construction	1,688,950	
	2008 Construction	695,100	
	2009 ARRA	8,041,842	
	2011 Rescission	($2,066,637)	
	Total	16,781,929	

Location and Purpose	Year	Amount of Funds Provided	Description
Florida, Canal Point	2008 Planning and Design	$521,325	POR was completed 2nd Qtr 2011 . Lease agreement has been finalized.
Agricultural Research Service Lab	2009 Planning and Design	1,096,000	
	2010 Construction	3,422,000	
	2011 Rescission	($4,106,211)	
	Total	933,114	
Georgia, Athens	1992 Planning	$400,000	
Southeast Poultry Research	1993 Construction	677,000	Draft POR was completed 1st Qtr 2007.
Laboratory	2008 Planning and Design	2,780,400	
	2009 Planning and Design	2,427,000	
	2011 Rescission	($5,832,898)	
	Total	451,502	
Hawaii, Hilo	1999 Planning and Design	$4,500,000	Design of Phases 1 and 2 is complete. Construction of Phase 1 was completed in the 3rd Quarter, 2007. Construction contract for Phase 2 was awarded in 4th Qtr 2010 and is scheduled for completion 3rd Qtr 2012.
U.S. Pacific Basin	2000 Construction	4,500,000	
Agricultural Research	2001 Construction	4,989,000	
Center	2002 Construction	3,000,000	
	2003 Design & 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)	
	Total	31,937,874	
Idaho, Hagerman	2005 Planning and Design	$992,000	Lease agreement is in place. POR was completed in the 3rd Quarter, 2007.
Aquaculture Facility	2006 Construction	990,000	
	2008 Construction	695,100	
	2009 Construction	544,000	
	2011 Rescission	($2,907,600)	
	Total	313,500	
Illinois, Peoria	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 was awarded in the 2nd Qtr 2010 using ARRA funding and will be completed 2nd Qtr 2012.
National Center for	2002 Construction	6,500,000	
Agricultural	2004 Construction	2,684,070	
Utilization Research	2005 Construction	2,976,000	
(Central Wing)	2006 Construction	3,588,750	
	2008 Construction	1,869,819	
	2009 Construction	2,192,000	
	2009 ARRA	16,237,165	
	Total	37,847,804	

Location and Purpose	Year	Amount of Funds Provided	Description
Iowa, Ames	2001 Design & Construction	$8,980,200	The accelerated plan for the completion of the modernization of ARS/APHIS animal facilities is in progress. All major components of the modernization are complete.
National Centers for	2002 Design & Construction	40,000,000	-Phase 1 Lab/Office (APHIS) was completed in 2004.
Animal Health	2002 Construction	50,000,000	-Large Animal BSL-3Ag facilities construction was completed in the 2nd Quarter, 2007.
	2002 APHIS Transfers	15,753,000	-Central Utility Plant & Infrastructure, Phase 1 and 2 construction is complete. Phase 3 construction was completed in the 1st Qtr, 2009.
	(Supplemental)	(14,081,000)	-Construction of the Consolidated Laboratory Facility was completed in the 2nd Quarter, 2009.
	(Other Transfers)	(1,672,000)	-Low Containment Large Animal Facility construction was completed in the 1st Qtr of 2009. Demolition of existing facilities underway.
	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	
	Total	461,754,700	
Kentucky, Bowling Green	2005 Planning and Design	$2,281,600	POR is complete for total project. Design (100%) for the Headhouse/Greenhouse only was completed 3rd Qtr of 2008. Lease agreement is in place. Construction of the GH/HH was awarded in the 4th Qtr 2010 and will be completed 2nd Qtr 2012.
Animal Waste Management	2006 Construction	2,970,000	
Research Laboratory	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	2005 Planning and Design	$2,976,000	
Forage Animal	2006 Construction	3,960,000	POR is complete. Lease agreement is in progress. Design (100%) was completed 2nd Qtr 2011.
Research Laboratory	2008 Construction	2,085,300	
	2009 Construction	1,632,000	
	2010 Construction	2,000,000	
	2011 Rescission	($9,678,689)	
	Total	2,974,611	
Louisiana, Houma	2004 Planning and Design	$1,342,035	Design (100%) completed 4th Quarter, 2007. Repackaging of design to allow for construction of some elements within the available funding was completed in the 2nd Qtr 2008. Phase 1A construction was completed 4th Qtr 2010. Phase 1b construction awarded in 2nd Qtr 2011 and will be completed 4th Qtr 2012.
Sugarcane Research	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	
	Total	15,935,604	
Louisiana, New Orleans	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%) for the LTR of facilities was completed 4th Quarter, 2008. Construction of the LTR was awarded 3rd Qtr, 2009 and completed 3rd Qtr 2011.
Southern Regional	1999 Modernization	6,000,000	
Research Center	2000 Modernization	5,500,000	
(Industrial Wing)	2006 Supplemental (design)	4,900,000	
	2006 Supplemental (construction)	20,000,000	
	Total	37,500,000	

Location and Purpose	Year	Amount of Funds Provided	Description
Maine, Orono/Franklin 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 Campus in Orono, ME needs to be developed.
	2002 Construction	3,000,000	
	2003 Construction	9,090,525	
	2004 Design & Construction	2,684,070	
	2005 Design & Construction	2,976,000	
	2006 Design & Construction	2,475,000	
	2011 Rescission	($2,012,504)	
	Total	20,707,591	
Maryland, Beltsville Beltsville Agricultural Research Center, (BARC)	1988 Design & Construction	$5,750,000	Study to evaluate boiler plants, steam lines, and electrical distribution was completed 4th Qtr, 2009. Construction contract for repairs to boiler plants and portions of the steam distribution system was awarded 4th Qtr 2010 with ARRA funding and will be completed 2nd Qtr 2012. Design-Build contract for major renovations to Building 306 was awarded 4th Qtr 2010 with ARRA funding and will be completed 3rd Qtr 2012.
	1989 Design & Construction	6,100,000	
	1990 Design & Construction	9,860,000	
	1991 Design & Construction	15,999,792	
	1992 Design & Construction	16,000,000	
	1993 Design & Construction	13,547,000	
	1994 Design & Construction	19,700,000 **	
	1995 Design & Construction	3,960,000	
	1996 Design & Construction	8,000,000	
	1997 Design & Construction	4,500,000	
	1998 Design & Construction	3,200,000	
	1999 Design & Construction	2,500,000	
	2000 Design & Construction	13,000,000	
	2001 Design & Construction	13,270,740	
	2002 Design & Construction	3,000,000	
	2003 Design & Construction	4,152,830	
	2004 Design & Construction	2,684,070	
	2005 Design & Construction	2,976,000	
	2006 Design & Construction	3,588,750	
	2009 Design & Construction	2,192,000	
	2009 ARRA	21,513,046	
	2010 Construction	3,000,000	
	2011 Rescission	($9,831,954)	
	Total	168,662,274	

**Appropriated under USDA Rental Payments Account

Location and Purpose	Year	Amount of Funds Provided	Description
Maryland, Beltsville National Agricultural Library	1998 Design & Construction	$2,500,000	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 facade, and replacement of the plumbing system was awarded 1st Qtr, 2010 using ARRA funding and will be completed 3rd Qtr 2012.
	1999 Design & Construction	1,200,000	
	2001 Design & Construction	1,766,106	
	2002 Construction	1,800,000	
	2003 Design & Construction	1,490,250	
	2004 Design & Construction	894,690	
	2009 ARRA	6,357,422	
	2011 Rescission	($115,175)	
	Total	15,893,293	

Location and Purpose	Year	Amount of Funds Provided	Description
Michigan, East Lansing	1992 Planning	$250,000	Design (100%) for this multi-phased facility modernization is complete.
Avian Disease and	1993 Planning	212,000	
Oncology Laboratory	1998 Planning and Design	1,800,000	
	2011 Rescission	($63,193)	
	Total	2,198,807	
Mississippi, Lorman	2006 Planning and Design	$1,980,000	A lease agreement with Alcorn State University for the new facility is in progress. POR was completed in 3rd Qtr 2008.
Biotechnology Laboratory	2008 Planning and Design	1,390,200	
Alcorn State University	2009 Construction	1,176,000	
	2010 Construction	1,500,000	
	2011 Rescission	($5,798,055)	
	Total	248,145	
Mississippi, Poplarville	2002 Design	$800,000	Construction of the Headhouse/Greenhouse was awarded in the 4th Quarter, 2007 and completed in the 1st Quarter, 2008.
Thad Cochran Southern	2003 Construction	9,140,200	
Horticultural Laboratory	2006 Supplemental	4,300,000	
	2011 Rescission	($9,178)	
	Total	14,231,022	
Mississippi, Starkville	2005 Planning and Design	$2,976,000	Lease agreement is in place. Design (100%) was completed in the 1st Quarter, 2008.
Poultry Science	2006 Construction	4,950,000	
Research Facility	2008 Construction	1,390,200	
	2009 Construction	3,177,000	
	2011 Rescission	($10,345,645)	
	Total	2,147,555	
Mississippi, Stoneville	2004 Construction	$4,831,326	Design (100%) is complete. Construction of Phase 1 is complete. Construction of mechanical, electrical, and plumbing systems for phases 2 thru 5 (of 5 total) and repair of deteriorated building envelope was awarded 3rd Qtr, 2010 and will be completed 3rd Quarter 2015.
Jamie Whitten Delta	2005 Construction	2,976,000	
States Research Center	2008 Construction	2,780,400	
	2009 ARRA	36,347,783	
	2010 Construction	4,000,000	
	2011 Rescission	($6,047,327)	
	Total	44,888,182	
Missouri, Columbia	2004 Planning and Design	$2,415,663	Design (100%) was completed in the 4th Qtr, 2008.
National Plant and Genetics	2005 Construction	4,960,000	
Security Center	2006 Construction	3,687,750	
	2008 Construction	2,085,300	
	2009 Construction	1,633,000	
	2010 Construction	3,500,000	
	2011 Rescission	($15,590,075)	
	Total	2,691,638	

Location and Purpose	Year	Amount of Funds Provided	Description
Montana, Bozeman	2005 Planning and Design	$1,984,000	Lease agreement is in place. Conceptual Design (35%) was completed 3rd Qtr, 2008.
Animal Bioscience Facility	2006 Construction	3,960,000	
	2008 Construction	1,869,819	
	2009 Construction	2,192,000	
	2010 Construction	3,654,000	
	2011 Rescission	($12,720,879)	
	Total	938,940	
Montana, Sidney	1998 Planning and Design	$606,000	Construction of Phase 1 (Lab/Office Building) was completed in 2003 and Phase 2 (Quarantine Lab) was completed in the 4th Quarter, 2008.
Northern Plains Agricultural Research Laboratory	1999 Construction	7,300,000	
	2004 Design and Construction	2,505,132	
	2011 Rescission	($29,505)	
	Total	10,381,627	
Nebraska, Lincoln	2008 Planning and Design	$1,390,200	POR was completed 3rd Qtr, 2011.
Systems Biology Research Facility	2009 Planning and Design	1,088,000	
	2010 Construction	3,760,000	
	2011 Rescission	($5,782,528)	
	Total	455,672	
New York, Geneva	2004 Planning and Design	$2,415,663	Design (100%) was completed in the 4th Quarter, 2007.
Grape Genetics	2005 Construction	2,976,000	
	2006 Construction	3,588,750	
	2008 Construction	1,869,819	
	2009 Construction	2,192,000	
	2010 Construction	3,654,000	
	2011 Rescission	($14,806,870)	
	Total	1,889,362	
New York, Ithaca	2004 Planning and Design	$3,847,167	Design (100%)was completed in the 2nd Quarter, 2008.
Crop-based Health Genomics	2005 Construction	2,976,000	
	2006 Construction	3,588,750	
	2011 Rescission	($7,314,491)	
	Total	3,097,426	
Ohio, Toledo	2005 Planning and Design	$1,984,000	Design (100%) completed 1st Qtr 2010. Lease agreement is in place.
University of Toledo	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	

Location and Purpose	Year	Amount of Funds Provided	Description
Oklahoma, Woodward	2002 Planning and Design	$1,500,000	Phases 1 and 2 of the three-phased construction project are complete.
Southern Plains Range	2003 Construction	7,948,000	
Research Station	2005 Construction	2,976,000	
	2011 Rescission	($152,556)	
	Total	12,271,444	
Pennsylvania, Wyndmoor	1997 Construction	$4,000,000	Modernization of the Center is being accomplished in nine phases, with construction of Phases 1 through 7 completed. Construction award for Phases 8 and 9 was made in the 4th Qtr. 2010 with ARRA funding and will be completed 2nd Qtr 2012..
Eastern Regional Research Center	1998 Construction	5,000,000	
	1999 Construction	3,300,000	
	2000 Construction	4,400,000	
	2002 Design & Construction	5,000,000	
	2009 ARRA	15,084,486	
	Total	36,784,486	
South Carolina, Charleston	1988 Feasibility Study	$50,000	Construction of Phase 1 (laboratory) and Phase 2A (Headhouse) is complete. Phase 2B (Greenhouse) construction was awarded in the 2nd Quarter, 2007 & completed in the 4th Qtr 2008.
U.S. Vegetable	1990 Planning and		
Laboratory	Construction	1,135,000	
	1994 Construction	909,000	
	1995 Construction	5,544,000	
	1996 Construction	3,000,000	
	1997 Construction	3,000,000	
	1998 Construction	4,824,000	
	2000 Construction	1,000,000 ***	
	2002 Construction	4,500,000	
	2003 Design	1,390,900	
	2004 Construction	3,131,415	
	2005 Construction	2,976,000	
	2006 Construction	1,980,000	
	2011 Rescission	($517)	
	Total	33,439,798	
***Reprogrammed from Horticultural Crop and Water Management Research Laboratory, Parlier, CA			
Texas, Kerrville	2008 Planning and Design	$1,390,200	POR was completed 2nd Qtr. 2010.
Knipling Bushland Lab	2009 Planning and Design	1,957,000	
	2011 Rescission	($2,768,214)	
	Total	578,986	
Utah, Logan	2008 Planning and Design	$5,560,800	POR was completed in the 4th Qtr. 2010.
Agricultural Research Center	2009 Design and Construction	4,351,000	
	2010 Construction	4,527,000	
	2011 Rescission	($13,839,929)	
	Total	598,871	

Location and Purpose	Year	Amount of Funds Provided	Description
Washington, Pullman	2004 Planning and Design	$3,936,636	Lease agreement with University is in place. Conceptual Design (35%) is complete.
ARS Research Lab	2005 Construction	2,976,000	
	2006 Construction	3,588,750	
	2008 Construction	1,869,819	
	2009 Construction	2,192,000	
	2010 Construction	3,740,000	
	2011 Rescission	($17,240,830)	
	Total	1,062,375	
West Virginia, Kearneysville	2003 Planning and Design	$471,913	Construction of Phases 1 and 2 (immediate laboratory repairs and renovation) was completed in the 3rd Quarter, 2007. The construction of the Greenhouse was completed the 1st Quarter, 2008. POR for the new laboratory was completed 2nd Qtr 2010. Conceptual design for new laboratory was completed 3rd Qtr 2011.
Appalachian Fruit Lab	2004 Construction	1,789,380	
	2005 Construction	3,608,896	
	2006 Construction	2,024,550	
	2008 Planning and Design	1,529,220	
	2009 Planning and Design	783,000	
	2010 Construction	2,000,000	
	2011 Rescission	($3,430,725)	
	Total	8,776,234	
West Virginia, Leetown	2002 Design & Construction	$2,200,000	Construction was completed in the 3rd Quarter, 2008.
National Center for Cool	2006 Construction	891,000	
and Cold Water Aquaculture	2011 Rescission	($4,717)	
(Broodstock Facility)	Total	$3,086,283	
Wisconsin, Marshfield	2003 Planning, Design		Design (100%) of Phase 1 and Phase 2 is complete. Phase 1 (Nutrient Lab) construction was completed in the 4th Qtr, 2008. Phase 2 construction (Animal Holding Facility) was awarded in the 4th Qtr, 2007. Phase 2 construction was completed 1st Qtr 2010.
Nutrient Management	and Construction	$2,980,500	
Laboratory	2004 Construction	3,668,229	
	2005 Construction	4,860,800	
	2006 Construction	7,920,000	
	2011 Rescission	($18,229)	
	Total	19,411,300	
Wisconsin, Prairie du Sac	2008 Planning and Design	$2,502,360	POR completed 3rd Qtr., 2011
Dairy Forage Agriculture Research	2009 Construction	2,002,000	
Center	2010 Construction	4,000,000	
	2011 Rescission	($7,675,381)	
	Total	828,979	

ARS' strategic goals, management initiatives, and objectives that contribute to the Department's strategic goals.

USDA Strategic Goal	Agency Strategic Goal	Agency Objective	Programs that Contribute	Key Outcome
USDA Strategic Goal: Assist Rural Communities to Create Prosperity So They Are Self-Sustaining, Repopulating, and Thriving Economically	**Agency Goal 2:** Enhance the Competitiveness and Sustainability of Rural and Farm Economies	Objective 2.1: Expand domestic market opportunities.	New Products/ Product Quality/ Value Added	Key Outcome 2: Technologies to enable dramatic increases in the sustainable production of bioenergy, increased energy security, and reduced energy costs for the agricultural sector. Technologies leading to new and improved foods, fibers, and biobased products that expand agricultural markets and provide new and improved products for consumers here and abroad.
		Objective 2.2: Increase the efficiency of domestic agricultural production and marketing systems.	Livestock/Crop Production	Key Outcome 2: Information and technology producers can use to compete more economically in the marketplace.
	Management Initiative 7(1): Provide Agricultural Library and Information Services to USDA and the Nation	Objective 7.1: Ensure provision and permanent access of quality agricultural information for USDA, the Nation, and the global agricultural community via the National Agricultural Library.	Library and Information Services	Key Outcome 7(1): Agricultural information which meets the needs of customers.
	Management Initiative 7(2): Provide Adequate Federal Facilities Required to Support the Research Mission of ARS	Objective 7.2: Provide for the construction/modernization of new and/or replacement laboratories and facilities, built in a timely manner and within budget.	Buildings and Facilities	Key Outcome 7(2): Laboratories and facilities which meet the needs of ARS' scientists.

USDA Strategic Goal	Agency Strategic Goal	Agency Objective	Programs that Contribute	Key Outcome
USDA Strategic Goal: Ensure Our National Forests and Private Working Lands Are Conserved, Restored, and Made More Resilient to Climate Change, While Enhancing Our Water Resources	**Agency Goal 6:** Protect and Enhance the Nation's Natural Resource Base and Environment	Objective 6.1: Enhance watersheds' capacities to deliver safe and reliable fresh water.	Environmental Stewardship (Water Quality)	Key Outcome 6: Safe, abundant, and reliable water resources.
		Objective 6.2: Improve soil and air quality to enhance crop production and environmental quality.	Environmental Stewardship (Air/Soil Quality; Global Climate Change)	Key Outcome 6: Enhanced crop production and improved environmental quality.
		Objective 6.3: Conserve and use pasture and range lands efficiently.	Environmental Stewardship (Range/Grazing Lands; Agricultural Systems Integration)	Key Outcome 6: Pasture and range land management systems that enhance economic viability and environmental services.
USDA Strategic Goal: Help America Promote Agricultural Production and Biotechnology Exports as America Works to Increase Food Security	**Agency Goal 2:** Enhance the Competitiveness and Sustainability of Rural and Farm Economies	Objective 2.2: Increase the efficiency of domestic agricultural production and marketing systems.	Livestock/Crop Production	Key Outcome 2: Information and technology producers can use to compete more economically in the marketplace.
USDA Strategic Goal: Ensure that All of America's Children Have Access to Safe, Nutritious, and Balanced Meals	**Agency Goal 4**: Enhance Protection and Safety of the Nation's Agriculture and Food Supply	Objective 4.1: Provide the scientific knowledge to reduce the incidence of foodborne illnesses in the U.S.	Food Safety	Key Outcome 4: Reduction in foodborne illness associated with the consumption of meat, poultry, and egg products.
		Objective 4.2: Reduce the number, severity, and distribution of agricultural pest and disease outbreaks.	Livestock/Crop Protection	Key Outcome 4: The knowledge the Nation needs for a secure agricultural production system and healthy food supply.
	Agency Goal 5: Improve the Nation's Nutrition and Health	Objective 5.2: Promote healthier eating habits and lifestyles.	Human Nutrition	Key Outcome 5: Eating habits more consistent with *Dietary Guidelines for Americans*.

Key Outcome 2: (1) Technologies to enable dramatic increases in the sustainable production of bioenergy, increased energy security, and reduced energy costs for the agricultural sector. Technologies leading to new and improved foods, fibers, and biobased products that expand agricultural markets and provide new and improved products for consumers here and abroad; (2) Information and technology producers can use to compete more economically in the marketplace.

Long-Term Performance Measures

- Enhanced bioproducts and value-added products.
- Healthier/more efficient agricultural crops and animals.
- Important genetic resources which have been identified and preserved.
- New/expanded markets for improved agricultural products.

Product Quality/Value Added

Selected Past Accomplishments toward Achievement of the Key Outcome

- Developed a new instant corn and soy blend with a one year shelf life as an emergency ready-to-eat food.
- Developed a new method for testing baked goods that do not contain trans fats.
- Developed an infrared peeling technology for peaches, pears, and tomatoes which will eliminate the use of more than 10 million gallons of water and the treatment of more than 10,000 tons of caustic water material from processing.
- Extracted keratin from wool and converted it into creams and emollients for applications in personal care products.
- Developed a catalyst that converts the oil from *Cuphea* seeds into a high value specialty chemical which can be used as a mosquito repellant, or as a natural fragrance.
- Developed a fire retardant gel that is biodegradable and less expensive than gels currently on the market.
- Selected an elite germplasm line from Pennycress that produces superior oil for renewable diesel or biodiesel production.
- Increased starch production in switchgrass by up to 250 percent using a novel form of the *corn gene cg1 (corngrass1)*.

Selected Accomplishments Expected at the 2013 Proposed Resource Level

- Develop partnership with Cornell University's Sustainable Food Systems Futures Center to integrate supply chain economic analyses.
- Enable new germplasm, varieties, and hybrids of bioenergy with optimal traits.
- Enable new optimal practices and systems that maximize the sustainable yield of high quality bioenergy feedstocks.
- Use the bioenergy crop germplasm and seed collection to phenotype/select high value agronomic/quality traits.
- Develop complete systems and life cycle analyses of biomass feedstock production inputs/outputs.
- Enable new, commercially preferred biorefining technologies.
- Develop technologies leading to new value-added products from crops and crop residues.
- Develop new value-added products from animal byproducts.
- Develop new biobased products.
- Genetically modify cereal seed components for novel/enhanced uses.

Livestock Production

Selected Past Accomplishments toward Achievement of the Key Outcome

- Developed a test that identifies beef heifers and cows that should not be used for breeding because of a low likelihood of achieving pregnancy.
- Found that rapid chilling of pork carcasses reduced the tenderness of pork loin chops.
- Using new DNA technology, identified the chromosomes associated with respiratory disease, foot rot, and pinkeye in cattle. Breeding for reduced susceptibility to these diseases would enhance animal well-being and reduce the need for antibiotics.
- Developed a faster growing Atlantic salmon and released the germplasm to commercial producers.
- Determined that a defective gene called "dystrophin" leads to elevated blood enzymes, heart arrhythmias, and reduced levels of the protein in heart and sketel muscles in swine. This research will assist pork producers to eliminate this defect from their herds improving production and pork quality.
- Proved that fish production could be significantly improved through proper pond oxygen management.

Selected Accomplishments Expected at 2013 Proposed Resource Level

- Increase stored germplasm resources and increase use of National Animal Germplasm Program.
- Increase the number of populations with adequate germplasm stores to enable reconstitution if necessary.
- Develop improved semen extenders and artificial insemination methodologies.
- Use the completed chicken, cattle, and swine genome sequences to identify genes impacting efficiency of nutrient utilization and adaptation to the production environment.
- Develop reduced single nucleotide polymorphism (SNP) chips to target specific livestock breeds and a particular suite of traits.
- Increase depth of sequence coverage in key genomic regions to identify causative mutations.
- Use metagenomics to identify microbial genes and microbial pathways affecting feed efficiency, animal health, and odor emissions in animal production.
- Develop genome sequence resources for catfish, rainbow trout, sheep, and turkey.
- Expand the capacity for high value animal trait evaluation and marker analyses to rapidly identify key genes.
- Develop integrated production systems that incorporate enhanced germplasm and pest/pathogen/water/nutrient management strategies to optimize sustainable animal production.

Crop Production

Selected Past Accomplishments toward Achievement of the Key Outcome

- Distributed globally new wheat germplasm which is resistant to stem rust race Ug99 (a disease which has caused widespread crop losses throughout the world).
- Discovered key physiological genetic factors relating to the cryopreservation of vegetatively propagated plants.
- Sequenced and described all of the genes expressed by grape powdery mildew, a fungus that annually costs grape growers up to $500 per acre.
- Developed peanuts with improved fatty acid composition and disease resistance.
- Released the first varieties of the native Hawaiian ohelo berry, as a new crop for small scale, edible berry production.
- Released corn germplasm lines with resistance to aflatoxin accumulation that causes the disease, *Aspergillus flavus*.
- Facilitated the import of virus resistant, genetically engineered "Rainbow" papaya fruit into Japan, one of the first such products from the U.S. accepted and marketed in Japan.

- Developed a product (now commercially available) that uses beta plant acids from hops to reduce varroa mites, a major cause honey bee colony losses.
- Demonstrated that growers could use their existing equipment to reduce pesticide and water use by 50 percent and still achieve effective pest and disease control.

Selected Accomplishments Expected at the 2013 Proposed Resource Level

- Develop sustainable crop production systems.
- Develop plant varieties and ecologically-based soil/plant management strategies.
- Apply a computer decision support system for crop production that reduces production risks/losses.
- Apply biocontrol technologies to crop plants to enhance disease resistance.
- Apply new genomic tools to accelerate genetic improvement of ‘specialty crops’ for superior product quality.
- Deploy new breeding strategies or genetic engineering methods based on knowledge of gene function and expression to enhance the effectiveness of crop improvement programs.
- Maintain and expand USDA germplasm collections in a healthy, secure, and easily accessible form.
- Distribute germplasm for research purposes.
- Expand collections of crop genetic stocks key to genomic research.
- Increase crop genetic resource regeneration, and safeguard collection.
- Secure more wild relatives of crops in gene banks.
- Expand the capacity for high value crop trait evaluation and marker analyses to rapidly identify key genes.
- Develop more productive, disease free floricultural and nursery crops.

Efficiency Measures

- Additional research funds leveraged from external sources.
- Relative increase in peer reviewed publications.

Key Outcome 4: (1) Reduction in foodborne illness associated with the consumption of meat, poultry, and egg products. (2) The knowledge the Nation needs for a secure agricultural production system and healthy food supply.

Long-Term Performance Measures

- Intervention strategies which reduce pathogens in animals used for food.
- New methodologies for detecting microorganisms/chemicals affecting food safety.
- Genetic lines of plants/animals which are more disease resistant.
- New vaccines for priority animal diseases.
- New diagnostic tests for economically important plant and animal diseases.
- Improved management/control of emerging plant and animal diseases.

Food Safety

Selected Past Accomplishments toward Achievement of the Key Outcome

- Demonstrated that a new chlorine stabilizer, T128, significantly improved the sanitizing efficiency of chlorine against bacterial cross contamination while maintaining the quality of leafy green vegetables.
- Developed, validated, and transferred to FSIS a quicker, better screening method that can identify individual drug residues in meat samples. This technology targets 60 of the most important drugs of regulatory concern.
- Developed a method to detect and identify the “top six” non-0157 shiga toxin producing *E. coli* in beef.

- Demonstrated that "nanoparticles" (i.e., magnesium oxide and zinc oxide) can dramatically kill *E.coli 0157, Salmonella spp., and Campylobacter jejuni*, and potentially can be added directly to foods or incorporated in packaging materials to improve food safety.
- Identified a gene (poxA) in *Salmonella typhimurium* (that can undetectably reside in pigs and pose a food safety problem for humans), that when mutated significantly reduces the ability of the bacterium to survive.

<u>Selected Accomplishments Expected at the 2013 Proposed Resource Level</u>

- Use population systems to understand the interrelationships of microorganisms in food environments, and the interrelationships among host, pathogen, and environment.
- Use systems biology to understand the basic genetic components of pathogens, their expression, and directly relate this information to the microorganisms's biology and its potential effect on food safety.
- Develop rapid systems to detect food pathogens that may enter through raw materials, contamination during processing or retail to protect public health.
- Develop production and processing intervention systems that may control, mitigate, or reduce biological and chemical contaminants in foods.
- Develop methods and models to predict the behavior of microorganisms in foods that may be used to support food safety measures and risk assessments.
- Develop rapid systems to detect toxins and chemical contaminants to protect human health and the environment.
- Develop and validate: two lab-based multi-platform contaminant detection technologies for the highest priority pathogens, toxins, and chemical residues; two multi-task on/in-line (in field) inspection technologies (for all size processors) that detect contaminants and changes in attributes at required line speeds; three detection methods for mycotoxins in foods to be used by the Centers for Disease Control and Prevention (CDC) for public health outbreaks and for use in developing countries.
- Develop five science-based management practices to prevent preharvest contamination of produce by enteric pathogens, and implement three intervention strategies to eliminate pathogen contamination: the control and prediction of the fate and transport of pathogens will be determined by specific tools developed; the role of the environment and animals in the prevalence, diversity, and quantity, and survival of pathogens in crops will be determined by specific analytic and field approaches; the specific pathogens and the effect of reduction strategies will be measured.
- Develop five innovative processing intervention strategies to assure and maintain postharvest safety and quality. The effect of food processing technologies on overall reduction of pathogens at the end of production is estimated through various studies/approaches.
- Identify/evaluate specific intervention strategies through the food production chain.
- Evaluate the role of alternatives to antibiotics.

Livestock Protection

<u>Selected Past Accomplishments toward Achievement of the Key Outcome</u>

- Investigated "direct fed microbials" (DFMs) as immunopotentiating agents to enhance host protective immunity against enteric pathogens in broiler chickens.
- Devised an insecticide use/method to more effectively control horn flies and stable flies that injure livestock, transmit disease organisms to animals, and spread food pathogens such as *E. coli and Salmonella*.
- Developed new tools/technologies to control the cattle fever tick.
- Developed new technologies/methods to protect U.S. troops serving overseas, from sand flies, mosquitoes, ticks, and chiggers that cause serious illnesses and diseases.

- Demonstrated that two blood-based tests which detect tuberculosis specific antibodies in deer and elk provide greater accuracy than skin tests. The research results will benefit livestock and captive cervid producers, wildlife agencies, and the general public in controlling the spread of TB in humans and animals.

Selected Accomplishments Expected at the 2013 Proposed Resource Level

- Identify functional genes that convey specific disease resistance traits.
- Identify and characterize gene functions/mechanisms responsible for disease resistance traits.
- Implement an integrated emerging disease research program in pathogenesis, diagnostics, and intervention.
- Implement a technology driven vaccinology research program for control and eradication of biological threat agents.
- Discover genetic profiles that convey protective immunity against infectious diseases/parasites.
- Develop control programs for invasive drug resistant nematodes, protozoa, and pests of livestock and poultry.
- Model the distribution of white-tailed deer and exotic ungulates in Southern Texas in order to be able to target measures to re-eradicate the cattle fever tick.
- Refine medicated baits and self treatment devices as tools for treatment of ticks on white-tailed deer providing practical tools for eradicating the cattle fever tick.
- Transform experimental screwworm flies in Panama using technology developed to create a male-only strain.
- Develop waterproof fire and ant baits and characterize new biological control agents.
- Provide new information on host and pest/pathogen interaction to develop protective mechanisms.
- Develop strategies to improve animal well-being.
- Discover and develop new diagnostic platforms for priority animal diseases.
- Discover and transfer new technologies for protection of animals and humans from biting arthropods.
- Discover and transfer new technologies for protection of animals from priority diseases.
- Conduct research on countering biological threats.
- Develop alternatives to antibiotics to prevent/treat pathogens affecting poultry health.

Crop Protection

Selected Past Accomplishments toward Achievement of the Key Outcome

- Sequenced the wheat stem rust pathogen's genome. This represents the first complete genome sequencing of any rust fungus and provides important information for the scientific community working on fungal plant pathogens and host resistance in cereal crops.
- Developed a broad spectrum diagnostic test that will detect all members of the sweet potato Begomovirus group that will be used in screening germplasm for new sources of disease resistance.
- Identified a gene responsible for susceptibility of wheat to fungal diseases. If the gene is removed or altered, there is the potential to greatly increase wheat yields.
- Released three new golden nematode resistant potato varieties.
- Developed guidelines for safe bioenergy crop production.
- Developed improved boll weevil detection/eradication methods.
- Discovered ten new species of insects for biological control of invasive pests in the United States.

Selected Accomplishments Expected at the 2013 Proposed Resource Level

- Develop new genomic approaches to control crop diseases, such as soybean rust, cereal pests, and rusts, and rice blast.
- Provide information on emerging diseases and invasive species that will enhance identification, detection, and control.
- Characterize pathogens and invasive species, and determine key events in disease development and infection processes.
- Develop systems which will increase knowledge of the ecology, physiology, epidemiology, and molecular biology of emerging diseases, invasive insects, and invasive weeds, which will be incorporated into pest risk assessments.
- Provide new information on host and pest/pathogen interaction to develop protective mechanisms.
- Research soil microbial ecology.
- Improve disease management of small fruits and nursery crops.
- Improve potato production through resistant varieties and new disease management techniques.
- Improve management of stripe rust of wheat and resistant varieties.
- Enhance control of invasive weeds, arthropods, and plant pathogens that threaten our food, fiber, and natural ecosystems.
- Enhance fungal disease protection in beans, sunflowers, and other crops.

Efficiency Measures

- Additional research funds leveraged from external sources.
- Relative increase in peer reviewed publications.

Key Outcome 5: Eating habits more consistent with *Dietary Guidelines for Americans*.

Long-Term Performance Measures

- New information on the benefits of consuming healthy diets and on effective intervention strategies.
- Better understanding of nutrients and their role in promoting health and preventing obesity and related diseases.
- Revised dietary guidelines.

Human Nutrition

Selected Past Accomplishments toward Achievement of the Key Outcome

- Demonstrated epigenetic changes in humans for the first time. The results prove that epigenetic changes need to be considered in evaluating the risk for many diseases and documenting the effects of early environment the establishment of heritable changes.
- Published and made available on the World Wide Web the first systematic catalog of all identifiable metabolites (small molecules that have biological activity in an organism) in human blood serum. The research enables researchers to link dietary and environmental changes with alterations in serum metabolites and prevention of chronic diseases including heart disease, obesity, and diabetes.
- Found that consumption of whey protein supplements result in decreased weight and body fat.
- Found that maternal obesity affects energy metabolism in offspring.
- Released the 24th version of the *National Nutrient Database for Standard Reference*. The data is used as the basis for national and international food policy decisions that link food nutrient intake to health or disease risk, and used for many private food databases.

Selected Accomplishments Expected at the 2013 Proposed Resource Level

- Provide updates of the National Nutrient Database.
- Provide reports from the "What We Eat in America" survey.
- Publish findings on requirements/ bioavailability of nutrients and their role in promoting health/ preventing obesity.
- Publish findings on the individual nutrition intervention strategies.
- Evaluate dietary patterns useful for preventing obesity.
- Conduct research on requirements/ bioavailability of nutrients to define their role in promoting health/preventing obesity.
- Examine interaction of dietary intake with genetic predisposition for promoting health.
- Release data from dietary supplement database.
- Identify genes or genetic markers among ethnic groups that respond to diet and physical activity.
- Publish research on the normal growth and aging process that affect nutrient requirements.
- Conduct research on metabolism that impacts nutritional status.
- Conduct research on immunology that interacts with nutritional status.
- Publish research on development of analytical methods for food composition and metabolism of nutrients.
- Enhance nutrition surveillance capability to link USDA/ARS food consumption data with Federal Dietary Policy Guidance.
- Improve nutrition monitoring by adding functionality to the Food Composition Database.

Efficiency Measures

- Additional research funds leveraged from external sources.
- Relative increase in peer reviewed publications.

Key Outcome 6: (1) Safe, abundant, and reliable water resources. (2) Enhanced crop production and improved environmental quality. (3) Pasture and range land management systems that enhance economic viability and environmental services.

Long-Term Performance Measures

- Tools/technologies which improve the quality of the Nation's surface waters.
- Improved management/conservation practices that conserve soil resources and reduce dust emissions from agricultural operations.
- Management practices/technologies which reduce gaseous emissions for agricultural operations.
- Scientific information for planning and managing carbon storage in soil.
- Improved management practices/technologies for managing pasture and range lands.

Environmental Stewardship

Selected Past Accomplishments toward Achievement of the Key Outcome

- Developed a series of satellite remote sensing tools/strategies to enable earlier detection of agricultural drought and mitigate its effects.
- Developed an improved river basin/water quality model to guide USDA conservation policies.
- Provided extensive measures on ammonia emissions from feedlots. These measures provide the cattle industry with accurate science-based information to meet regulatory requirements, and give regulators data to build ammonia emissions inventories.
- Found that like switchgrass, no-till corn (with proper management under the right conditions) can also sequester significant amounts of CO_2.

- Assembled the first alfalfa gene index, increasing the value of alfalfa as a bioenergy crop.
- Demonstrated that *Brassica juncea* has superior oil producing qualities which make it a promising candidate to meet future U.S. biofuel production needs.
- Demonstrated that the use of new plastic mulches were the most effective strategy for reducing non-target fumigant emissions.
- Provided data on the impacts of rising CO_2 on the Nation's range lands. This data will help climate change scientists develop management strategies for ranchers and public land managers.

Selected Accomplishments Expected at the 2013 Proposed Resource Level

- Expand the ARS Greenhouse Gas Reduction through Agricultural Carbon Enhancement Network (GRACEnet) project into U.S. biomass and specialty crops, and into farming systems in one sub-Saharan or Asian country.
- Develop methods to genotypically and phenotypically characterize large numbers of crop species and varieties in collections to develop high yielding and profitable crops.
- Provide a web-accessible management tool based on geospatial information on crop condition, soil moisture, drought monitoring, and hydrologic models for producers, land managers, and communities needing to use water more efficiently and cost-effectively.
- Develop or evaluate a method or technology to assess and conserve water availability through more efficient sensing, supply, delivery, and reuse systems.
- Develop or evaluate a method or technology to reduce or prevent nutrient contamination of surface and ground waters.
- Develop or evaluate a method or technology that reduces sediment loads to waterways, improves farm land sustainability, and improves or restores stream corridors and riparian ecosystems.
- Develop or assess a system or practice that ameliorates, offsets, or mitigates the impact of agricultural production and processing on water resources.
- Develop sustainable water management strategies.
- Develop one technology or decision tool to predict carbon sequestration in the soil.
- Develop one management practice or control technology to reduce emissions from agricultural operations.
- Reduce risks to agricultural production/ecosystem services from interacting climate-related stresses.
- Develop one cost effective practice or strategy to restore degraded range lands.
- Develop one method or strategy to measure and monitor pasture and range land health.
- Adapt agricultural systems to climate variability and weather extremes.
- Sustain agricultural production capacity for food and energy security and ecosystems services over long periods at landscape scale.
- Enhance the quantity/quality of water resources for agriculture.

Efficiency Measures

- Additional research funds leveraged from external sources.
- Relative increase in peer reviewed publications.

Key Outcome 7 (1): Agricultural information which meets the needs of customers.

Long-Term Performance Measures

- National Digital Library for Agriculture (NDLA) is developed.
- Agricultural Online Access (AGRICOLA) is fully integrated into NDLA.
- Valuable USDA publications are digitally reformatted for preservation.

Library and Information Services

Selected Past Accomplishments toward Achievement of the Key Outcome

- Page views and searches on NAL's web site exceeded 100 million for the first time in 2011.
- NAL Digital Collections is being developed to provide easy access to digital content available via NAL. NAL is unifying and simplifying access and discovery by migrating existing digital collections from different platforms; streamlining production processes and procedures; and opening the database to relevant research collectors.
- Developed a more useable version of AGRICOLA and released it to web search engines, increasing visibility and usage. NAL is further improving AGRICOLA by implementing automated indexing.
- NAL is coordinating and providing technical support to bring VIVO to USDA. VIVO, a semantic, open source system, enables networking of scientists – their research, grants, publications, and more. Launched for internal USDA review in mid-August 2011, VIVO currently contains content from five agencies: ARS, ERS, NASS, NIFA, and the Forest Service.
- In partnership with the American Farm Bureau Federation, NAL's Alternative Farming and Rural Information Center launched a beta version of the Start2 Farm web-based educational clearinghouse.

Selected Accomplishments Expected at the 2013 Proposed Resource Level

- Provide additional resources for NAL's digital information services.
- Provide access to sustainability and environmental data sets for the scientific community.

Key Outcome 7 (2): Laboratories and facilities which meet the needs of ARS' scientists.

Long-Term Performance Measures

- Laboratories and facilities are constructed/modernized in accordance with ARS' mission and are completed on schedule and within budget.

Buildings and Facilities

Selected Past Accomplishments toward Achievement of the Key Outcome

- In 2011, approximately $230 million of Building and Facilities (B&F) funding was rescinded that had been previously appropriated to continue modernization/renovation projects and construction of new facilities at a number of ARS locations. The loss of these B&F funds prevented execution of design and construction efforts for modernization and new construction to continue.

  Construction funding was previously provided to execute portions of planned construction projects for laboratories/facilitates at the following locations: Hilo, Hawaii (U.S. Pacific Basin Agricultural Research Center); Peoria, Illinois (National Center for Agricultural Utilization Research); Bowling Green, Kentucky (Animal Waste Management Research Laboratory); Houma, Louisiana (ARS Sugarcane Research Laboratory); and Stoneville, Mississippi (Jamie Whitten Delta States Research Center). In 2012, execution of these projects is continuing.

  Design funds were previously provided to initiate planning and design efforts for laboratories/facilities projects at the following locations: Davis, California (Grape Genomics Research Center); Salinas, California (U.S. Agricultural Research Station); Storrs, Connecticut (Center of Excellence for Vaccine Research); Athens, Georgia (Southeast Poultry Research Laboratory); Canal Point, Florida (Agricultural Research Laboratory); Lincoln, Nebraska (Systems Biology Research Facility); Kerrville, Texas (Knipling-Bushland Laboratory); Logan, Utah (Agricultural Research Center); Hagerman, Idaho (National Trout Production & Evaluation Facility); Lexington, Kentucky (Forage Animal Research Laboratory); Starkville, Mississippi (Poultry Science Research Facility); Columbia, Missouri (National Plant and Genetics Security Center); Bozeman, Montana (Animal Bioscience Facility); Geneva, New York (Center for Grape Genetics); Toledo, Ohio (University of Toledo); Pullman, Washington (ARS Research Laboratory); Washington, DC (U.S. National Arboretum); Kearneysville, West Virginia (Appalachian Fruit Laboratory); and Prairie du Sac, Wisconsin (Dairy Forage Research Center). These projects are currently on hold pending availability of construction funds.

Selected Accomplishments Expected at the 2013 Proposed Resource Level

- Repair/maintain ARS buildings/facilities using Repair and Maintenance funds.

AGRICULTURAL RESEARCH SERVICE

Strategic Goal Funding Matrix

(Dollars in thousands)

Program / Program Items	2010 Actual	2011 Actual	2012 Estimate	Change	2013 Estimate
Department Strategic Goal: Assist rural communities to create prosperity so they are self-sustaining, repopulating, and economically thriving					
Product Quality/Value Added	$111,056	$105,037	$100,541	-$7,334	$93,207
Staff Years	866	835	796	-5	791
Livestock Production	43,941	40,694	38,027	-2,324	35,703
Staff Years	233	225	219	-1	218
Crop Production	133,070	129,113	127,495	-209	127,286
Staff Years	756	976	963	0	963
National Agricultural Library	22,233	21,343	20,919	43	20,962
Staff Years	127	121	121	0	121
Repair & Maintenance	17,503	17,468	17,468	3,000	20,468
Staff Years	0	0	0	0	0
Total Costs, Strategic Goal	327,803	313,655	304,450	-6,824	297,626
Total Staff Years, Strategic Goal	1,982	2,157	2,099	-6	2,093
Department Strategic Goal: Ensure our national forests and private working lands are conserved, restored, and made more resilient to climate change, while enhancing our water resources					
Environmental Stewardship	207,583	200,963	189,034	24,849	213,883
Staff Years	1,891	1,539	1,460	0	1,460
Total Costs, Strategic Goal	207,583	200,963	189,034	24,849	213,883
Total Staff Years, Strategic Goal	1,891	1,539	1,460	0	1,460
Department Strategic Goal: Help America promote agricultural production and biotechnology exports as America works to increase food security					
Livestock Production	43,942	40,694	38,027	-2,323	35,704
Staff Years	234	225	219	-1	218
Crop Production	107,054	103,129	101,512	-285	101,227
Staff Years	755	767	756	0	756
Total Costs, Strategic Goal	150,996	143,823	139,539	-2,608	136,931
Total Staff Years, Strategic Goal	989	992	975	-1	974
Department Strategic Goal: Ensure that all America's children have access to safe, nutritious, and balanced meals					
Food Safety	107,597	106,789	106,210	2,044	108,254
Staff Years	787	787	783	6	789
Human Nutrition	89,734	85,440	85,438	-1,128	84,310
Staff Years	279	279	279	0	279
Livestock Protection	90,216	79,353	76,166	1,403	77,569
Staff Years	518	499	478	5	483
Crop Protection	205,710	203,207	193,810	-9,818	183,992
Staff Years	1,324	1,276	1,220	-4	1,216
Total Costs, Strategic Goal	493,257	474,789	461,624	-7,499	454,125
Total Staff Years, Strategic Goal	2,908	2,841	2,760	7	2,767
Total Costs, All Strategic Goals	1,179,639	1,133,230	1,094,647	7,918	1,102,565
Total FTEs, All Strategic Goals	7,770	7,529	7,294	0	7,294

Summary of Budget and Performance
Key Performance Outcomes and Measures

USDA Strategic Goal: Assist rural communities to create prosperity so they are self-sustaining, repopulating, and thriving economically.
Program Area: New Products/Product Quality/Value Added
Key Outcome: Technologies to enable dramatic increases in the sustainable production of bioenergy, increased energy security, and reduced energy costs for the agricultural sector. Technologies lending to new and improved foods, fibers, and biobased products that expand agricultural markets and provide new and improved products for consumers here and abroad.

Performance Measures and Targets

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Create new scientific knowledge and innovative technologies that represent scientific and technological advancements or breakthroughs applicable to bioenergy.	•Enabled new germplasm, varieties, and hybrids of bioenergy with optimal traits. •Enabled new optimal practices and systems that maximize the sustainable yield of high quality bioenergy feedstocks. •Enabled new, commercially preferred biorefining technologies.	•Enable new germplasm, varieties, and hybrids of bioenergy with optimal traits. •Enable new optimal practices and systems that maximize the sustainable yield of high quality bioenergy feedstocks. •Enable new, commercially preferred biorefining technologies. •Use the bioenergy crop germplasm and seed collection to phenotype/select high value agronomic/ quality traits.	•Enable new germplasm, varieties, and hybrids of bioenergy with optimal traits. •Enable new optimal practices and systems that maximize the sustainable yield of high quality bioenergy feedstocks. •Enable new, commercially preferred biorefining technologies. •Use the bioenergy crop germplasm and seed collection to phenotype/select high value agronomic/ quality traits.

Performance Measure	2011 Estimate	2012 Target	2013 Target
		•Develop complete systems and life cycle analyses of biomass feedstock production inputs/outputs.	•Develop complete systems and life cycle analyses of biomass feedstock production inputs/outputs.
Dollars ($)	$13,318,000	$13,318,000	$13,356,000

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Develop cost effective, functional industrial and consumer products, including higher quality, healthy foods, that satisfy consumer demand in the United States and abroad.	•Developed technologies leading to new value-added products from crops and crop residues. •Developed new value-added products from animal byproducts. •Developed new biobased products. •Genetically modified cereal seed components for new/enhanced uses.	•Develop technologies leading to new value-added products from crops and crop residues. •Develop new value-added products from animal byproducts. •Develop new biobased products. •Genetically modify cereal seed components for new/enhanced uses. •Develop partnership with Cornell University's Sustainable Food Systems Futures Center to integrate supply chain economic analyses.	•Develop technologies leading to new value-added products from crops and crop residues. •Develop new value-added products from animal byproducts. •Develop new biobased products. •Genetically modify cereal seed components for new/enhanced uses. •Develop partnership with Cornell University's Sustainable Food Systems Futures Center to integrate supply chain economic analyses.
Dollars ($)	$91,719,000	$87,223,000	$79,851,000

Program Area: Livestock/Crop Production
Key Outcome: Information and technology producers can use to compete more economically in the marketplace.

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Develop new technologies, tools, and information contributing to improved precision animal production systems to meet current and future food animal production needs of diversified consumers, while simultaneously minimizing the environmental footprint of production systems and enhancing animal well-being.	•Continued to increase stored germplasm resources and increase use of National Animal Germplasm Program. •Increased the number of populations with adequate germplasm stores to enable reconstitution if necessary. •Developed improved semen extenders and artificial insemination methodologies. •Used the completed chicken, cattle, and swine genome sequences to identify genes impacting efficiency of nutrient utilization and adaptation to the production environment. •Developed reduced SNP chips to target specific livestock breeds and a particular suite of traits •Increased depth of sequence coverage in key genomic regions to identify causative mutations.	•Continue to increase stored germplasm resources and increase use of National Animal Germplasm Program. •Increase the number of populations with adequate germplasm stores to enable reconstitution if necessary. •Develop improved semen extenders and artificial insemination methodologies. •Use the completed chicken, cattle, and swine genome sequences to identify genes impacting efficiency of nutrient utilization and adaptation to the production environment. •Develop reduced SNP chips to target specific livestock breeds and a particular suite of traits	•Continue to increase stored germplasm resources and increase use of National Animal Germplasm Program. •Increase the number of populations with adequate germplasm stores to enable reconstitution if necessary. •Develop improved semen extenders and artificial insemination methodologies. •Use the completed chicken, cattle, and swine genome sequences to identify genes impacting efficiency of nutrient utilization and adaptation to the production environment. •Develop reduced SNP chips to target specific livestock breeds and a particular suite of traits

Performance Measure	2011 Estimate	2012 Target	2013 Target
	•Used metagenomics to identify microbial genes and microbial pathways affecting feed efficiency, animal health, and odor emissions in animal production. •Developed genome sequence resources for catfish, rainbow trout, sheep, and turkey.	•Increase depth of sequence coverage in key genomic regions to identify causative mutations. •Use metagenomics to identify microbial genes and microbial pathways affecting feed efficiency, animal health, and odor emissions in animal production. •Develop genome sequence resources for catfish, rainbow trout, sheep, and turkey. •Expand the capacity for high value animal trait evaluation and marker analyses to rapidly identify key genes.	•Increase depth of sequence coverage in key genomic regions to identify causative mutations. •Use metagenomics to identify microbial genes and microbial pathways affecting feed efficiency, animal health, and odor emissions in animal production. •Develop genome sequence resources for catfish, rainbow trout, sheep, and turkey. •Expand the capacity for high value animal trait evaluation and marker analyses to rapidly identify key genes. •Develop integrated production systems that incorporate enhanced germplasm and pest/pathogen/water/ nutrient management strategies to optimize sustainable animal production.
Dollars ($)	$40,694,000	$38,027,000	$35,703,000

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Develop systems and technologies to reduce production costs and risks while enhancing natural resource quality.	•Applied a computer decision support system for crop and animal production that reduces production risks/losses.	•Apply a computer decision support system for crop and animal production that reduces production risks/losses. •Apply biocontrol technologies to crop plants to enhance disease resistance. •Develop sustainable crop production systems. •Develop plant varieties and ecologically-based soil/plant management strategies.	•Apply a computer decision support system for crop and animal production that reduces production risks/losses. •Apply biocontrol technologies to crop plants to enhance disease resistance. •Develop sustainable crop production systems. •Develop plant varieties and ecologically-based soil/plant management strategies.
Dollars ($)	$63,638,000	$62,961,000	$62,080,000

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Expand, maintain, and protect our genetic resource base, increase our knowledge of genes, genomes, and biological processes, and provide economically and environmentally sound technologies that will improve the production efficiency, health, and value of the Nation's crops.	•Applied new genomic tools to accelerate genetic improvement of 'specialty crops' for superior product quality. •Deployed new breeding strategies or genetic engineering methods based on knowledge of gene function and expression to enhance the effectiveness of crop improvement programs. •Maintained USDA germplasm collections in a healthy, secure, and easily accessible form. • Distributed germplasm for research purposes. • Increased crop genetic resource regeneration, and safeguard collection. •Secured more wild relatives of crops in gene banks. •Expanded collections of crop genetic stocks key to genomic research.	•Apply new genomic tools to accelerate genetic improvement of 'specialty crops' for superior product quality. •Deploy new breeding strategies or genetic engineering methods based on knowledge of gene function and expression to enhance the effectiveness of crop improvement programs. •Maintain USDA germplasm collections in a healthy, secure, and easily accessible form. •Distribute germplasm for research purposes. •Increase crop genetic resource regeneration, and safeguard collection. •Secure more wild relatives of crops in gene banks. •Expand collections of crop genetic stocks key to genomic research.	•Apply new genomic tools to accelerate genetic improvement of 'specialty crops' for superior product quality. •Deploy new breeding strategies or genetic engineering methods based on knowledge of gene function and expression to enhance the effectiveness of crop improvement programs. •Maintain and expand USDA germplasm collections in a healthy, secure, and easily accessible form. •Distribute germplasm for research purposes. •Increase crop genetic resource regeneration, and safeguard collection. •Secure more wild relatives of crops in gene banks. •Expand collections of crop genetic stocks key to genomic research.

Performance Measure	2011 Estimate	2012 Target	2013 Target
		•Expand the capacity for high value crop trait evaluation and marker analyses to rapidly identify key genes.	•Expand the capacity for high value crop trait evaluation and marker analyses to rapidly identify key genes. •Develop more productive, disease free floricultural and nursery crops.
Dollars ($)	$65,475,000	$64,534,000	$65,205,500

Program Area: Library and Information Services
Key Outcome: Agricultural information which meets the needs of customers.

Performance Measure	2011 Estimate	2012 Target	2013 Target
•The services and collections of the National Agricultural Library continue to meet the needs of its customers.	Provided additional resources for NAL's digital information services.	•Provide additional resources for NAL's digital information services.	•Provide additional resources for NAL's digital information services. •Provide access to sustainability and environmental data sets for the scientific community.
Dollars ($)	$16,007,000	$15,583,000	$15,722,000
•The National Agricultural Library and partners implement the National Digital Library for Agriculture.	•Page views/searches on NAL's web site exceeded 100 million for the first time in 2011.	• Funding level will determine NAL's ability to improve services, i.e., reference services, material acquisition, as well as ability to fill vacant NAL positions.	• Funding level will determine NAL's ability to improve services, i.e., reference services, material acquisition, as well as ability to fill vacant NAL positions.
Dollars ($)	$5,336,000	$5,336,000	$5,241,000

Program Area: Buildings and Facilities
Key Outcome: Laboratories and facilities which meet the needs of ARS' scientists.

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Selected ARS laboratories/facilities are repaired/maintained with R&M available funds.	•Repaired/maintained ARS laboratories/ facilities using Repair and Maintenance funds.	•Repair/maintain ARS laboratories/facilities using Repair and Maintenance funds.	•Repair/maintain ARS laboratories/facilities using Repair and Maintenance funds.
Dollars ($)	$17,468,000	$17,468,000	$20,468,000

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

Program Area: Environmental Stewardship (Water Quality)

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

Performance Measures and Targets

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Develop technology and practices to reduce the delivery of agricultural pollutants by water on farms and ranches and quantify the environmental benefit of conservation practices in watersheds.	•Developed a method or technology to assess and conserve water availability through more efficient sensing, supply, delivery, and reuse systems. •Developed a method/ technology to reduce or prevent nutrient contamination of surface and ground waters. •Developed a method/ technology that reduces sediment loads to waterways, improves farm land sustainability, and improves or restores stream corridors and riparian ecosystems. •Developed a system/ practice that ameliorates, offsets, or mitigates the impact of agricultural production and processing on water resources. •Expanded the ARS GRACEnet project into U.S. biomass and specialty crops, and into farming systems in one sub-Saharan or Asian country.	•Develop or evaluate a method or technology to assess and conserve water availability through more efficient sensing, supply, delivery, and reuse systems. •Develop or evaluate a method or technology to reduce or prevent nutrient contamination of surface and ground waters. •Develop or evaluate a method or technology that reduces sediment loads to waterways, improves farm land sustainability, and improves or restores stream corridors and riparian ecosystems. •Develop or assess a system or practice that ameliorates, offsets, or mitigates the impact of agricultural production and processing on water resources. •Expand the ARS GRACEnet project into U.S. biomass and specialty crops, and into	•Develop or evaluate a method or technology to assess and conserve water availability through more efficient sensing, supply, delivery, and reuse systems. •Develop or evaluate a method or technology to reduce or prevent nutrient contamination of surface and ground waters. •Develop or evaluate a method or technology that reduces sediment loads to waterways, improves farm land sustainability, and improves or restores stream corridors and riparian ecosystems. •Develop or assess a system or practice that ameliorates, offsets, or mitigates the impact of agricultural production and processing on water resources. •Expand the ARS GRACEnet project into U.S. biomass and specialty crops, and into

Performance Measure	2011 Estimate	2012 Target	2013 Target
	•Provided a web-accessible management tool based on geospatial information on crop condition, soil moisture, drought monitoring, and hydrologic models for producers, land managers, and communities needing to use water efficiently and cost-effectively. .	farming systems in one sub-Saharan or Asian country. •Provide a web-accessible management tool based on geospatial information on crop condition, soil moisture, drought monitoring, and hydrologic models for producers, land managers, and communities needing to use water efficiently and cost-effectively. •Develop sustainable water management strategies.	farming systems in one sub-Saharan or Asian country. •Provide a web-accessible management tool based on geospatial information on crop condition, soil moisture, drought monitoring, and hydrologic models for producers, land managers, and communities needing to use water efficiently and cost-effectively. •Develop sustainable water management strategies. •Enhance the quantity/quality of water resources for agriculture.
Dollars ($)	$67,607,000	$62,034,000	$14,628,000

Program Area: Environmental Stewardship (Air/Soil Quality; Global Climate Change)
Key Outcome: Enhanced crop production and improved environmental quality.

Performance Measure	2011 Estimate	2012 Target	2013 Target
• Develop practices and technologies to enhance soil resources and reduce emissions of particulate matter and gases from crop production lands, agricultural processing operations, and animal production systems.	•Developed one technology or decision tool to predict carbon sequestration in the soil. •Developed one management practice or control technology to reduce emissions from agricultural operations. •Designed methods to genotypically and phenotypically characterize large numbers of crop species and varieties in collections to develop high yielding and profitable crops.	•Develop one technology or decision tool to predict carbon sequestration in the soil. •Develop one management practice or control technology to reduce emissions from agricultural operations. •Develop methods to genotypically and phenotypically characterize large numbers of crop species and varieties in collections to develop high yielding and profitable crops. •Reduce risks to agricultural production/ecosystem services from interacting climate-related stresses. •Develop one management practice or control technology to reduce emissions from agricultural operations.	•Develop one technology or decision tool to predict carbon sequestration in the soil. •Develop one management practice or control technology to reduce emissions from agricultural operations. •Develop methods to genotypically and phenotypically characterize large numbers of crop species and varieties in collections to develop high yielding and profitable crops. •Reduce risks to agricultural production/ecosystem services from interacting climate-related stresses. •Develop one management practice or control technology to reduce emissions from agricultural operations. •Adapt agricultural systems to climate variability and weather extremes.

Performance Measure	2011 Estimate	2012 Target	2013 Target
			•Sustain agricultural production capacity for food and energy security and ecosystem services over long periods at landscape scale.
Dollars ($)	$86,616,000	$84,892,000	$98,034,000

Program Area: Environmental Stewardship (Range/Grazing Lands; Agricultural Systems Integration)
Key Outcome: Pasture and range land management systems that enhance economic viability and environmental services.

Performance Measure	2011 Estimate	2012 Target	2013 Target
• Improved management practices and technologies for managing pasture and rangelands to improve economic profitability and enhance environmental values.	•Developed one cost effective practice or strategy to restore degraded range lands. •Developed one method or strategy to measure and monitor pasture and range land health.	•Develop one cost effective practice or strategy to restore degraded range lands. •Develop one method or strategy to measure and monitor pasture and range land health.	•Develop one cost effective practice or strategy to restore degraded range lands. •Develop one method or strategy to measure and monitor pasture and range land health.
Dollars ($)	$46,740,000	$42,108,000	$43,179,000

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

Program Area: Livestock/Crop Production

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

Performance Measures and Targets

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Develop new technologies, tools, and information contributing to improved precision animal production systems to meet current and future food animal production needs of diversified consumers, while simultaneously minimizing the environmental footprint of production systems and enhancing animal well-being.	•Continued to increase stored germplasm resources and increase use of National Animal Germplasm Program. •Increased the number of populations with adequate germplasm stores to enable reconstitution if necessary. •Developed improved semen extenders and artificial insemination methodologies. •Used the completed chicken, cattle, and swine genome sequences to identify genes impacting efficiency of nutrient utilization and adaptation to the production environment. •Developed reduced SNP chips to target specific livestock breeds and a particular suite of traits •Increased depth of sequence coverage in key genomic regions to identify causative mutations.	•Continue to increase stored germplasm resources and increase use of National Animal Germplasm Program. •Increase the number of populations with adequate germplasm stores to enable reconstitution if necessary. •Develop improved semen extenders and artificial insemination methodologies. •Use the completed chicken, cattle, and swine genome sequences to identify genes impacting efficiency of nutrient utilization and adaptation to the production environment. •Develop reduced SNP chips to target specific livestock breeds and a particular suite of traits •Increase depth of sequence coverage in key genomic regions to	•Continue to increase stored germplasm resources and increase use of National Animal Germplasm Program. •Increase the number of populations with adequate germplasm stores to enable reconstitution if necessary. •Develop improved semen extenders and artificial insemination methodologies. •Use the completed chicken, cattle, and swine genome sequences to identify genes impacting efficiency of nutrient utilization and adaptation to the production environment. •Develop reduced SNP chips to target specific livestock breeds and a particular suite of traits •Increase depth of sequence coverage in key genomic regions to

Performance Measure	2011 Estimate	2012 Target	2013 Target
	•Used metagenomics to identify microbial genes and microbial pathways affecting feed efficiency, animal health, and odor emissions in animal production. •Developed genome sequence resources for catfish, rainbow trout, sheep, and turkey.	identify causative mutations. •Use metagenomics to identify microbial genes and microbial pathways affecting feed efficiency, animal health, and odor emissions in animal production. •Develop genome sequence resources for catfish, rainbow trout, sheep, and turkey. •Expand the capacity for high value animal trait evaluation and marker analyses to rapidly identify key genes.	identify causative mutations. •Use metagenomics to identify microbial genes and microbial pathways affecting feed efficiency, animal health, and odor emissions in animal production. •Develop genome sequence resources for catfish, rainbow trout, sheep, and turkey. •Expand the capacity for high value animal trait evaluation and marker analyses to rapidly identify key genes. •Develop integrated production systems that incorporate enhanced germplasm and pest/pathogen/water/ nutrient management strategies to optimize sustainable animal production.
Dollars ($)	$40,694,000	$38,027,000	$35,704,000

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Develop systems and technologies to reduce production costs and risks while enhancing natural resource quality.	•Applied a computer decision support system for crop and animal production that reduces production risks/losses.	•Apply a computer decision support system for crop and animal production that reduces production risks/losses. •Apply biocontrol technologies to crop plants to enhance disease resistance. •Develop sustainable crop production systems. •Develop plant varieties and ecologically-based soil/plant management strategies.	•Apply a computer decision support system for crop and animal production that reduces production risks/losses. •Apply biocontrol technologies to crop plants to enhance disease resistance. •Develop sustainable crop production systems. •Develop plant varieties and ecologically-based soil/plant management strategies.
Dollars ($)	$37,653,000	$36,977,000	$36,020,500

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Expand, maintain, and protect our genetic resource base, increase our knowledge of genes, genomes, and biological processes, and provide economically and environmentally sound technologies that will improve the production efficiency, health, and value of the Nation's crops.	•Applied new genomic tools to accelerate genetic improvement of 'specialty crops' for superior product quality. •Deployed new breeding strategies or genetic engineering methods based on knowledge of gene function and expression to enhance the effectiveness of crop improvement programs. •Maintained USDA germplasm collections in a healthy, secure, and easily accessible form. • Distributed germplasm for research purposes. • Increased crop genetic resource regeneration, and safeguard collection. •Secured more wild relatives of crops in gene banks. •Expanded collections of crop genetic stocks key to genomic research.	•Apply new genomic tools to accelerate genetic improvement of 'specialty crops' for superior product quality. •Deploy new breeding strategies or genetic engineering methods based on knowledge of gene function and expression to enhance the effectiveness of crop improvement programs. •Maintain USDA germplasm collections in a healthy, secure, and easily accessible form. •Distribute germplasm for research purposes. •Increase crop genetic resource regeneration, and safeguard collection. •Secure more wild relatives of crops in gene banks. •Expand collections of crop genetic stocks key to genomic research.	•Apply new genomic tools to accelerate genetic improvement of 'specialty crops' for superior product quality. •Deploy new breeding strategies or genetic engineering methods based on knowledge of gene function and expression to enhance the effectiveness of crop improvement programs. •Maintain and expand USDA germplasm collections in a healthy, secure, and easily accessible form. •Distribute germplasm for research purposes. •Increase crop genetic resource regeneration, and safeguard collection. •Secure more wild relatives of crops in gene banks. •Expand collections of crop genetic stocks key to genomic research.

Performance Measure	2011 Estimate	2012 Target	2013 Target
		•Expand the capacity for high value crop trait evaluation and marker analyses to rapidly identify key genes.	•Expand the capacity for high value crop trait evaluation and marker analyses to rapidly identify key genes. •Develop more productive, disease free floricultural and nursery crops.
Dollars ($)	$65,476,000	$64,535,000	$65,206,500

USDA Strategic Goal: Ensure that all of America's children have access to safe, nutritious, and balanced meals.
Program Area: Food Safety
Key Outcome: Reduction in foodborne illness associated with the consumption of meat, poultry, and egg products.
Performance Measures and Targets

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Develop new technologies that assist ARS customers in detecting, identifying, and controlling foodborne diseases that affect human health.	•Used population systems to understand the interrelationships of microorganisms in food environments, and the interrelationships among host, pathogen, and environment. •Used systems biology to understand the basic genetic components of pathogens, their expression, and directly relate this information to the microorganisms's biology and its potential effect on food safety. •Developed rapid systems to detect food pathogens that may enter through raw materials, contamination during processing, or retail to protect public health. •Developed production and processing intervention systems that may control, mitigate, or reduce biological and chemical contaminants in foods. •Developed methods and models to predict the behavior of micro-	•Use population systems to understand the interrelationships of microorganisms in food environments, and the interrelationships among host, pathogen, and environment. •Use systems biology to understand the basic genetic components of pathogens, their expression, and directly relate this information to the microorganisms's biology and its potential effect on food safety. •Develop rapid systems to detect food pathogens that may enter through raw materials, contamination during processing, or retail to protect public health. •Develop production and processing intervention systems that may control, mitigate, or reduce biological and chemical contaminants in foods. •Develop methods and models to predict the	•Use population systems to understand the interrelationships of microorganisms in food environments, and the interrelationships among host, pathogen, and environment. •Use systems biology to understand the basic genetic components of pathogens, their expression, and directly relate this information to the microorganisms's biology and its potential effect on food safety. •Develop rapid systems to detect food pathogens that may enter through raw materials, contamination during processing, or retail to protect public health. •Develop production and processing intervention systems that may control, mitigate, or reduce biological and chemical contaminants in foods. •Develop methods and models to predict the

Performance Measure	2011 Estimate	2012 Target	2013 Target
	organisms in foods and may be use to support food safety measures and risk assessment. •Developed rapid systems to detect toxins and chemical contaminants to protect human health and the environment. • Developed and validated: two lab-based multi-platform contaminant detection technologies for the highest priority pathogens, toxins, and chemical residues; two multi-task on/in-line (in field) inspection technologies (for all size processors) that detect contaminants and changes in attributes at required line speeds; three detection methods for mycotoxins in foods to be used by CDC for public health outbreaks and for use in developing countries. • Developed five science-based management practices to prevent preharvest contamination of produce, by enteric	behavior of microorganisms in foods and may be use to support food safety measures and risk assessment. •Develop rapid systems to detect toxins and chemical contaminants to protect human health and the environment. • Develop and validate: two lab-based multi-platform contaminant detection technologies for the highest priority pathogens, toxins, and chemical residues; two multi-task on/in-line (in field) inspection technologies (for all size processors) that detect contaminants and changes in attributes at required line speeds; three detection methods for mycotoxins in foods to be used by CDC for public health outbreaks and for use in developing countries. • Develop five science-based management practices to prevent preharvest	behavior of microorganisms in foods and may be use to support food safety measures and risk assessment. •Develop rapid systems to detect toxins and chemical contaminants to protect human health and the environment. •Develop and validate: two lab-based multi-platform contaminant detection technologies for the highest priority pathogens, toxins, and chemical residues; two multi-task on/in-line (in field) inspection technologies (for all size processors) that detect contaminants and changes in attributes at required line speeds; three detection methods for mycotoxins in foods to be used by CDC for public health outbreaks and for use in developing countries. • Develop five science-based management practices to prevent preharvest

Performance Measure	2011 Estimate	2012 Target	2013 Target
	pathogens, and implemented three intervention strategies to eliminate pathogen contamination: the control and prediction of the fate and transport of pathogens will be determined by specific tools developed; the role of the environment and animals in the prevalence, diversity, and quantity, and survival of pathogens in crops will be determined by specific analytic and field approaches; the specific pathogens and the effect of reduction strategies will be measured. • Developed five innovative processing intervention strategies to assure and maintain postharvest safety and quality. The effect of food processing technologies on overall reduction of pathogens at the end of production is estimated through various studies/approaches.	contamination of produce, by enteric pathogens, and implement three intervention strategies to eliminate pathogen contamination: the control and prediction of the fate and transport of pathogens will be determined by specific tools developed; the role of the environment and animals in the prevalence, diversity, and quantity, and survival of pathogens in crops will be determined by specific analytic and field approaches; the specific pathogens and the effect of reduction strategies will be measured. • Develop five innovative processing intervention strategies to assure and maintain postharvest safety and quality. The effect of food processing technologies on overall reduction of pathogens at the end of production is estimated through	contamination of produce, by enteric pathogens, and implement three intervention strategies to eliminate pathogen contamination: the control and prediction of the fate and transport of pathogens will be determined by specific tools developed; the role of the environment and animals in the prevalence, diversity, and quantity, and survival of pathogens in crops will be determined by specific analytic and field approaches; the specific pathogens and the effect of reduction strategies will be measured. • Develop five innovative processing intervention strategies to assure and maintain postharvest safety and quality. The effect of food processing technologies on overall reduction of pathogens at the end of production is estimated through

Performance Measure	2011 Estimate	2012 Target	2013 Target
		various studies/ approaches.	various studies/ approaches. •Evaluate the role of alternatives to antibiotics. •Identify/evaluate specific intervention strategies through the food production chain.
Dollars ($)	$106,789,000	$106,210,000	$108,254,000

Program Area: Livestock/Crop Protection
Key Outcome: The knowledge the Nation needs for a secure agricultural production system and healthy food supply.

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Provide scientific information to protect animals, humans, and property from the negative effects of pests, infectious diseases, and other disease causing entities.	•Identified functional genes that convey specific disease-resistance traits. •Implemented an integrated emerging disease research program in pathogenesis, diagnostics, and intervention. •Implemented a technology driven vaccinology research program for control and eradication of biological threat agents. •Developed control programs for invasive drug resistant nematodes, protozoa, and pests of livestock and poultry. •Modeled the distribution of white-tailed deer and exotic ungulates in Southern Texas in order to be able to target measures to re-eradicate the cattle fever tick. •Refined medicated baits and self treatment devices as tools for treatment of ticks on white-tailed deer, providing practical tools for eradicating the cattle fever tick.	•Identify functional genes that convey specific disease-resistance traits. •Identify and characterize gene functions/ mechanisms responsible for disease-resistance traits. •Implement an integrated emerging disease research program in pathogenesis, diagnostics, and intervention. •Implement a technology driven vaccinology research program for control and eradication of biological threat agents. •Discover genetic profiles that convey protective immunity against infectious diseases/parasites. •Develop control programs for invasive drug resistant nematodes, protozoa, and pests of livestock and poultry.	•Identify functional genes that convey specific disease-resistance traits. •Identify and characterize gene functions/ mechanisms responsible for disease-resistance traits. •Implement an integrated emerging disease research program in pathogenesis, diagnostics, and intervention. •Implement a technology driven vaccinology research program for control and eradication of biological threat agents. •Discover genetic profiles that convey protective immunity against infectious diseases/parasites. •Develop control programs for invasive drug resistant nematodes, protozoa, and pests of livestock and poultry.

Performance Measure	2011 Estimate	2012 Target	2013 Target
	•Transformed experimental screwworm flies in Panama using technology developed to create a male-only strain. •Developed waterproof fire and ant baits; characterized biological control agents. •Provided new information on host and pest/pathogen interaction to develop protective mechanisms.	•Model the distribution of white-tailed deer and exotic ungulates in Southern Texas in order to be able to target measures to re-eradicate the cattle fever tick. •Refine medicated baits and self treatment devices as tools for treatment of ticks on white-tailed deer, providing practical tools for eradicating the cattle fever tick. •Transform experimental screwworm flies in Panama using technology developed to create a male-only strain. •Develop waterproof fire and ant baits; characterize biological control agents. •Provide new information on host and pest/pathogen interaction to develop protective mechanisms.	•Model the distribution of white-tailed deer and exotic ungulates in Southern Texas in order to be able to target measures to re-eradicate the cattle fever tick. •Refine medicated baits and self treatment devices as tools for treatment of ticks on white-tailed deer, providing practical tools for eradicating the cattle fever tick. •Transform experimental screwworm flies in Panama using technology developed to create a male-only strain. •Develop waterproof fire and ant baits; characterize biological control agents. •Provide new information on host and pest/pathogen interaction to develop protective mechanisms.

Performance Measure	2011 Estimate	2012 Target	2013 Target
		•Develop strategies to improve animal well-being.	•Develop strategies to improve animal well-being. •Develop alternatives to antibiotics to prevent/treat pathogens affecting poultry health.
Dollars ($)	$52,950,000	$52,950,000	$53,002,000
•Develop and transfer tools to the agricultural community, commercial partners, and government agencies to control or eradicate domestic and exotic diseases and pests that affect animal and human health.	•Discovered and developed new diagnostic platforms for priority animal diseases. • Discovered and transferred new technologies for protection of animals and humans from biting arthropods. •Discovered and transferred new technologies for protection of animals from priority diseases. •Discovered and transferred new technologies for protection of property from structural pests.	•Discover and develop new diagnostic platforms for priority animal diseases. • Discover and transfer new technologies for protection of animals and humans from biting arthropods. •Discover and transfer new technologies for protection of animals from priority diseases. •Conduct research on countering biological threats.	•Discover and develop new diagnostic platforms for priority animal diseases. • Discover and transfer new technologies for protection of animals and humans from biting arthropods. •Discover and transfer new technologies for protection of animals from priority diseases. •Conduct research on countering biological threats.
Dollars ($)	$26,403,000	$23,216 ,000	$24,567,000

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Develop control strategies based on fundamental and applied research to reduce losses caused by plant diseases, nematodes, arthropods, and weeds that are effective and affordable while maintaining environmental quality. Develop technically and economically feasible alternatives to preplant and postharvest use of methyl bromide.	•Developed new genomic approaches to control crop diseases, such as soybean rust, cereal pests, and rusts, and rice blast.	•Develop new genomic approaches to control crop diseases, such as soybean rust, cereal pests, and rusts, and rice blast.	•Develop new genomic approaches to control crop diseases, such as soybean rust, cereal pests, and rusts, and rice blast. •Improve management of stripe rust of wheat and resistant varieties. •Enhance fungal disease protection in beans, sunflowers, and other crops. •Improve disease management of small fruits and nursery crops. •Improve potato production through resistant varieties and new disease management technologies. •Enhance control of invasive weeds, arthropods, and plant pathogens that threaten our food, fiber, and natural ecosystems.
Dollars ($)	$79,931,000	$76,776,000	$74,569,000

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Provide needed scientific information and technology that is environmentally acceptable to producers of agriculturally important plants in support of exclusion, early detection and eradication, control, and monitoring of invasive arthropods, weeds, nematodes, and pathogens; enhanced sustainability; and restoration of affected areas. Conduct biologically-based integrated and areawide management of key invasive species.	•Provided information on emerging diseases and invasive species that will enhance identification, detection, and control. •Characterized pathogens and invasive species, and determined key events in disease development and infection processes.	•Provide information on emerging diseases and invasive species that will enhance identification, detection, and control. •Characterize pathogens and invasive species, and determine key events in disease development and infection processes. •Provide new information on host and pest/pathogen interaction to develop protective mechanisms.	•Provide information on emerging diseases and invasive species that will enhance identification, detection, and control. •Characterize pathogens and invasive species, and determine key events in disease development and infection processes. •Provide new information on host and pest/pathogen interaction to develop protective mechanisms.
Dollars ($)	$83,297,000	$78,553,000	$72,173,000

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Provide environmentally sound fundamental and applied scientific information and technologies to action agencies, producers, exporters, and importers of commercially important plant and animal products in support of exclusion, early detection, and eradication of quarantine pests and pathogens that can impede foreign trade.	•Developed systems which will increase knowledge of the ecology, physiology, epidemiology, and molecular biology of emerging diseases, invasive insects, and invasive weeds, which will be incorporated into pest risk assessments.	•Develop systems which will increase knowledge of the ecology, physiology, epidemiology, and molecular biology of emerging diseases, invasive insects, and invasive weeds, which will be incorporated into pest risk assessments.	•Develop systems which will increase knowledge of the ecology, physiology, epidemiology, and molecular biology of emerging diseases, invasive insects, and invasive weeds, which will be incorporated into pest risk assessments.
Dollars ($)	$39,979,000	$38,481,000	$37,250,000

Program Area: Human Nutrition
Key Outcome: Eating habits more consistent with *Dietary Guidelines for Americans*.

Performance Measure	2011 Estimate	2012 Target	2013 Target
•Monitor food consumption/intake patterns of Americans, including those of different ages, ethnicity, regions, and income levels, and measure nutrients and other beneficial components in the food supply. Provide the information in databases to enable ARS customers to evaluate the healthfulness of the American food supply and the nutrient content of the American diet.	•Provided updates of the National Nutrient Database. •Provided reports from the "What We Eat in America" survey. •Published findings on requirements/ bioavailability of nutrients and their role in promoting health/ preventing obesity. •Published findings on individual nutrition intervention strategies.	•Provide updates of the National Nutrient Database. •Provide reports from the "What We Eat in America" survey. •Publish findings on requirements/ bioavailability of nutrients and their role in promoting health/ preventing obesity. •Publish findings on individual nutrition intervention strategies.	•Provide updates of the National Nutrient Database. •Provide reports from the "What We Eat in America" survey. •Publish findings on requirements/ bioavailability of nutrients and their role in promoting health/ preventing obesity. •Publish findings on individual nutrition intervention strategies. •Improve nutrition monitoring by adding functionality to the Food Composition Database.
Dollars ($)	$12,277,000	$12,275,000	$12,196,000
•Define the role of nutrients, foods, and dietary patterns in growth, maintenance of health, and prevention of obesity and other chronic diseases. Assess bioavailability and health benefits of food components. Conduct research that forms the basis for and evaluates nutrition standards and Federal dietary recommendations.	•Evaluated dietary patterns useful for preventing obesity. •Conducted research on requirements/ bioavailability of nutrients to define their role in promoting health/preventing obesity.	•Evaluate dietary patterns useful for preventing obesity. •Conduct research on requirements/ bioavailability of nutrients to define their role in promoting health/preventing obesity.	•Evaluate dietary patterns useful for preventing obesity. •Conduct research on requirements/ bioavailability of nutrients to define their role in promoting health/preventing obesity.

Performance Measure	2011 Estimate	2012 Target	2013 Target
	•Examined interaction of dietary intake with genetic predisposition for promoting health. •Released data from dietary supplement database. •Identified genes or genetic markers among ethnic groups that respond to diet and physical activity.	•Examine interaction of dietary intake with genetic predisposition for promoting health. •Release data from dietary supplement database. • Identify genes or genetic markers among ethnic groups that respond to diet and physical activity.	•Examine interaction of dietary intake with genetic predisposition for promoting health. •Release data from dietary supplement database. • Identify genes or genetic markers among ethnic groups that respond to diet and physical activity. • Enhance nutrition surveillance capability to link USDA/ARS food consumption data with Federal Dietary Policy Guidance.
Dollars ($)	$35,170,000	$35,170,000	$34,104,000
•Publish research findings not encompassed under the other performance measures for this objective likely to significantly advance the knowledge of human nutrition, extensively influence other researchers in the same or related field, or yield important new directions for research.	•Published research on normal growth and aging processes that affect nutrient requirements. •Conducted research on metabolism that impacts nutritional status. •Conducted research on immunology that interacts with nutritional status.	•Publish research on normal growth and aging processes that affect nutrient requirements. •Conduct research on metabolism that impacts nutritional status.	•Publish research on normal growth and aging processes that affect nutrient requirements. •Conduct research on metabolism that impacts nutritional status.

Performance Measure	2011 Estimate	2012 Target	2013 Target
	•Published research on development of analytical methods for food composition and metabolism of nutrients.	•Conduct research on immunology that interacts with nutritional status. •Publish research on development of analytical methods for food composition and metabolism of nutrients.	•Conduct research on immunology that interacts with nutritional status. •Publish research on development of analytical methods for food composition and metabolism of nutrients.
Dollars ($)	$37,993,000	$37,993,000	$38,010,000

AGRICULTURAL RESEARCH SERVICE

Full Cost by Department Strategic Goal

Salaries & Expenses

Department Strategic Goal 1: Assist Rural Communities to Create Prosperity so They Are Self-Sustaining, Repopulating, and Economically Thriving.

PROGRAM	PROGRAM ITEMS	FY 2010	FY 2011	FY 2012	FY 2013
		Dollars in thousands			
	Direct Costs:				
	Research and Development	279,270	266,568	258,284	249,442
	Indirect Costs:				
	Program and Administrative/Financial Management	23,556	22,483	21,785	21,039
	USDA Central Charges	7,050	6,729	6,520	6,297
	Task Force, Advisory Committees, and Other Support Costs	425	406	393	380
	Total Indirect Cost	31,030	29,619	28,698	27,715
	Total Costs	**310,300**	**296,187**	**286,982**	**277,158**
	FTEs	1,982	2,157	2,099	2,093

Performance Measures:

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

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

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

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

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

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

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

Priority buildings/facilities projects are completed on schedule and within budget.

		FY 2010	FY 2011	FY 2012	FY 2013
Repair and Maintenance		17,503	17,468	17,468	20,468
	FTEs	0	0	0	
	Total Costs for Department Strategic Goal 1 (program, direct, indirect)	**327,803**	**313,655**	**304,450**	**297,626**
	FTEs	**1,982**	**2,157**	**2,099**	**2,093**

Department Strategic Goal 2: Ensure Our National Forests and Private Working Lands Are Conserved, Restored, and Made More Resilient to Climate Change, While Enhancing Our Water Resources.

PROGRAM	PROGRAM ITEMS	FY 2010	FY 2011	FY 2012	FY 2013
		Dollars in thousands			
	Direct Costs:				
	Research and Development	186,825	180,867	170,131	192,495
	Indirect Costs:				
	Program and Administrative/Financial Management	15,758	15,254	14,349	16,236
	USDA Central Charges	4,716	4,566	4,295	4,859
	Task Force, Advisory Committees, and Other Support Costs	284	275	259	293
	Total Indirect Cost	20,758	20,096	18,903	21,388
	Total Costs for Department Strategic Goal 2 (program, direct, indirect)	**207,583**	**200,963**	**189,034**	**213,883**
	FTEs	1,891	1,539	1,460	1,460

Performance Measures:

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

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

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

Department Strategic Goal 3: Help America Promote Agricultural Production and Biotechnology Exports as America Works to Increase Food Security.

PROGRAM	PROGRAM ITEMS	Dollars in thousands FY 2010	FY 2011	FY 2012	FY 2013
	Direct Costs:				
	Research and Development	135,896	129,441	125,585	123,238
	Indirect Costs:				
	Program and Administrative/Financial Management	11,462	10,918	10,593	10,394
	USDA Central Charges	3,431	3,268	3,170	3,111
	Task Force, Advisory Committees, and Other Support Costs	207	197	191	188
	Total Indirect Cost	15,100	14,382	13,954	13,693
	Total Costs for Department Strategic Goal 3 (program, direct, indirect)	**150,996**	**143,823**	**139,539**	**136,931**
	FTEs	989	992	975	974

Performance Measures:

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

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

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

Department Strategic Goal 4: Ensure that All of America's Children Have Access to Safe, Nutritious, and Balanced Meals.

PROGRAM	PROGRAM ITEMS	Dollars in thousands FY 2010	FY 2011	FY 2012	FY 2013
	Direct Costs:				
	Research and Development	443,931	427,310	415,462	408,713
	Indirect Costs:				
	Program and Administrative/Financial Management	37,444	36,040	35,043	34,473
	USDA Central Charges	11,207	10,787	10,488	10,318
	Task Force, Advisory Committees, and Other Support Costs	676	650	632	622
	Total Indirect Cost	49,326	47,479	46,162	45,413
	Total Costs for Department Strategic Goal 4 (program, direct, indirect)	**493,257**	**474,789**	**461,624**	**454,125**
	FTEs	2,908	2,841	2,760	2,767

Performance Measures:

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

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

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

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

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

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

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

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

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

Total Costs for all Department Strategic Goals (program, direct, indirect)		**1,179,639**	**1,133,230**	**1,094,647**	**1,102,565**
	FTEs	7,770	7,529	7,294	7,294
Total Costs for Buildings and Facilities		**70,873**	**0**	**0**	**0**
	FTEs	0	0	0	0
Grand Total Costs for all Department Strategic Goals		**1,250,512**	**1,133,230**	**1,094,647**	**1,102,565**
	FTEs	**7,770**	**7,529**	**7,294**	**7,294**