FY 2012 Explanatory Notes
Agricultural Research Service

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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, 2010, there were 6,657 permanent, full-time employees including 489 in the Headquarters Offices and 6,168 in field offices.

GAO Audits (Completed)

GAO-10-116, 11/30/2009, Energy-Water Nexus.

GA0-10-352, 3/11/2010, U.S. Global Food Security Strategy Agency Listing of Food Security-Related Programs and Activities.

GAO-10-421, 3/24/2010, Impact of Davis-Bacon Requirements on Recovery Act Programs.

GAO-10-364, 3/30/2010, Department of Defense (DOD) Interagency Coordination for its Homeland Defense Operations and Civil Support Efforts in the United States.

GAO-10-648R, 6/14/2010, Federal Funding Provided to Association of Community Organizations for Reform Now (ACORN) or ACORN-Related Entities.

GAO-10-583, 6/30/2010, Management and Activities of the Propane Education and Research Council (PERC) and the National Oilheat Research Alliance (NORA).

GAO Audits (In Progress)

120696, Global Positioning System.

120788, DOD Research Facilities and Administration Cost Reimbursement.

194749, Improving Federal Oversight and Accountability of Federal Grant Funds.

311044, Update to the 2005 Wireless Network Security Report.

360855, Veterinarian Capabilities for Disease Prevention, Food Safety, and Defense.

360867, Carbon Offsets.

360910, Regulation of Dietary Supplements and Functional Foods.

360973, Biofuels: Potential Effects and Challenges of Required Increases in Production and Use.

361132, Federal Requirements that May Delay Recovery Act Projects.

361174, Quality Assurance of Carbon Offsets in U.S. Climate Change Programs.

361177, The U.S. Department of Agriculture (USDA) Protocols and Standards to Ensure the Safety of Meat and Other Food Procured by Schools.

361185, Renewable Energy Initiatives.

361191, Ethanol Blends and Risks.

361204, Agroterrorism Response and Recovery Efforts.

361216, Chesapeake Bay Action Plan.

361223, Antibiotic Use in Food and Animals.

440674, Integration of U.S. Biosurveillance Efforts.

450547, Improving Federal Agency Use of Performance Information.

450696, National Pandemic Implementation Plan Action Items Assessment.

460579, High Containment Laboratories: National Strategy for Oversight Is Needed.

460599, Safety Reporting Options for Bio-Safety Labs.

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

460613, Geoengineering Technology Assessment.

460617, High Containment Laboratories: Duplication of Federal Oversight Activities.

OIG Audits (Completed)

50401-67-FM, 11/16/2009, USDA Consolidated Financial Statement Audit for Fiscal Years 2009 and 2008.

OIG Audits (In Progress)

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

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

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

50401-70-FM, Fiscal Year 2010 Consolidated Financial Statement Audit.

50501-01-11, USDA's Management and Security over Wireless Handheld Devices.

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.

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

50601-16-TE, Controls over Genetically Engineered Animal and Plant Research.

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

50703-01-HQ, Oversight and Control of USDA American Recovery and Reinvestment Act Activities.

AGRICULTURAL RESEARCH SERVICE

Available Funds and Staff Years
2010 Actual and Estimated 2011 and 2012

Item	Actual 2010		Estimated 2011		Estimated 2012	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Salaries and Expenses	$1,179,639,000	7,770	$1,179,639,000	7,995	$1,137,690,000	7,813
Miscellaneous Fees	6,801,633	- -	- -	- -	- -	- -
Transfer from Department of Health and Human Services	2,000,000	- -	- -	- -	- -	- -
Transfer from Office of Congressional Relations	145,000	- -	- -	- -	- -	- -
Transfer from United States Department of State	- -	- -	- -	- -	- -	- -
Total, Salaries and Expenses	1,188,585,633	7,770	1,179,639,000	7,995	1,137,690,000	7,813
Buildings & Facilities	70,873,000	- -	70,873,000	- -	- -	- -
Rescission	- -	- -	- -	- -	-223,749,000	- -
Recovery Act	168,200,580	- -	- -	- -	- -	- -
Total, Buildings & Facilities	239,073,580	- -	70,873,000	- -	-223,749,000	- -
Total, Agricultural Research Service	1,427,659,213	7,770	1,250,512,000	7,995	1,137,690,000	7,813
Obligations under other USDA appropriations:						
Agricultural Marketing Service	287,907	1	288,000	1	288,000	1
Agriculture & Food Research Initiative (AFRI)	7,268,540	29	7,270,985	15	7,270,985	15
Animal & Plant Health Inspection Service	15,486,904	61	15,492,000	33	15,492,000	33
Assistant Secretary for Civil Rights	110,528	1	111,000	1	111,000	1
Departmental Administration	3,116,537	13	3,118,000	7	3,118,000	7
Economic Research Service	3,179,895	13	3,181,000	7	3,181,000	7
Food, Nutrition & Consumer Services	1,441,662	6	1,442,000	3	1,442,000	3
Food Safety & Inspection Service	1,165,035	4	1,165,000	2	1,165,000	2
Foreign Agricultural Service	13,718,873	54	13,724,000	29	13,724,000	29
Forest Service	1,404,342	6	1,405,000	3	1,405,000	3
Hazardous Waste	1,098,322	4	1,099,000	2	1,099,000	2
National Agricultural Statistics Service	4,437,824	18	4,439,000	9	4,439,000	9
National Institute of Food and Agriculture	9,783,968	39	9,787,878	21	9,787,878	21
Natural Resources Conservation Service	1,721,166	7	1,722,000	4	1,722,000	4

AGRICULTURAL RESEARCH SERVICE

Available Funds and Staff Years
2010 Actual and Estimated 2011 and 2012

Item	Actual 2010		Estimated 2011		Estimated 2012	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Other USDA Funds:						
(continued)						
Specialty Crops Research Initiative (SCRI, NIFA).	2,188,262	9	2,189,000	5	2,189,000	5
Misc., Other USDA Funds.	1,638,415	7	1,639,000	3	1,639,000	3
Total, Other USDA Appropriations.	68,048,180	273	68,072,862	144	68,072,862	144
Total, Agriculture Appropriations.	1,495,707,393	8,043	1,318,584,862	8,139	73,622,862	7,957
Other Federal Funds:						
Agency for International Development	1,831,672	7	1,832,000	4	1,832,000	4
Centers for Disease Control and Prevention.	812,299	3	813,000	2	813,000	2
Department of Commerce.	132,521	1	133,000	- -	133,000	- -
Department of Defense.	5,640,522	22	5,643,000	12	5,643,000	12
Department of Energy.	1,820,233	7	1,821,000	4	1,821,000	4
Department of Health & Human Services.	5,260,852	21	5,263,000	11	5,263,000	11
Department of Homeland Security.	3,565,162	14	3,566,000	8	3,566,000	8
Department of State	537,561	2	538,000	1	538,000	1
Department of the Interior	1,652,937	7	1,654,000	4	1,654,000	4
Department of Treasury	111,000	1	111,000	- -	111,000	- -
Environmental Protection Agency.	1,294,278	5	1,295,000	3	1,295,000	3
National Aeronautics & Space Administration.	637,074	3	637,000	1	637,000	1
Strategic Environmental Research Development Program (SERDP)	172,648	1	173,000	- -	173,000	- -
Misc., Other Federal Funds.	1,402,232	6	1,403,000	3	1,403,000	3
Total, Other Federal Funds	24,870,991	100	24,882,000	53	24,882,000	53
Non-Federal Funds:						
Arizona, University of.	239,936	1	240,000	1	240,000	1
Arkansas, University of.	184,278	1	184,000	- -	184,000	- -
Baylor College of Medicine.	170,933	1	171,000	- -	171,000	- -
Binational Agricultural Research & Development (BARD).	293,043	1	293,000	1	293,000	1

AGRICULTURAL RESEARCH SERVICE

Available Funds and Staff Years
2010 Actual and Estimated 2011 and 2012

Item	Actual 2010		Estimated 2011		Estimated 2012	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Non-Federal Funds:						
(continued)						
California, State of.	1,021,875	4	1,022,000	2	1,022,000	2
California, University of.	764,180	3	764,000	2	764,000	2
Citrus Research & Development Foundation	419,238	2	419,000	1	419,000	1
Cornell University.	442,445	2	443,000	1	443,000	1
Cotton Incorporated.	875,625	4	876,000	2	876,000	2
Delta Health Alliance.	361,232	1	361,000	1	361,000	1
District of Columbia Department of the Environment (DCDOE) .	500,000	2	500,000	1	500,000	1
Florida Citrus Production Research Council.	156,776	1	157,000	- -	157,000	- -
Florida, State of.	1,074,048	4	1,074,000	2	1,074,000	2
Florida, University of.	336,459	1	337,000	1	337,000	1
Food and Agricultural Organization of the United Nations (FAO)	392,461	1	393,000	1	393,000	1
Georgia, University of.	295,786	1	296,000	1	296,000	1
Hispanic Serving Institutions National Program.	1,703,851	7	1,705,000	4	1,705,000	4
Idaho, University of.	232,265	1	232,000	1	232,000	1
Illinois, University of.	164,888	1	165,000	- -	165,000	- -
Iowa State University.	344,102	1	344,000	1	344,000	1
Kansas Bioscience Authority. . . .	1,022,000	4	1,022,000	2	1,022,000	2
Kansas State University.	294,559	1	295,000	1	295,000	1
Maryland, University of.	120,358	1	120,000	- -	120,000	- -
Michigan State University.	132,174	1	132,000	- -	132,000	- -
Minnesota, University of.	447,488	2	448,000	1	448,000	1
National Pork Board.	334,715	1	335,000	1	335,000	1
Nebraska Community Foundation	124,178	1	124,000	- -	124,000	- -
Nebraska, University of.	178,998	1	179,000	- -	179,000	- -
North Carolina State University. .	107,416	1	107,000	- -	107,000	- -
North Dakota State University . . .	231,493	1	232,000	1	232,000	1
Oregon State University.	138,940	1	139,000	- -	139,000	- -
Pennsylvania State University. . .	297,081	1	297,000	1	297,000	1
Revocable Permits & Easements.	345,168	- -	345,000	- -	345,000	- -
Sale of Animals & Personal Property (Proceeds)	209,348	- -	209,000	- -	209,000	- -
South Dakota State University. . .	529,061	2	529,000	1	529,000	1

AGRICULTURAL RESEARCH SERVICE

Available Funds and Staff Years
2010 Actual and Estimated 2011 and 2012

Item	Actual 2010		Estimated 2011		Estimated 2012	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Non-Federal Funds: (continued)						
South Florida Water Management District	419,604	2	420,000	1	420,000	1
Texas A&M University	207,088	1	207,000	1	207,000	1
Texas Agrilife Research	165,332	1	165,000	- -	165,000	- -
Texas Agrilife Research and Extension Center	242,893	1	243,000	1	243,000	1
Texas State Soil & Water Conservation Board	163,763	1	164,000	- -	164,000	- -
Travel and Miscellaneous Reimbursements	142,244	- -	142,000	- -	142,000	- -
United Soybean Board	4,253,663	17	4,255,000	9	4,255,000	9
Utah State University	124,025	1	124,000	- -	124,000	- -
Vermont, State of	174,649	1	175,000	- -	175,000	- -
Washington State University	238,090	1	238,000	1	238,000	1
Misc., Non-Federal Funds	4,421,186	18	4,423,000	9	4,423,000	9
Total, Non-Federal Funds	25,038,935	102	25,045,000	53	25,045,000	53
Miscellaneous Contributed Funds:	18,447,276	37	18,000,000	37	18,000,000	37
Total, Agricultural Research Service	1,564,064,595	8,282	1,386,511,862	8,282	1,273,689,862	8,100

AGRICULTURAL RESEARCH SERVICE

Permanent Positions by Grade and Staff Year Summary
2010 Actual and Estimated 2011 and 2012

	2010			2011			2012		
Grade	Head-quarters	Field	Total	Head-quarters	Field	Total	Head-quarters	Field	Total
ES-00	11	26	37	11	26	37	11	26	37
GS/GM-15	51	621	672	51	621	672	50	604	654
GS/GM-14	63	620	683	63	620	683	61	603	664
GS/GM-13	138	614	752	138	614	752	134	597	731
GS-12	115	438	553	115	438	553	112	426	538
GS-11	39	616	655	39	616	655	38	599	637
GS-10	3	8	11	3	8	11	3	8	11
GS-9	40	1,045	1,085	40	1,045	1,085	39	1,016	1,055
GS-8	26	401	427	26	401	427	25	390	415
GS-7	57	750	807	57	750	807	55	729	784
GS-6	28	324	352	28	324	352	27	315	342
GS-5	24	210	234	24	210	234	23	204	227
GS-4	6	39	45	6	39	45	0	38	38
GS-3	3	17	20	3	17	20	0	16	16
GS-2	0	8	8	0	8	8	0	0	0
Other Graded Positions.....	6	0	6	6	0	6	0	0	0
Ungraded Positions.....	0	542	542	0	542	542	0	527	527
Total Permanent Positions.....	610	6,279	6,889	610	6,279	6,889	578	6,098	6,676
Unfilled Positions end-of-year..	121	111	232	121	111	232	105	96	201
Total Permanent Full-Time Employment, end-of-year..	489	6,168	6,657	489	6,168	6,657	473	6,002	6,475
Staff Year Estimate.....	510	7,772	8,282	510	7,772	8,282	492	7,608	8,100

AGRICULTURAL RESEARCH SERVICE

SIZE, COMPOSITION AND COST OF MOTOR VEHICLE FLEET

The 2012 Budget Estimates propose the replacement of 16 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 haul 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 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.

Impediments to managing the motor vehicle fleet. There are no identified impediments to managing the motor vehicle fleet in the most cost-effective manner. Unpredictable fuel and maintenance costs present challenges to project operating costs. USDA has experienced problems with electronically collecting fleet costs. Under the SmartPay2 contract, USDA has a fleet credit card backed by VISA, which allows for wider nationwide coverage, especially in rural areas. However, USDA is experiencing problems in receiving detailed cost information for transactions, USDA continues to work with US Bank and VISA to resolve these issues. ARS relies on electronic data collection and manual data entry. There is no interface between USDA's Bank Card system and USDA's inventory system. The interface has been on hold until USDA replaces its current inventory system. The new inventory is expected in FY2012. Because of the continued delay, ARS has asked USDA to pursue building the interface to allow fleet costs to reside in one system.

Size, composition and cost of agency motor vehicle fleet as of September 30, 2010 are as follows:

Size, Composition, and Annual Cost
(in thousands of dollars)

Number of Vehicles by Type *									
Fiscal Year	Sedans & Station Wagons	Light Trucks, SUVs and Vans 4X2	Light Trucks, SUVs and Vans 4X4	Medium Duty Vehicles	Ambulances	Buses	Heavy Duty Vehicles	Total # of Vehicles	Annual Operating Cost
FY2009	258	1,655	846	974	0	1	30	3,764	$3,974
Change	21	-2	-2	4	0	0	12	33	-69
FY2010	279	1,422	836	923	0	1	42	3,503	3,905
Change**	-2	-44	-69	0	0	0	0	-115	234
FY2011	277	1,378	767	923	0	1	42	3,388	4,139
Change	0	0	0	0	0	0	0	0	248
FY2012	277	1,378	767	923	0	1	42	3,388	4,387

NOTES:

***** These numbers include vehicles that are owned by the agency and leased from GSA.

** The decrease is the result of a clean-up effort.

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, $1,137,690,000: 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

Analysis of Change in Appropriation

Lead-Off Tabular Statement

SALARIES AND EXPENSES - CURRENT LAW

Annualized Continuing Resolution, 2011	$1,179,639,000
Budget Estimate, 2012	1,137,690,000
Change in Appropriation	-41,949,000

AGRICULTURAL RESEARCH SERVICE

Summary of Increases and Decreases
(On basis of appropriation)

Item of Change	2011 Estimated	Pay Costs	Program Changes	2012 Estimated
Product Quality/Value Added	$111,056,000	--	-$4,589,000	$106,467,000
Livestock Production	87,883,000	--	-12,704,000	75,179,000
Crop Production	240,124,000	--	-3,787,000	236,337,000
Food Safety	107,597,000	--	+6,648,000	114,245,000
Livestock Protection	90,216,000	--	-10,087,000	80,129,000
Crop Protection	205,710,000	--	-8,620,000	197,090,000
Human Nutrition	89,734,000	--	-595,000	89,139,000
Environmental Stewardship	207,583,000	--	-12,061,000	195,522,000
National Agricultural Library	22,233,000	--	+846,000	23,079,000
Funds Included for Homeland Security	[39,170,000]	--	+[4,638,000]	[43,808,000]
Repair and Maintenance	17,503,000	--	+3,000,000	20,503,000
Total Available	$1,179,639,000	--	-$41,949,000	$1,137,690,000

NOTES: Research activities carried out in support of Homeland Security are reflected under the Food Safety, Livestock Protection, and Crop Protection program areas.

AGRICULTURAL RESEARCH SERVICE

Project Statement by Program
(On basis of appropriation)

	2010 Actual		2011 Estimated		Increase	2012 Estimated	
	Amount	Staff Years	Amount	Staff Years	or Decrease	Amount	Staff Years
Product Quality/Value Added.....	$110,551,124	866	$111,056,000	895	-$4,589,000	$106,467,000	863
Livestock Production.....	87,483,472	467	87,883,000	482	-12,704,000	75,179,000	476
Crop Production.....	239,032,362	1,511	240,124,000	1,868	-3,787,000	236,337,000	1,861
Food Safety.....	107,597,000	787	107,597,000	787	+6,648,000	114,245,000	787
Livestock Protection.....	89,805,865	518	90,216,000	535	-10,087,000	80,129,000	519
Crop Protection.....	204,828,642	1,324	205,710,000	1,368	-8,620,000	197,090,000	1,310
Human Nutrition.....	89,734,000	279	89,734,000	279	-595,000	89,139,000	279
Environmental Stewardship.....	206,639,299	1,891	207,583,000	1,649	-12,061,000	195,522,000	1,586
National Agricultural Library.....	23,569,790	127	22,233,000	132	+846,000	23,079,000	132
Repair and Maintenance.....	17,461,413	--	17,503,000	--	+3,000,000	20,503,000	--
Total	1,176,702,967	7,770	1,179,639,000	7,995	-41,949,000	1,137,690,000	7,813
H1N1 Influenza.....	1,416,145	--	--	--	--	--	--
Miscellaneous Fees.....	166,889	--	--	--	--	--	--
Funds Included for Homeland Security.....	[39,170,000]	--	[39,170,000]	--	+[4,638,000]	[43,808,000]	--
Total Available	1,178,286,001	7,770	1,179,639,000	7,995	-41,949,000	1,137,690,000	7,813
Unobligated Balance.....	8,299,632	--	--	--	--	--	--
Total Available or Estimate.....	1,186,585,633	7,770	1,179,639,000	7,995	-41,949,000	1,137,690,000	7,813
Miscellaneous Fees.....	-4,801,633	--	--	--			
Transfer from Office of Congressional Relations.....	-145,000	--	--	--			
Transfer from Health and Human Services.....	-2,000,000	--	--	--			
Total Appropriation.....	1,179,639,000	7,770	1,179,639,000	7,995			
Staff Years:							
Direct		7,770		7,995			7,813
Other		512		287			287
Total, Staff Year Estimate		8,282		8,282			8,100

NOTE: Research activities carried out in support of Homeland Security are reflected under the Food Safety, Livestock Protection, and Crop Protection program areas.

Justification of Increases and Decreases

ARS' FY 2012 Salaries and Expenses President's Budget request proposes an increase of $55.7 million for new and expanded research initiatives in food safety; crop/animal breeding and protection; child and human nutrition; bioenergy/biomass; plant, animal, and microbial collections; production systems for sustainable agriculture; global climate change; and the National Agricultural Library. In addition, the agency is requesting an increase of $3 million for the repair and maintenance of its laboratories/facilities. Offsetting ARS' requested increases are $100.7 million in proposed reductions to ongoing research programs, reflecting the need to reallocate ongoing research programs within increasingly constrained resources in order to fund the highest priority needs and curtail Federal spending.

New Products/Product Quality/Value Added

a) An increase of $6,000,000 for Energy Research at Regional Biofuels Feedstocks Research Centers.

Key Outcome

This proposed increase will help the United States become energy independent by demonstrating the effective conversion of regional feedstocks into a sustained source of biofuels.

Need for Change

A U.S. government-wide strategy for bioenergy, *Growing America's Fuels*, is being developed to achieve the Congressional mandate of 36 billon gallons of biofuels to be produced by 2022. The plan builds upon the President's May 5, 2009, memorandum forming the Biofuels Interagency Working Groups with Cabinet level USDA, Department of Energy (DOE), and Environmental Protection Agency (EPA) participation. The plan outlines an approach that utilizes the core competencies of USDA and other agencies across government and public-private partnerships to support the existing biofuels industry while accelerating the commercial establishment of advanced biofuels. Key features of the plan include: (i) strong management for results using a regional supply chain systems approach; (ii) continued support for development of first- and second-generation biofuels with a major focus on accelerating third generation (drop-in) biofuels development; and (iii) support of feedstock research and demonstration including perennial grasses to ensure sustainable supply chain development that minimizes transaction costs and creates wealth for farms and rural communities. The plan identifies USDA as having a significant leadership role in the development of improved varieties of dedicated biomass crops suited to different growing environments across the country, and the necessary sustainable production systems to dependably produce the biomass for advanced biofuel conversion facilities. Concurrently, GAO reports and projects developed by the Economic Research Service (ERS) highlight the impact that bioenergy feedstock production will have on soil and water resources, the availability of food and feed, and the environment. To implement the bioenergy strategy while maintaining the sustainability of agricultural productivity, ARS needs to strengthen the Regional Feedstock Research and Demonstration Centers by enhancing existing resources and using a hub-and-spoke system, and linking with robust partnerships with land grant and other universities, industry, and other Federal and State agencies, tribal nations, and international organizations.

ARS' bioenergy research program develops technologies to enable sustainable commercial production of biofuels by the agricultural sector in ways that enhance the Nation's natural resources without disrupting existing food, feed, and fiber markets. Research optimizes both the production of plant feedstocks and the biorefining of agricultural materials to bioenergy and value-added coproducts. The research strengthens rural economies, provides increased supplies of renewable transportation fuel, enhances energy security, and improves the U.S. balance of trade.

ARS pursues three major research goals targeted at biofuels which:

- Enable new varieties and hybrids of bioenergy feedstocks 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.

There are numerous interdependencies within ARS' bioenergy research program that require substantial coordination and sharing of technical information in order to maximize national impact. Unique ARS capacities and capabilities that help ensure successful removal of technical barriers to biofuels production and applications include ARS' research on plant genetics, genomics, and biotechnology research for crop improvement; its National Plant Germplasm System in partnership with land-grant universities and Agricultural Experiment Stations; its development of germplasm and production systems for improved feedstock crop varieties; its nationwide locations for field tests of new crops and production practices; its development of integrated systems for soil, water, and waste management; its development of new value-added co-products; its in-house pilot plant facilities; and its strong relationships with stakeholders for technology transfer. ARS' bioenergy research supports the National Action Plan of the United States Biomass Research and Development Board, and the Energy Strategic Plan of USDA Research, Education, and Economics mission area.

Outcomes

Research at the Centers will accelerate the development and deployment of dedicated energy feedstocks and sustainable feedstock production systems for advanced biofuels suited for best participation within different regions across the U.S. by adapted feedstocks. Superior genetic varieties and cultivars for the kinds of feedstocks will be enhanced with a regional focus. Sustainable production and logistic systems that are suited to regional conditions, regional soil and water resources, and biofuel refinery specifications will also be enhanced. Sustainable regional feedstock supply chain systems will be strengthened to link feedstock development, production, logistics, conversion, co-product production, and distribution. Economic, environmental, and social uncertainties will be identified upfront for all supply chain segments to build confidence for creating markets, investments, and credit that help provide long-term sustainable biofuel production supply chains.

Means to Achieve Change

- Accomplish research at the five Regional Biofuels Feedstocks Research and Demonstration Centers in Different Regions of the Country to Emphasize Region Specific Crop and Sustainable Production Systems ($6,000,000). ARS will:
  -- At the Southeastern Center focus on feedstock development and sustainable production in Florida, Georgia, South Carolina, Alabama, Mississippi, Louisiana, Arkansas, and Eastern Texas, and primarily focus on energycane, sorghum, and perennial grasses. There will be significant coordination with a Forest Service (FS) woody biomass center for multifunctional landscape management. Accelerate the development and deployment of dedicated energy feedstocks and sustainable feedstock production systems for advanced biofuels suited for best participation within the region by adapted feedstocks.
  -- At the East-Central Center focus on feedstock development and sustainable production east of the 100th meridian: Nebraska, North Dakota, South Dakota, Minnesota, Iowa, Missouri, Wisconsin, Illinois, Michigan, Indiana, Ohio, Kentucky, Tennessee, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, and focus primarily on perennial grasses, with significant consideration of existing corn grain ethanol and corn stover cellulosic biomass. Accelerate the development and deployment of dedicated energy feedstocks and sustainable feedstock production systems for advanced biofuels suited for best participation within the region by adapted feedstocks.
  -- At the Western Center focus on New Mexico, Arizona, California, Nevada, and Utah, with primary emphasis on new oil seed crops and other new feedstocks. Accelerate the development and deployment of dedicated energy feedstocks and sustainable feedstock production systems for advanced biofuels suited for best participation within the region by adapted feedstocks.
  -- At the Northwestern Center focus on Washington, Oregon, Idaho, Montana, Colorado, Wyoming, North Dakota, and South Dakota, with primary emphasis on oil seed crops. Accelerate the development and

deployment of dedicated energy feedstocks and sustainable feedstock production systems for advanced biofuels suited for best participation within the region by adapted feedstocks.

-- At the South-Central Great Plains Center focus on Texas, Oklahoma, Kansas, and Southern Nebraska, with primary emphasis on biomass sorghum including sweet sorghum, alternatives to irrigated agriculture in the region due to diminishing water resource availability, and livestock utilization of coproducts from ethanol production. Accelerate the development and deployment of dedicated energy feedstocks and sustainable feedstock production systems for advanced biofuels suited for best participation within the region by adapted feedstocks.

b) A decrease of $5,896,000 in Congressionally-added earmarks to provide savings to finance higher priority research initiatives.

Need for Change

Research projects under this program activity have been identified for termination given that they represent Congressionally-added earmarks. The savings achieved from these terminations will be redirected to finance the higher priority agricultural research initiatives identified in the FY 2012 Budget, will improve program and operational efficiencies, and will serve to restrain Federal spending.

IL, Peoria – Crop Production and Food Processing ($786,000)
SD, Brookings – Biomass Crop Production ($1,250,000)
HQ – Biotechnology Research and Development Corporation ($3,500,000)
HQ – National Corn to Ethanol Research Pilot Plant ($360,000)

c) A decrease of $4,693,000 in ongoing research projects to support higher priority research initiatives.

Need for Change

The FY 2012 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 programs are proposed for reduction or termination given that they: (1) are considered by the Administration to be of lower priority; (2) are duplicative or can be accomplished more effectively elsewhere in ARS; (3) are marginal or below threshold funding for program viability and sustainability; or (4) are projects that 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 FY 2012 Budget, and will improve program and operational efficiencies.

NM, Las Cruces – Long Staple Cotton ($188,000)
OK, Lane – Genetics and Production Research ($1,349,000)
SC, Clemson – Cotton Quality Research ($2,623,000)
TX, Weslaco – Kika de la Garza Subtropical Research Center, Crop Quality and Fruit Insects Research ($533,000)

Livestock Production

a) An increase of $4,000,000 for Safeguarding Food Production through Management Systems that Optimize Genetic Potential and Protect the Environment.

Key Outcome

This proposed increase will improve animal production systems and thereby enhance food production to meet the needs of a growing population.

Need for Change

World hunger is a major threat to global stability, and 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. The key to meeting the demands of the growing population will be improving productivity. Enhancing food production 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, health, 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 disease resistance and 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. 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 ARS' current research programs. Across all species, genetic improvement is critical to improving production systems. Specifically, in aquaculture (at Leetown, West Virginia; Orono, Maine; and Stoneville, Mississippi), dairy (at Beltsville, Maryland), and beef, and swine (at Clay Center, Nebraska), the funding enhancement will strengthen ARS' program in genetic improvement by enhancing selective breeding efforts through incorporation of genomic information. Optimizing nutrient utilization and minimizing disease losses are key to reducing feed inputs and waste outputs. Building databases that connect DNA sequence and performance data are critical 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 proposed research will improve the adaptability and sustainability of animals which will ensure the availability of agricultural products to consumers worldwide. 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 are needed to increase the forage efficiency of ruminant species to best leverage these resources in sustainable programs that improve the efficiency of forage utilization and preserve and enhance ecosystem integrity. Emerging genomic technologies which will increase the efficiency of nutrient utilization, will in turn positively impact sustainability through reduced feed input and waste and odor production of livestock, poultry and aquatic animal production systems. Aquaculture systems, based on domesticated lines of fish and shellfish that have been improved for agronomic performance, will lead to more efficient and environmentally benign production.

Means to Achieve Change

- Develop Integrated Production Systems that Incorporate Enhanced Germplasm and Pest/Pathogen/Water/Nutrient Management Strategies to Optimize Sustainable Animal Production ($4,000,000). ARS will:
  --Develop optimized and integrated strategies to maximize the efficiency of nutrient utilization for ruminants using emerging genetic and genomic technologies focused on forage-based systems.
  --Develop optimized and integrated strategies to maximize the efficiency of nutrient and feed utilization for swine and poultry using emerging genetic and genomic technologies.
  --Test large scale closed aquaculture systems for increasing efficiency and system controls.

--Evaluate fish performance in high density recirculating versus flow through, net pen, and pond production systems.
--Improve agronomic performance of fish through selective breeding and application of marker assisted selection.
--Integrate genomic sequence information and variation with phenotypic data to speed production efficiency, health, and animal quality.

b) An increase of $500,000 for research on Animal and Microbial Collections.

Key Outcome

This proposed increase will protect and expand valuable animal, insect, and microbial germplasm.

Need for Change

The capacity of agricultural research effectively rests on a dynamic foundation of invaluable living animal and microbial genetic resources, and research tools in the form of scientific collections of preserved biological specimens. Today, critical components of that foundation are eroding – and some are imperiled – by lack of facilities, personnel, and operating funds needed to meet the growing demands of global agricultural research. At the same time, demands for collections are increasing due to need for: (1) new genetic material for use in responding to climate change and dwindling water tables, and to preserve genetic variation ex situ due to habitat loss; (2) determination of host origin for developing biological control and other approaches for managing increasing numbers of insects and microbial pests gaining entry through ports due to increased travel and trade; and (3) microbial strain stocks for biosecurity purposes.

The proposed funding increase will enhance currently funded programs and support new research to expand and protect valuable animal, insect, and microbial germplasm. Operational capacity and infrastructure require expansion to meet increased demand for germplasm. Specific targets for new initiatives include fulfilling the demand for additional genetic and trait data, and acquiring and conserving germplasm of animals and animal relatives for genomic research and genetic improvement. Researchers will more efficiently obtain needed accessions, contribute new animal information, and conserve more diverse resources using the GRIN-Global information system.

The USDA has principal responsibility for safeguarding the Nation's insect systematics collections which are needed for: (1) port identifications by APHIS and DHS; (2) developing pest management strategies based on an accurate knowledge of pest origin, distribution, and biology; and (3) location and safe testing of natural enemies for biological control of insects and weeds. New molecular and visual technologies will accelerate the identification process and instantaneously transmit insect specimen images, etc., via satellite from ports to taxonomists located here or overseas. As a result, collections will be linked into an international network for rapid specimen identification.

Outcomes

The proposed increase will enable ARS to expand activities to identify, acquire, and secure unprotected genetic resources of animals, insects, and veterinary associated microbes. A broad spectrum of genetic diversity in the form of viable and well documented germplasm will be conserved. Vulnerable or threatened genetic resources vital to national security will be safely stored and backed-up in secure facilities. Successful implementation will provide users with more dependable and more diverse sources of high quality genetic resources. Agricultural animals will be better protected from pests through biological control and other management tools. More effective use of the genetic resources will be facilitated by making the collections and related information more readily accessible and useful to scientists developing strategies for controlling diseases of agricultural animals and beneficial insects.

Means to Achieve Change

- Enhance Animal and Microbial Collections' Capacity ($500,000). ARS will:
  -- Improve methods for cryopreservation of semen for swine, poultry, fish, and shellfish.
  -- Strengthen key collections of microbes associated with animal diseases.

c) A decrease of $6,400,000 in Congressionally-added earmarks to provide savings to finance higher priority research initiatives.

Need for Change

Research projects under this program activity have been identified for termination given that they represent Congressionally-added earmarks. The savings achieved from these terminations will be redirected to finance the higher priority agricultural research initiatives identified in the FY 2012 Budget, will improve program and operational efficiencies, and will serve to restrain Federal spending.

AR, Booneville – Endophyte Research ($994,000)
AR, Stuttgart – Aquaculture Fisheries Center ($519,000)
AR, Stuttgart – Aquaculture Initiatives Harbor Branch Oceanographic Institute ($1,597,000)
AL, Auburn – Catfish Genome ($819,000)
FL, Brooksville – Subtropical Beef Germplasm ($1,033,000)
HI, Hilo – Tropical Aquaculture Feeds ($1,438,000)

d) A decrease of $10,804,000 in ongoing research projects to support higher priority research initiatives.

Need for Change

The FY 2012 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 programs are proposed for reduction or termination given that they: (1) are considered by the Administration to be of lower priority; (2) are duplicative or can be accomplished more effectively elsewhere in ARS; (3) are marginal or below threshold funding for program viability and sustainability; or (4) are projects that 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 FY 2012 Budget, and will improve program and operational efficiencies.

AK, Fairbanks – Subartic Agricultural Research ($2,387,000)
FL, Brooksville – Beef Cattle Research ($781,000)
KY, Lexington – Improved Forage Livestock Production ($533,000)
MD, Beltsville – Bovine Genetics ($569,000)
MS, Stoneville – Aquaculture ($288,000)
MS, Stoneville – Biotechnology Research to Improve Crops and Livestock ($689,000)
MS. Stoneville – National Warmwater Aquaculture Center (Catfish Health) ($220,000)
NE, Clay Center – Livestock Genome Mapping Initiative $347,000)
WV, Beaver – Appalachian Farming Systems Research Center ($2,177,000)
WV, Leetown – Aquaculture Systems (Rainbow Trout) ($473,000)
WV, Leetown – Aquaculture (Trout Genome) ($506,000)
WV, Leetown – Coldwater Aquaculture ($1,834,000)

Crop Production

a) An increase of $4,723,000 for Crop Breeding.

Key Outcome

This proposed increase will improve crop breeding which will provide plants with higher yields, disease resistance, weather stress tolerance, and decreased dependence on inputs such as fertilizer and fuel.

Need for Change

Breeding research is needed to improve complex traits, such as developing perennial grains with high seed yields, as well as integrating disease resistance and weather stress tolerance genes from wild and weedy relatives of crop plants. Perennial grain production systems offer benefits, in soil and water conservation, and decreased dependence on fertilizer and fuel inputs. The requested funding will provide support for new breeding projects, to develop perennial grains and new fruit and rice varieties that thrive under limited water availability, and in colder or warmer weather conditions.

The requested funding will also provide new knowledge and tools for crop breeders to use the Nation's germplasm collections more efficiently, and to develop new varieties that strengthen food security and meet market needs. New genomic and biotechnology strategies offer new tools to accelerate crop genetic improvement. Developing improved seeds and new varieties also requires effective methods and expertise in selecting desired traits ("phenotyping"). Also, in addition, the additional funding will support the objectives of the National Plant Genome Initiative, which are to "translate basic discovery to the field," and "develop coordinated solutions to data access, analysis, and synthesis."

Outcomes

Perennnial grains that have a longer growing season and deeper rooting depths will use water and nutrients more efficiently. The longer roots will reduce erosion risk and preserve soil carbon. ARS and its partners will breed improved crop germplasm that is better adapted to local environments. Plant varieties that can be planted earlier in the spring and that will produce fruit longer in the fall will be developed. Development of new plant varieties with greater environmental flexibility will benefit growers through reduced yield losses and greater economic gains.

Means to Achieve Change

- Enhance Plant Breeding for Sustainable Production and Climate Change Protection ($2,473,000). ARS will:
  -- Identify and manipulate genes associated with perennialism and domestication to speed up the development of perennial grains with higher seed yield.
  -- Combine expanded breeding with enhanced research on perennial grain production systems.
  -- Expand breeding of fruits and grains for water use efficiency and drought tolerance.
  -- Develop new berries and stone fruit with longer harvest seasons and other improved traits that increase sustainable production.

- Expand the Knowledge and Tools Needed for Classical Plant Breeding ($2,250,000). ARS will:
  -- Expand research in breeding tools and genetic selection to enable classical breeders to breed faster and more efficiently.
  -- Expand the capacity of breeders to use and integrate genes and traits from tropical and other diverse genetic sources.
  -- Develop and conserve genetic resources for alfalfa genetic improvement.

b) An increase of $3,300,000 for research on Plant and Microbial Collections.

Key Outcome

This proposed increase will protect and expand valuable genetic resources of plants, insects, and associated microbes.

Need for Change

The capacity of agricultural research effectively rests on a dynamic foundation of invaluable living plant and microbial genetic resources, and research tools in the form of scientific collections of preserved biological specimens. Today, critical components of that foundation are eroding – and some are imperiled – by lack of facilities, personnel, and operating funds needed to meet the growing demands of global agricultural research. At the same time, demands for collections are increasing due to a need for: (1) new genetic material for use in responding to climate change and dwindling water tables, and to preserve genetic variation ex situ due to habitat loss; (2) feedstocks for biofuel production and germplasm for increased productivity to meet rising human populations; (3) determination of host origin for developing biological control and other approaches for managing increasing numbers of insect, weed, and microbial pests gaining entry through ports due to increased travel and trade; and (4) microbial strain stocks for biosecurity purposes.

The requested funding increase will enhance currently funded programs and support new research to expand and protect valuable plant, insect, and microbial germplasm. Operational capacity and infrastructure require expansion to meet increased demand for germplasm. Specific targets for new initiatives include fulfilling the demand for additional genetic and trait data, and acquiring and conserving germplasm of horticultural crops and wild crop relatives for genomic research and genetic improvement. Researchers will more efficiently obtain needed accessions, contribute new plant information, and conserve more diverse resources using the GRIN-Global information system. Training in plant germplasm and information system management is a companion critical component.

The USDA has principal responsibility for safeguarding the Nation's insect systematics collections which are needed for: (1) port identifications by APHIS and DHS; (2) developing pest management strategies based on an accurate knowledge of pest origin, distribution, and biology; (3) identification of new pollinators; and (4) location and safe testing of natural enemies for biological control of insects and weeds. New molecular and visual technologies will accelerate the identification process and instantaneously transmit insect specimen images, etc., via satellite from ports to taxonomists located here or overseas. As a result, collections will be linked into an international network for rapid specimen identification.

Outcomes

The proposed increase will enable ARS to expand activities to identify, acquire, and secure unprotected genetic resources of plants, insects, crops, and associated microbes. A broad spectrum of genetic diversity in the form of viable and well documented germplasm will be conserved. Vulnerable or threatened genetic resources vital to national security will be safely stored and backed-up in secure facilities. Successful implementation will provide users with more dependable and more diverse sources of high quality genetic resources. Crops will be better protected from pests through biological control, plant resistance, and other management tools. Crop improvement for weather tolerance and end product quality will be accelerated. More effective use of the genetic resources for crop improvement will be facilitated by making the collections and related information more readily accessible and useful to scientists developing strategies for controlling diseases of crops and beneficial insects.

Means to Achieve Change

- Enhance Capacity to Conserve a Broad Diversity of National Plant Germplasm System Resources ($3,300,000). ARS will:
  -- Expand plant germplasm collection and conservation with a target for food security and crop protection, with a focus on small fruits/horticultural crops, vegetable

crops, wild relatives of crops, and new seed stocks for genomic research.
-- Provide effective management of the Genetic Resources Information Network (GRIN) Global system.

c) A decrease of $5,983,000 in Congressionally-added earmarks to provide savings to finance higher priority research initiatives.

Need for Change

Research projects under this program activity have been identified for termination given that they represent Congressionally-added earmarks. The savings achieved from these terminations will be redirected to finance the higher priority agricultural research initiatives identified in the FY 2012 Budget, will improve program and operational efficiencies, and will serve to restrain Federal spending.

AR, Booneville – Center for Agroforestry ($660,000)
AR, Booneville – Dale Bumpers Small Farms Research Center ($1,805,000)
DC, Washington – Medicinal and Bioactive Crops ($111,000)
GA, Dawson – Water Use Reduction ($1,200,000)
HI, Hilo – Pacific Basin Agricultural Research Center Staffing ($700,000)
MD, Beltsville – Potato Diseases ($61,000)
MN, St. Paul – Soybean Genomics ($200,000)
MN, St. Paul – Wild Rice ($303,000)
ND, Mandon – Northern Great Plains Research Laboratory ($543,000)
WV, Kearneysville – Computer Vision Engineer ($400,000)

d) A decrease of $5,827,000 in ongoing research projects to support higher priority research initiatives.

Need for Change

The FY 2012 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 programs are proposed for reduction or termination given that they: (1) are considered by the Administration to be of lower priority; (2) are duplicative or can be accomplished more effectively elsewhere in ARS; (3) are marginal or below threshold funding for program viability and sustainability; or (4) are projects that 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 FY 2012 Budget, and will improve program and operational efficiencies.

AK, Fairbanks – Subartic Agricultural Research ($1,050,000)
GA, Byron – Western Pecan Research ($68,000)
GA, Watkinsville – Southern Piedmont Conservation Research ($1,783,000)
HI, Hilo – Sugarcane Research ($646,000)
IA, Ames – Bioinformatics Institute Model Plants ($1,025,000)
IA, Ames – Michael Fields Agricultural Institute ($178,000)
IN, West Lafayette – Genomics of Pest Resistance in Wheat ($82,000)
MD, Beltsville – Disease Resistance and Alternate Crops (Coffee and Cocoa) ($69,000)
OK, Lane – Genetics and Production Research ($836,000)
OR, Corvallis – Hops ($90,000)

Food Safety

a) An increase of $10,650,000 to Make America's Food Supply Safer.

Key Outcome

This proposed increase will improve the safety of the Nation's food supply by: providing more sensitive technologies for detecting pathogens and toxins in foods; developing alternatives to antibiotics used in animals; and researching "chemical threat agents" which could be used by terrorists.

Need for Change

The safety of the food supplies in the United States continues to be a critical priority. The USDA's principal food safety goal was a 50 percent reduction in foodborne illness and deaths (and chronic effects). This goal was described in *Healthy People 2010 (HP2010)*. Some of the *HP2010* objectives were attained, while others not attained were added in the new *HP2020* document.

Foodborne outbreaks are seen as a major cause of morbidity, mortality, chronic disease, and economic devastation. The full cost/burden is estimated to be $152 billion per year. The cause of the continued outbreaks remains unresolved, but issues such as intensive food production, rapidly increasing international trade in foods, changes in consumption habits, and travel and immigration of people are important.

The most recent 10 year retrospective review of data from the CDC reveals limited reduction in foodborne illnesses and the subsequent effects on morbidity, mortality, and chronic effects. Food safety research faces many challenges due to the complexity of the production, processing, distribution and consumption processes. Technologies must be sensitive, faster, more reliable, and applied well before the food is introduced into commerce in order to reduce directed food safety recalls, and foodborne illnesses, hospitalizations, and deaths. Reducing the most dangerous foodborne diseases will reduce morbidity and mortality costs, which in turn will effectively reduce acute and long-term health care costs and achieve better health care outcomes.

Recent major outbreaks of foodborne illnesses have been caused by E. coli O157:H7 and the related Shiga-toxin producing non-E. coli O157:H7 strains in ground beef and fresh produce supplies. Salmonella *paratyphi B* has also been linked to various products including produce, peanut butter, and tree nuts. These STEC non-0157 strains (i.e., 026, 0111, 0103, 0121, 045, and 0145) are of critical concern to both the Food Safety and Inspection Service (FSIS) and the Food and Drug Administration (FDA). It is likely that these strains will be considered as adulterants and, therefore, will become strictly regulated in foods. Contaminated fresh produce presents an increasingly serious issue as does contamination due to chemical residues and biological toxins. Many of the issues relative to solving foodborne illness outbreaks is the inability to rapidly and unequivocally isolate, detect, identify, and characterize the contaminant.

Supporting this research will require an integrated ecosystem management approach, in collecting environmental and ecological data on the role of wildlife, water, production animals, and management practices. The research will require the development of sophisticated and rapid technologies for pathogen, toxin, and/or chemical contaminant detection. This identification will provide the capability to follow pathogen, toxin, and chemical movement through the food safety continuum.

Significant evidence exists to support that antibiotic resistant organisms increase the burden of illness. The annual cost of infections caused by antibiotic resistant bacteria is estimated to be about $5 billion. Many resistant strains of bacteria include those that cause foodborne illnesses. Drug resistance is a critical issue for the FDA Center for Veterinary Medicine (CVM). For example, FDA's risk assessment of the antimicrobial fluoroquinolone showed that the use of this drug was closely linked to the development of resistance in campylobacter, leading to a ban on the use of fluoroquinolones for chickens. ARS efforts are essential in providing data to support FDA food safety guidance and regulatory decisions concerning antimicrobial use, and for industry developments.

A subset of emerging chemical agents, known generically as "Non-Traditional Agents" (NTAs) encompass a wide range of potential threat chemicals not specifically proscribed under the Chemical Weapons Convention. Research on these agents will be conducted under a specific request.

Funding requested for ARS' food safety program in the FY 2012 Budget will provide support for several USDA and Presidential initiatives. Research on emerging chemical threat agents will support the President's Strategy for Countering Biological Threats. This research, conducted in collaboration with FSIS, will be performed at the U.S. Army Edgewood Chemical Biological Center in Maryland. Research on developing detection and sensing technologies for pathogens, toxins, and chemical contaminants builds on current in-house research focusing on critical toxins, for example, aflatoxins and plant toxins that have both national and international health impacts. These projects will enhance USDA's role with the World Health Organization and the Centers for Disease Control and Prevention. This work will be conducted in Albany, California and Athens, Georgia. Research at Albany will specifically focus on plant toxins that are important biosecurity threats while research at Athens will continue development of their sensing technology program. Both of these programs address biological threats and international food safety concerns. Developing and evaluating alternatives to antibiotics in food animals addresses specific concerns by Congress, consumer organizations, industry, and government regulatory agencies. As public health officials create new guidelines it is imperative that ARS assist in evaluating the impact of changes in antibiotic use in food animals. This research builds on current in-house studies on the effect of alternative food additives to the development of antimicrobial resistance. This research will be conducted at several ARS locations including the National Animal Disease Center in Ames, Iowa; College Station, Texas; and Athens, Georgia. By the inclusion of several locations, the focus of the research will enable coverage of all food animal species. ARS is a leader in produce food safety research and has one of the few coordinated environmental and epidemiologic field studies for potential risk factors, pathogenesis, and intervention development for produce. The produce initiative enhances current in-house research conducted at Albany, California and Beltsville, Maryland. Research will enable ARS to provide needed data to industry and the FDA, which regulates fresh produce, about the role of the environment, host, and pathogen interactions on the development, persistence, and movement of foodborne pathogens.

Outcomes

Technologies will be developed for the entire food chain to enable the most effective and rapid detection and characterization capabilities. Food matrices pose one of the unique challenges since they are very complex and highly distributed. Validated, unequivocal detection methods including extraction and concentration procedures for high risk complex food matrices will be developed. Ideally, these methods will be able to detect contamination in a food within a single shift or before foods are transported and distributed to consumers.

Alternatives to antibiotics currently used in food production will be developed and evaluated. Results will provide necessary data for regulatory guidelines currently under development by the FDA-CVM. The development and validation of alternatives to antibiotics will be invaluable to industry for the advancement of improved food production. Research examining the changes in microbial ecology in the intestinal flora due to current antibiotics and future products will fill the research gaps highlighted by the Interagency Public Health Action Plan.

Research exploring the environmental, host, and pathogen interactions will provide needed information about past foodborne outbreaks and potential interventions. This research will also provide the opportunity for industry and governmental agencies to evaluate current and future management and control strategies for the reduction of foodborne pathogens and contaminants in produce.

Means to Achieve Change

- Conduct Research on Emerging Chemical Threat Agents ($7,000,000). In coordination with FSIS, ARS will:
  -- Conduct highly critical research on emerging chemical threat agents (also referred to as "Non-Traditional Agents" or NTAs) and their possible use in food.

- Develop Sensitive and Specific Detection and Sensing Technologies for Pathogens, Toxins, and Chemical Contaminants ($1,000,000). ARS will:
  -- Develop detection and intervention technologies that can be used at the earliest possible stage in the food safety continuum, thus avoiding/preventing the need for possible recalls, and reducing the public health impact.

- Develop and Evaluate Alternatives to Antibiotics in Food Animals As Well As Evaluate the Impact of Changes in Current Policies for Antibiotic Use ($1,400,000). ARS will:
  -- Develop and evaluate alternatives to antibiotics, such as pre-/pro-biotics, vaccines, and immune modulating products, natural products, and control/management strategies in food animal species.

- Pathogenesis, Risk Factors, and Interventions in Produce ($1,250,000). ARS will:
  -- Determine how pathogens are introduced into the environment through epidemiologic and ecologic studies; determine their prevalence and levels of contamination in/on: water sources prior to and used during growing and harvest cycles; farm animals; wildlife; produce handlers; visitors; and equipment. Determine the role of epiphytic and soft rot microorganisms in pathogen internalization and/or attachment, and pathogen occurrence and movement. Conduct field/epidemiologic studies to determine the prevalence, diversity, quantity colonization and survival of pathogens associated with crops produced conventionally and organically. Determine pathogen persistence and survival in the environment through studies on environmental factors; seasonality; production cycles; mechanism(s) of transference to edible plant surfaces; adjacent land use; buffer zones; water sources; and fecal contamination by farm animals, wildlife, and other organisms (insect and protozoa).

b) A decrease of $4,002,000 in ongoing research projects to support higher priority research initiatives.

Need for Change

The FY 2012 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 programs are proposed for reduction or termination given that they: (1) are considered by the Administration to be of lower priority; (2) are duplicative or can be accomplished more effectively elsewhere in ARS; (3) are marginal or below threshold funding for program viability and sustainability; or (4) are projects that 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 FY 2012 Budget, and will improve program and operational efficiencies.

GA, Watkinsville – Southern Piedmont Conservation Research ($580,000)
LA, New Orleans – Hyperspectral Imaging Technique ($500,000)
MS. Stoneville – Center for Food Safety and Postharvest Technology ($1,025,000)
PA, Wyndmoor – Food Safety Engineering (Purdue) ($1,705,000)
KY, Bowling Green – Waste Management ($192,000)

Livestock Protection

a) An increase of $3,600,000 for Protecting Livestock and Poultry.

Key Outcome

This proposed increase will help safeguard the food supply by expanding the Nation's ability to respond to new and emerging diseases, and foreign animal disease threats.

Need for Change

Global food security is one of the critical elements facing our Nation in the 21st century. A growing world population, environmental challenges, limits on the availability of arable land and natural resources, and climate change will have considerable impact on our ability to grow and safeguard the food supply. Production of

animal products must increase exponentially to meet the challenges. The health of animals, which are constantly challenged by pests and diseases, is the cornerstone of food security and agricultural productivity. Importantly, public health and the welfare of people worldwide will be dependent on animal health. Scientific knowledge, technological breakthroughs, and innovation are the major engines for protecting crops and livestock and providing food security. A key aspect of enhancing agricultural production systems is improving protection at each step from production to consumption by the application of transformational solutions. The production and distribution system in the United States encompasses a diverse, extensive, and easily accessible system that is open to the introduction of pathogens and chemical contaminants through natural processes, global commerce, and intentional means. It is of paramount importance for ARS to support the President's National Strategy for Countering Biological Threats. Sixty percent of new and emerging diseases are reported to be zoonotic diseases (i.e., diseases transmissible between animals and humans). ARS' health research initiatives to combat these diseases benefit both animal and human health. Developing programs to address the risks and manage biohazards are necessary for the United States to be prepared for potential threats to agriculture, natural or introduced.

The funding requested will provide new research projects which will support the President's Strategy for Countering Biological Threats, and will enhance current ARS research programs focused on the development of veterinary countermeasures to control and eradicate diseases of livestock and poultry. Access to new technologies to develop and stockpile veterinary countermeasures to protect our livestock and poultry industries against priority biological threats is critical to safeguard the Nation's food supply (i.e., milk, eggs, and meat), public health, and the export of agricultural products. Specifically, a new initiative for African Swine Fever (in Manhattan, Kansas and Orient Point, New York) is critical to safeguard our swine industry against this priority biological threat agent that is rapidly spreading in the Caucasus, Russia; and threatens Asia, Europe, and North America. A new initiative for PPR (*Peste des petits* ruminants) is also critical to not only protect our sheep industry but to also establish research collaborations with countries in the Middle East to support the Department of State and the Department of Defense Biological Engagement Program initiatives. A new initiative for sheep respiratory disease will determine the role of domestic sheep in causing dieoffs of bighorn sheep from respiratory disease and develop methods to reduce transmission and enhance immunity in domestic and bighorn sheep. The funding requested will significantly enhance ARS' current programs focused on the development of countermeasures for Foot and Mouth Disease and Classical Swine Fever (in Orient Point, New York); Babesiosis (in Pullman, Washington); Johne's disease; tuberculosis; and bovine respiratory diseases (in Ames, Iowa). Each of these diseases were identified as priorities by stakeholders because of their significant impact on the Nation's economy, food security, and public health. Also, the requested funds will enable the application of new genomics tools to improve the "gut health" of birds (in Beltsville, Maryland), which is critical to identify alternatives to antibiotic use in poultry production, improve feed efficiency, and reduce feed waste.

Outcomes

The proposed research will expand ARS' capacity to respond to new and emerging diseases, and foreign animal disease threats. Research to safeguard food security by improving the adaptability and sustainability of animals will ensure the availability of agricultural products to consumers worldwide. Reducing losses to diseases will benefit producers as well as minimize the threat of diseases to animals and thereby safeguard global food security and public health. ARS will enhance its capacity to improve animal health, animal well-being, and agricultural biosecurity in the field, laboratory, and during an agriculture emergency response. The development of evidence-based biosafety/biocontainment guidance will fill a gap that has been reported in a number of U.S. government reports including the USDA/HHS led Transfederal Task Force on Biosafety and Biocontainment Oversight.

Means to Achieve Change

- Provide New Information on Host/Pathogen Interactions to Develop Veterinary Countermeasures ($2,600,000). ARS will:
  -- Identify poultry nutritional strategies to discover alternatives to antibiotics, improve feed efficiency, and limit waste, and determine the role of pathogen subclinical infections on feed utilization and health.
  -- Determine the pathogens and risk parameters of disease for the transmission of bighorn sheep pneumonia and death in relation to contact with domestic sheep: 1) define risk parameters of disease transmission

under range conditions; 2) develop methods to reduce transmission risks; and 3) develop methods to provide immunity to domestic and bighorn sheep.
-- Develop methods for eradicating the cattle fever tick from wild ungulates and cattle in South Texas to prevent reintroduction of bovine babesiosis into the United States: 1) utilize genomics to create RNA molecules that will disrupt the tick physiology and remain environmentally friendly; and 2) use bioinformatics and sequence data to find new physiological targets for new anti-tick vaccines.
-- Develop new tools to control bovine tuberculosis including: 1) novel vaccines that will allow differentiation between infected and vaccinated cattle; 2) efficacious vaccines for use in wildlife reservoirs; and 3) new, rapid, accurate diagnostic assays based on new genetic information.
-- Develop new tools to control Johne's disease including: 1)improved diagnostic assays using newly identified proteins and genes to detect early infection; and 2) new vaccines based on novel technologies, adjuvants, and antigens.
--Develop new tools to control bovine respiratory diseases; conduct research on bacterial vaccines for cattle using novel vaccine technologies and platforms based on newly determined virulence factors.
--Conduct comparative microbial genomics studies of Bovine Viral Diarrhea (BVD) variant viruses to develop new genetic information for disease detection and vaccine development.

- Conduct Research on Countering Biological Threats ($1,000,000). ARS will:
  -- Conduct applied biosafety research to identify effective disinfectants and validate their use to decontaminate containment areas and equipment. The information to be used for the USDA Biocontainment Guidelines, and improve biosecurity of high risk pathogens in U.S biocontainment laboratories and vivariums.
  -- Develop countermeasures for African Swine Fever, Classical Swine Fever, Foot and Mouth Disease, and *Peste des petits* ruminants.

b) An increase of $500,000 for research on Animal and Microbial Collections.

Key Outcome

This proposed increase will protect and expand valuable animal, insect, and microbial germplasm.

Need for Change

The capacity of agricultural research effectively rests on a dynamic foundation of invaluable living animal and microbial genetic resources, and research tools in the form of scientific collections of preserved biological specimens. Today, critical components of that foundation are eroding – and some are imperiled – by lack of facilities, personnel, and operating funds needed to meet the growing demands of global agricultural research. At the same time, demands for collections are increasing due to need for: (1) new genetic material for use in responding to climate change and dwindling water tables, and to preserve genetic variation ex situ due to habitat loss; (2) determination of host origin for developing biological control and other approaches for managing increasing numbers of insects and microbial pests gaining entry through ports due to increased travel and trade; and (3) microbial strain stocks for biosecurity purposes.

The requested funding increase will enhance currently funded programs and support new research to expand and protect valuable animal, insect, and microbial germplasm. Operational capacity and infrastructure require expansion to meet increased demand for germplasm. Specific targets for new initiatives include fulfilling the demand for additional genetic and trait data, and acquiring and conserving germplasm of animals and animal relatives for genomic research and genetic improvement. Researchers will more efficiently obtain needed accessions, contribute new animal information, and conserve more diverse resources using the GRIN-Global information system.

The USDA has principal responsibility for safeguarding the Nation’s insect systematics collections which are needed for: (1) port identifications by APHIS and DHS; (2) developing pest management strategies based on an accurate knowledge of pest origin, distribution, and biology; and (3) location and safe testing of natural enemies for biological control of insects and weeds. New molecular and visual technologies will accelerate the identification process and instantaneously transmit insect specimen images, etc., via satellite from ports to

taxonomists located here or overseas. As a result, collections will be linked into an international network for rapid specimen identification.

Outcomes

The proposed increase will enable ARS to expand activities to identify, acquire, and secure unprotected genetic resources of animals, insects, and veterinary associated microbes. A broad spectrum of genetic diversity in the form of viable and well documented germplasm will be conserved. Vulnerable or threatened genetic resources vital to national security will be safely stored and backed-up in secure facilities. Successful implementation will provide users with more dependable and more diverse sources of high quality genetic resources. Agricultural animals will be better protected from pests through biological control, plant resistance, and other management tools. More effective use of the genetic resources will be facilitated by making the collections and related information more readily accessible and useful to scientists developing strategies for controlling diseases of agricultural animals and beneficial insects.

Means to Achieve Change

- Enhance Animal and Microbial Collections' Capacity ($250,000). ARS will:
  -- Improve methods for cryopreservation of semen for swine, poultry, fish, and shellfish.
  -- Strengthen key collections of microbes associated with animal diseases.

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- Enhance Capacity to Conserve Insect Germplasm and Insect Systematics' Capacity ($250,000). ARS will:
  -- Develop a system for storage of beneficial and pest insect germplasm.
  -- Expand development of barcoding and other molecular methods for insect systematics.

c) A decrease of $10,770,000 in Congressionally-added earmarks to provide savings to finance higher priority research initiatives.

Need for Change

Research projects under this program activity have been identified for termination given that they represent Congressionally-added earmarks. The savings achieved from these terminations will be redirected to finance the higher priority agricultural research initiatives identified in the FY 2012 Budget, will improve program and operational efficiencies, and will serve to restrain Federal spending.

FL, Gainesville – Mosquito Trapping Research/West Nile Virus ($1,454,000)
KS, Manhattan – Arthropod-Borne Animal Diseases Research Laboratory ($1,500,000)
LA, New Orleans – Formosan Subterranean Termite Research ($3,490,000)
LA, New Orleans – Termite Species in Hawaii ($200,000)
MD, Beltsville – Poultry Diseases ($408,000)
NY, Greenport – Animal Vaccines ($1,518,000)
HQ – Lyme Disease 4 Poster Project ($700,000)
HQ – National Bio- and Agro-Defense Facility ($1,500,000)

d) A decrease of $3,417,000 in ongoing research projects to support higher priority research initiatives.

Need for Change

The FY 2012 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 programs are proposed for reduction or termination given that they: (1) are considered by the Administration to be of lower priority; (2) are duplicative or can be accomplished more effectively elsewhere in ARS; (3) are marginal or below threshold funding for program viability and sustainability; or (4) are projects that 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 FY 2012 Budget, and will improve program and operational efficiencies.

LA, New Orleans – Formosan Subterranean Termite Research ($3,193,000)
MS, Stoneville – Red Imported Fire Ants ($224,000)

Crop Protection

a) An increase of $3,250,000 for Crop Protection.

Key Outcome

This proposed increase will enhance crop yields by improving genetic disease resistance.

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. The key to meeting the demands of the growing population will be improving crop productivity and health.

Sustainability of our Nation's food supply depends on a continuous supply of improved plant varieties with protection from emerging diseases, insects, and damaging environmental conditions. Funding requested for crop protection will provide support for new projects to combat crop diseases. New projects to address citrus diseases will develop new innovative genetic methods to increase resistance to citrus greening. New sources of rust resistance from wild and weedy relatives of legumes will be identified and exploited to protect dry beans and other legumes from rust pathogens. Enhanced funding to protect corn from mycotoxins (aflatoxin) contamination will exploit new corn genome sequence information and new biological control strategies to develop more effective genetic and management solutions to reduce aflatoxin contamination.

Prevention of grain disease losses is critical to addressing world hunger. Maintaining steady supplies of grain crops, keeping grain marketing channels open, and avoiding grain shortages are essential. Unfortunately, new and emerging grain diseases are putting the world's grain supply at catastrophic risk. A virulent wheat stem rust mutant, Ug99, has emerged in Eastern Africa that threatens wheat and barley production in Africa and Asia; North and South American wheat production is also at risk. Enhanced funding for the Wheat (Ug99) Rust Initiative is requested to expand cereal rust pathogen characterization research, and to deploy rust resistance genes into new wheat and barley varieties, particularly in the Western States.

Outcomes

As a result of the research, crop yields and production efficiency will be increased. Catastrophic losses from new and emerging crop diseases will be avoided. Risk of food shortages, particularly for grains, fruits, and vegetables will be reduced. Incorporation of more durable genetic protection, particularly in underserved areas, will constrict the international spread of new and emerging pathogens. World hunger will be reduced for those in need by a more plentiful, economic, and safe supply of food.

Means to Achieve Change

- Discover and Deploy New Resistance Genes to Pests and Pathogens ($2,000,000). ARS will:
  -- Deploy new technologies to develop resistance in commercial citrus to newly emerging diseases and their vectors, including citrus greening and novel means of controlling its psyllid vector.
  -- Discover and deploy genetic mechanisms that block rusts of dry beans and legumes.
  -- Develop new genetic and management systems to protect corn from aflatoxin accumulation.

- Strengthen Grain Disease Research to Protect the World Grain Supply ($1,250,000).
  ARS will:
  -- Expand and strengthen cereal pathology research that identifies new sources of genetic resistance to emerging cereal pathogens.

-- Develop advanced bioinformatic and statistical genetic tools that strategically integrate genomic and phenotypic information to accelerate breeding grain crops.
-- Accelerate and strengthen collaborative international germplasm enhancement to increase disease protection in staple grain crops.

b) An increase of $1,700,000 for research on Plant and Microbial Collections.

Key Outcome

This proposed increase will protect and expand valuable genetic resources of plants, insects, and associated microbes.

Need for Change

The capacity of agricultural research effectively rests on a dynamic foundation of invaluable living plant and microbial genetic resources, and research tools in the form of scientific collections of preserved biological specimens. Today, critical components of that foundation are eroding – and some are imperiled – by lack of facilities, personnel, and operating funds needed to meet the growing demands of global agricultural research. At the same time, demands for collections are increasing due to need for: (1) new genetic material for use in responding to climate change and dwindling water tables, and to preserve genetic variation ex situ due to habitat loss; (2) feedstocks for biofuel production and germplasm for increased productivity to meet rising human populations; (3) determination of host origin for developing biological control and other approaches for managing increasing numbers of insect, weed, and microbial pests gaining entry through ports due to increased travel and trade; and (4) microbial strain stocks for biosecurity purposes.

The requested funding increase will enhance currently funded programs and support new research to expand and protect valuable plant, insect, and microbial germplasm. Operational capacity and infrastructure require expansion to meet increased demand for germplasm. Specific targets for new initiatives include fulfilling the demand for additional genetic and trait data, and acquiring and conserving germplasm of horticultural crops and wild crop relatives for genomic research and genetic improvement. Researchers will more efficiently obtain needed accessions, contribute new plant and information, and conserve more diverse resources using the GRIN-Global information system. Training in plant germplasm and information system management is a companion critical component.

The USDA has principal responsibility for safeguarding the Nation's insect systematics collections which are needed for: (1) port identifications by APHIS and DHS; (2) developing pest management strategies based on an accurate knowledge of pest origin, distribution, and biology; (3) identification of new pollinators; and (4) location and safe testing of natural enemies for biological control of insects and weeds. New molecular and visual technologies will accelerate the identification process and instantaneously transmit insect specimen images, etc., via satellite from ports to taxonomists located here or overseas. As a result, collections will be linked into an international network for rapid specimen identification.

Outcomes

The proposed increase will enable ARS to expand activities to identify, acquire, and secure unprotected genetic resources of plants, insects, crops, and associated microbes. A broad spectrum of genetic diversity in the form of viable and well documented germplasm will be conserved. Vulnerable or threatened genetic resources vital to national security will be safely stored and backed-up in secure facilities. Successful implementation will provide users with more dependable and more diverse sources of high quality genetic resources. Crops will be better protected from pests through biological control, plant resistance, and other management tools. Crop improvement for weather tolerance and end product quality will be accelerated. More effective use of the genetic resources for crop improvement will be facilitated by making the collections and related information more readily accessible and useful to scientists developing strategies for controlling diseases of crops and beneficial insects.

Means to Achieve Change

- Enhance Plant and Microbial Collections' Capacity ($1,200,000). ARS will:
  -- Strengthen key collections of microbes associated with crop diseases and those microbes useful for controlling invasive crop pests and weeds.
- Enhance Capacity to Conserve Insect Germplasm and Insect Systematics' Capacity ($500,000). ARS will:
  -- Develop a system for storage of beneficial and pest insect germplasm.
  -- Expand development of barcoding and other molecular methods for insect systematics.

c) A decrease of $2,265,000 in Congressionally-added earmarks to provide savings to finance higher priority research initiatives.

Need for Change

Research projects under this program activity have been identified for termination given that they represent Congressionally-added earmarks. The savings achieved from these terminations will be redirected to finance the higher priority agricultural research initiatives identified in the FY 2012 Budget, will improve program and operational efficiencies, and will serve to restrain Federal spending.

MD, Beltsville – Biomedical Materials in Plants ($1,700,000)
MN, St. Paul – Cereal Disease ($290,000)
HQ – Northwest Center for Small Fruits ($275,000)

d) A decrease of $11,305,000 in ongoing research projects to support higher priority research initiatives.

Need for Change

The FY 2012 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 programs are proposed for reduction or termination given that they: (1) are considered by the Administration to be of lower priority; (2) are duplicative or can be accomplished more effectively elsewhere in ARS; (3) are marginal or below threshold funding for program viability and sustainability; or (4) are projects that 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 FY 2012 Budget, and will improve program and operational efficiencies.

AK, Fairbanks – Subartic Agricultural Research ($2,647,000)
CA, Shafter – Western Integrated Cropping Systems Research ($1,620,000)
FL, Ft. Lauderdale – Invasive Species (Aquatic Weeds) ($261,000)
HI, Hilo – Fruit Fly Eradication ($205,000)
HI, Hilo – Minor Crop Pest Control ($339,000)
HI, Hilo – Papaya Ringspot ($266,000)
IN, West Lafayette – Oat Virus ($68,000)
MD, Beltsville – Weed Management Research ($137,000)
NY, Ithaca – Golden Nematode ($492,000)
NY, Ithaca – Pear Thrips ($57,000)
OR, Corvallis – Eastern Filbert Blight ($64,000)
TX, Weslaco, Kika de la Garza Subtropical Agricultural Research Center – Crop Quality and Fruit Insects Research ($1,663,000)
TX, Weslaco – Integrated Farming and Natural Resources Research ($182,000)
TX, Weslaco – Beneficial Insects Research ($3,304,000)

Human Nutrition

a) An increase of $7,500,000 for Child and Human Nutrition.

Key Outcome

This proposed increase will help reduce the growing incidence of obesity in America.

Need for Change

Obesity rates among adults and children in the U.S. have increased significantly over the past several decades so that today only one-third of Americans are at healthy weight. Obesity is an underlying risk factor for numerous chronic diseases including cardiovascular disease, cancer, arthritis, and diabetes. Reducing the prevalence of obesity with an emphasis on preventing obesity in children will greatly improve the overall health of Americans and decrease future health care costs in the United States.

While obesity is a multi-faceted disorder whose causes are not completely understood, at its base it is a nutritional disorder of simply consuming more calories than the body needs. An added complication of too many calories is that the overall diet that supplies those calories generally does not provide the dietary quality recommended in the USDA/HHS *Dietary Guidelines for Americans (DGA)*, the basis for all food policy in the United States. Lack of adherence to the *DGA* also increases the risk for many chronic diseases. The reasons for lack of adherence to these guidelines are unclear. We need a better understanding of the basis for food choices. Enhancing dietary quality needs go hand-in-hand with balancing the caloric intake and expenditure. An added complication when dealing with the *DGA* as it pertains to children is that the guidelines are based, in part, on recommended nutrient requirements and those requirements are not always clear for children because most values were derived from those set for adults.

ARS' human nutrition program provides research to improve the nutrition and health of the American people. Funding requested in FY 2012 targets five initiatives to build the scientific basis for dietary guidance to promote health and prevent obesity/disease in children. The first initiative builds upon redirected base funds used to develop tools for identifying impediments to following the *DGA*. The initiative funds the next step—research to discover how to increase adoption of the *DGA* in children and families of varying demographic status, ethnicity, and in rural/urban locales across the U.S. The second initiative funds new research to determine nutrient requirements for children rather than extrapolating data from that established for adults. The third initiative investigates human genetic variations that can alter physiological responses to dietary and physical activity interventions. This effort will increase the ability of the ARS, a world leader in this area of research, to focus on U.S. ethnic minorities at highest risk for obesity and its health complications. The fourth initiative, "Establishing Health-Promoting Properties of Specialty Crops and Whole Grains," will apply the cutting edge science of metabolomics, recently added to ARS' capabilities. This research represents a new area of investigation. The fifth initiative will enhance the capacity of Nutrition.gov, the number one nutrition web site on Google searches, to distribute new and evolving childhood obesity prevention information directly to the American population.

Outcomes

The proposed increase will fund research to better understand the role of the *DGA* in mitigating the childhood obesity epidemic and reducing the risk of chronic diseases related to obesity. Research will also determine actual nutrient requirements for children where those nutrients have previously been extrapolated from adult values. This practice has resulted in errors where usual intake from a normal diet by some children either does not meet or exceeds the current recommendations.

Means to Achieve Change

- Evaluate the Factors Affecting Adherence to the *DGA* ($4,500,000). ARS will:
  -- This effort builds upon a pilot study that used temporary agency funding to develop a survey instrument for identification of barriers and facilitators to following the *DGA*. In order to discover the most useful factors for various ages, ethnic groups, and urban versus rural locales, a multi-site study will be conducted

at all of ARS' Human Nutrition Research Centers which will provide scientifically and statistically valid recommendations for increasing conformity with the *DGA*.

- Determine Nutrient Requirements for Children ($900,000). ARS will:
  -- Perform studies that establish actual nutrient requirements based on the needs of children rather than using the current standard of extrapolating from adult values, a process that has been identified as being flawed.

- Personalize Prevention through Diet, Behavior, and Genomics ($800,000). ARS will:
  -- Identify genetic variations among normal genes that alter the response to diet and physical activity among ethnic groups in the U.S.

- Establish Health Promoting Properties of Specialty Crops and Whole Grains ($800,000). ARS will:
  -- Demonstrate that consumption of fruits, vegetables, nuts, and whole grain products, which are recommended in the *DGA* for better health, actually have benefits, and indicate what amounts are needed in a standard diet.

- Strengthen the Nutrition.gov Web site ($500,000). ARS will:
  -- Enhance the capacity of Nutrition.gov, the number one nutrition web site in Google searches. New modules will be developed to support "Let's Move" and other initiatives related to the prevention of childhood obesity.

b) A decrease of $4,158,000 in Congressionally-added earmarks to provide savings to finance higher priority research initiatives.

Need for Change

Research projects under this program activity have been identified for termination given that they represent Congressionally-added earmarks. The savings achieved from these terminations will be redirected to finance the higher priority agricultural research initiatives identified in the FY 2012 Budget, will improve program and operational efficiencies, and will serve to restrain Federal spending.

AR, Little Rock – Sorghum Research ($135,000)
LA, New Orleans – Diet, Nutrition, and Obesity Research ($623,000)
LA, New Orleans – Phytoestrogen Research ($1,750,000)
MA, Boston – Human Nutrition Research ($350,000)
NC, Kannapolis – North Carolina Human Nutrition Center ($1,000,000)
TX, Houston – Human Nutrition Research ($300,000)

c) A decrease of $3,937,000 in ongoing research projects to support higher priority research initiatives.

Need for Change

The FY 2012 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 programs are proposed for reduction or termination given that they: (1) are considered by the Administration to be of lower priority; (2) are duplicative or can be accomplished more effectively elsewhere in ARS; (3) are marginal or below threshold funding for program viability and sustainability; or (4) are projects that 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 FY 2012 Budget, and will improve program and operational efficiencies.

HQ – Delta Obesity Prevention Initiative/Human Nutrition Delta Initiative ($3,937,000)

Environmental Stewardship

a) An increase of $4,000,000 to Adapt American Agriculture to a Changing Global Climate.

Key Outcome

This proposed increase will result in higher yielding crops which are more tolerant of climate change and weather extremes.

Need for Change

Climate change will pose new challenges for American agriculture in the future. Increasing demands on natural resources coupled with uncertainties in temperature changes and precipitation patterns require new strategies to ensure sustainable production to meet our food and biofuel needs. New knowledge and practices are needed to adapt agriculture to increasing abiotic stresses (e.g., extremes and variability in temperature and water availability) and other threats. Farmers and land managers need information and decision-support tools to adapt current agricultural systems to a changing environment, thus sustaining agricultural productivity while protecting our natural resources and ecosystem services.

Sustaining agricultural production requires new crop varieties with critical traits (including resistance to drought and extreme temperatures), strategies for new stand establishment of clonally propagated crops, and approaches to balance yield with environmental impact. Key physiological crop traits that convey tolerance or adaptation to changes in water availability and temperature are needed.

New management practices and decision-support tools and are needed to help agricultural producers and land managers take advantage of improved crop varieties, opportunities to benefit from market based incentives to reduce the Nation's net greenhouse gas footprint, and changes in water availability and temperature. New management options and decision tools are needed for sustaining production of food and biofuels on multi-functional landscapes, including pastures and rangelands, as temperature and water variability and extremes change in new patterns in time and space. If agricultural systems are managed carefully, they offer opportunities to mitigate the continued increase in greenhouse gas concentrations while sustaining agricultural productivity and other ecosystem services; thus, research on strategies and systems to reduce greenhouse gas emissions from agricultural practices is needed. Drought conditions, reduced snowpack, changes of precipitation variability, and increasing population are creating shortages of water for agriculture and ecosystem services. New and improved sustainable water management tools are needed to respond to climate changes that will impact the hydrology at the watershed scale and change seasonal crop demands and water supply and availability.

ARS' climate change research develops knowledge and technologies for reducing atmospheric greenhouse gas concentrations through management of agricultural emissions and carbon sequestration, and enables agriculture to adapt to climate change. Through its coordinated multi-location project, GRACEnet (Greenhouse gas Reduction through Agricultural Carbon Enhancement network), ARS conducts research focused on developing soil carbon and greenhouse gas measurement methods; soil carbon content and greenhouse gas emissions associated with current agricultural practices; and the effects of new alternative practices on net emissions, soil carbon sequestration, and other environmental benefits. Products in development include a national database of current greenhouse gas fluxes and carbon storage that can serve as a baseline for verifying carbon credits; analyses of net agricultural greenhouse gas emissions data on regional and national levels; and regional and national guidelines for best management practices in major crops to minimize greenhouse gas emissions and maximize carbon sequestration on agricultural lands.

Research on adaptation to climate change is leading to: the capacity to predict and manage how climate change affects crop and forage quality; determine how the interacting impacts of elevated carbon dioxide, ozone, precipitation, and temperature affect agricultural systems, including nitrogen requirements, yield, and commodity quality; ascertain how carbon dioxide affects water use efficiency of different crops; and more fully understand potential climate and weather-related changes to risks from pests, pathogens, and weeds. Other outcomes of ARS' climate change research include: crop germplasm that is adapted to changing climate, weather, and atmospheric composition ensuring a secure and stable supply of commodities for domestic consumption, animal

feed, industrial uses, and export. ARS' climate change research supports the USDA Climate Change Science Plan, and the interdepartmental U.S. Global Change Research Program.

Outcomes

Research will result in high yielding and profitable crops tolerant to climate change and weather extremes, developed from crop collections that have been genotypically and phenotypically characterized for traits such as drought and temperature extreme tolerance, ozone resistance, water use efficiency, rapid maturation, carbon dioxide response, and stand establishment. Farm income and rural communities' economies will be improved because crop yields and quality will be enhanced by resistance to widespread and increasing abiotic stressors. Land management practices guided by ARS' enhanced national carbon sequestration and greenhouse gas mitigation research network (the GRACEnet project) will provide data related to different agricultural management strategies that can lead to reductions in net greenhouse gas emissions from agricultural production systems by 15 to 25 percent, and farmers will be compensated accurately in carbon credit trading programs. The number of farmers eligible for carbon credit payments will be increased by carbon sequestration and greenhouse gas footprint data from the GRACEnet project expanded into biomass and specialty crops, and into farming systems around the world. Research results will be applied to achieve sustainability through optimizing agricultural yield, carbon sequestration, greenhouse gas mitigation, and preservation of other desirable ecosystem services. Farmers, ranchers, and communities within watersheds will realize increased income because costs of water management, competition for supplies, and environmental mediation of contaminants will be lowered.

Means to Achieve Change

- Provide Validation and Verification of Offset Markets ($1,000,000). ARS will:
  -- Identify farming practices that provide a sustainable balance of crop production (including specialty crops), soil carbon sequestration, net greenhouse gas emissions, and other ecosystem services. Apply findings of the ARS GRACEnet project and related carbon storage models to develop decision support technologies that enable producers and resource managers to meet multiple goals of production, ecosystem services, and resource conservation.

- Increase the Resilience of Crops and Production Systems to the Abiotic Stresses of Climate Change and Weather Extremes, Resulting in Healthier, High Yielding Crops ($2,000,000). ARS will:
  -- Develop tools and practices that enable agricultural systems to manage water supply; adapt to extremes of precipitation that affect soil moisture, runoff, and erosion; conserve soil and water resources; and maintain or enhance biodiversity and ecosystem services.
  -- Develop weather tolerant germplasm and improve genetic and physiological models to predict crop responses to changing conditions, thus enabling crop producers to adapt to climate change.

- Better Understand and Mitigate the Effects of Climate Change in Production Systems through Improved Water Management ($1,000,000). ARS will:
  -- Produce a prediction tool for farmers, ranchers, and communities to avoid water shortages and conflicts over water quality and supplies, based on predictive capabilities developed from decades of ARS watershed research and National Agricultural Statistics Service cropland data that indicate planted acreage and yield.
  -- Produce a web accessible management tool based on geospatial information on crop condition, soil moisture, drought monitoring, and hydrologic models which leads producers, land managers, and communities to efficient and cost-effective water use.

b) An increase of $4,500,000 for the Development Production Systems to Support Sustainable Agriculture.

Key Outcome

This proposed increase will provide new strategies and technologies which support sustainable agriculture.

Need for Change

American farms generate more than $200 billion in goods and services on 442 million acres, but many farms are suffering from commodity prices that have remained relatively unchanged for decades, while the costs of fuel and other purchased inputs have continued to rise. In addition, there is increasing competition from overseas markets where production costs are comparatively low, and increasing pressures within the U.S. caused by urban expansion and the need to protect water resources from nonpoint source pollution from agriculture. At the same time, continued advancement of conservation goals is needed to enhance the natural resource base upon which the Nation not only depends for food, feed, fiber, and renewable energy, but also for abundant and high quality supplies of fresh water, clean air, and healthy ecosystems. The challenges producers face regarding productivity, profitability, and natural resource stewardship are complex, and research to enhance agricultural sustainability must span the entire range of scales of physical and biological processes on the land, from the microscopic to entire watersheds. Management and assessment technologies are needed that enable and support different agricultural production systems to determine how changing or new technology will affect their productivity, profitability, energy efficiency, and natural resource stewardship. Although current research addresses a wide range of challenges to sustainability, processes operating at the extremes of geographic and temporal scales defy/stretch our current ability to monitor and assess the impact of broad policy and environmental changes (e.g., bioenergy and climate change), amid their inherent complexities. Integrative assessment and predictive technologies need to be developed that implement the most modern techniques and methods in recognition of agriculture's changing presence on the land to solve problems in resource management and sustainable production.

ARS' interdisciplinary research on agricultural sustainability integrates information and technologies which develop new practices and dynamic systems that enhance productivity, profitability, energy efficiency, and natural resource stewardship for different kinds and sizes of American farms, including organic production systems. New configurations of practices are identified that utilize on-farm resources and natural ecosystem processes to reduce the need for purchased inputs, and reduce production costs and risks. Precision management, automation, and decision support technologies are used to increase production efficiencies and enhance environmental benefits. Strategies are developed for sustainable production of bio-based energy products from farms. Production systems incorporate consumer preferences and supply chain economic information to expand market opportunities for agricultural and other value-added bio-based products. Diverse improved agricultural systems support the long-term financial viability, competitiveness, and sustainability of farms and rural communities, and increase food, and fiber security for the Nation and the world.

The wide variety of products and outcomes of ARS sustainability research in progress include the most productive cropping strategies in relation to overall soil biological activity and various soil quality indicators for conservation tillage practices in both irrigated and dryland cropping rotations in the Northern Great Plains; recommendations for mid-Atlantic region organic grain farmers to select crop rotations that meet the agronomic, economic, and environmental goals based on fundamental ecological processes; management strategies based on estimates of the relative economic risks in Upper Midwest corn-soybean production systems to help farmers evaluate new crops for diversifying rotations; alternative conservation systems that include direct seed organic, perennial- and annual-based no-till systems for both small and large farms; management guidelines for nitrogen fertilizer application rates and timing for potato grown under reduced tillage, high residue conditions; a method for segregating grain into different quality classes at harvest using information from combine harvester yield monitors and protein sensors; and an assessment of the economic and environmental benefits and risks associated with establishing and maintaining alley cropping, shelter belt, forest farming, and riparian buffer agroforestry practices for low-resource farms. ARS' nationally coordinated research on agricultural sustainability addresses many issues and priorities identified in the National Research Council (2010) report, *Toward Sustainable Agricultural Systems in the 21st Century*.

Outcomes

Research will leverage ARS' capabilities for long-term production and environmental management trials in watersheds to develop strategies to sustain agricultural productivity in the Mississippi River Basin (which represents approximately one-third of the U.S.) while reducing unwanted exports from agricultural lands and effectively managing water resources in light of increasing demands from multiple users (i.e., agriculture,

industry, municipalities, the environment). The structure, composition, physiological activities, and ecology of complex microbial communities in soil, water, and air, and key associations with crops and livestock will be examined. Metagenomic approaches will be utilized to facilitate further study of the physiology and ecology of microorganisms that cannot be obtained through traditional microbiology. How changes in environment or management options affect microbial communities and their beneficial or detrimental activities related to resource management, commodity production, and food safety will be identified.

Means to Achieve Change

- Enhance Agricultural Sustainability and Resource Management in the Mississippi River Basin ($1,800,000). 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.
  - -- Conduct research to enable maintaining natural resource integrity in agricultural landscapes as production systems change in response to economically driven market forces.
  - -- Conduct research to enhance income streams for rural communities through landscape scale restoration efforts to develop nutrient credit trading markets.
  - -- Enhance the sustainability of agricultural productivity in highly erodible landscapes of the Lower Mississippi River Basin through improved, targeted management and conservation practices to reduce nutrient and pesticide losses, erosion, and sediment loading.

- Improve Environmental Quality and Production Efficiency by Managing Microorganisms in Agricultural Systems ($2,700,000). ARS will:
  - -- Develop improved characterization, understanding, and manipulation of microbial communities in soil and water; increase capabilities to identify and track characteristics and changes of microbial populations in the field that affect resource quality and food safety; and examine responses of microbial communities to changing environmental or management conditions that can alter the distribution, movement, biological activity, and survival of microbes in the environment.
  - -- Increase crop uptake of nitrogen, improve crop yield, reduce production costs, and reduce environmental impacts of nitrogen fertilizers by improving management of microbial populations in the rhizosphere that are involved in nitrogen cycling and availability; improve capabilities to identify and track characteristics and changes of nitrogen cycling microbial communities in the field; and determine how microbial competition in the root zone among species and communities of microbes affect improvements in nitrogen availability and uptake by crop plants.
  - -- Improve animal feed efficiency, reduce production costs, and reduce greenhouse gas emissions from livestock through improved characterization, understanding, and manipulation of microorganisms in the rumen and gut; and increase capabilities to identify and track characteristics and changes of microbial populations in livestock digestive tracts.

c) A decrease of $5,763,000 in Congressionally-added earmarks to provide savings to finance higher priority research initiatives.

Need for Change

Research projects under this program activity have been identified for termination given that they represent Congressionally-added earmarks. The savings achieved from these terminations will be redirected to finance the higher priority agricultural research initiatives identified in the FY 2012 Budget, will improve program and operational efficiencies, and will serve to restrain Federal spending.

AL, Auburn – Improved Crop Production Practices ($1,293,000)
CA, Brawley – Water Management Research Laboratory ($340,000)
MD, Beltsville – Bioremediation Research ($111,000)
MD, Beltsville – Foundry Sand By-Products Utilization ($638,000)
MS, Oxford – Seismic and Acoustic Technologies in Soils Sedimentation Laboratory ($332,000)
PA, Kutztown – Livestock-Crop Rotation Management ($349,000)

WA, Prosser – Forage Crop Stress Tolerance and Virus Disease Management ($200,000)
WI, Madison – Dairy Forage Research Center ($2,500,000)

d) A decrease of $14,798,000 in ongoing research projects to support higher priority research initiatives.

Need for Change

The FY 2012 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 programs are proposed for reduction or termination given that they: (1) are considered by the Administration to be of lower priority; (2) are duplicative or can be accomplished more effectively elsewhere in ARS; (3) are marginal or below threshold funding for program viability and sustainability; or (4) are projects that 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 FY 2012 Budget, and will improve program and operational efficiencies.

FL, Brooksville – Beef Cattle Research ($611,000)
GA, Watkinsville – Southern Piedmont Conservation Research ($598,000)
IA, Ames – Air Quality ($615,000)
KY, Bowling Green – Waste Management ($357,000)
MS, Oxford – Acoustics ($816,000)
MS, Oxford – National Center for Computational Hydroscience and Engineering ($893,000)
OH, Coshocton – Northern Appalachian Experimental Watershed Research ($1,392,000)
TX, Weslaco, Kika de la Garza Subtropical Agricultural Research Center – Integrated Farming and Natural Resources Research ($3,316,000)
UT, Logan – Locoweed ($164,000)
WV, Beaver – Appalachian Farming Systems Research Center ($6,036,000)

Library and Information Services

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

Key Outcome

This proposed increase will enable NAL to provide researchers and scientists with needed information on agriculture and the environment.

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.

b) A decrease of $654,000 in Congressionally-added earmarks to provide savings to finance higher priority research initiatives.

Need for Change

Research projects under this program activity have been identified for termination given that they represent Congressionally-added earmarks. The savings achieved from these terminations will be redirected to finance the higher priority agricultural research initiatives identified in the FY 2012 Budget, will improve program and operational efficiencies, and will serve to restrain Federal spending.

MD, Beltsville – National Center for Agricultural Law ($654,000)

Repair and Maintenance

a) An increase of $3,000,000 for Repair and Maintenance of ARS' Facilities.

Need for Change

Over the years funding for repair and maintenance has not kept pace with the needs of over 3,100 ARS facilities comprising 13 million square feet. Due to the age of many of ARS' research facilities, major building systems – heating, ventilation, air-conditioning, electrical, roofs, and infrastructure (i.e., paving, steam and water lines, and waste treatment disposal systems) – have either reached or passed their useful life expectancies. Other existing deficiencies affecting safety and health needs, such as fume hood upgrades, single pass air, and building code upgrade requirements need to be corrected.

The National Research Council has noted that the operation and maintenance cost of a facility accounts for 60 to 85 percent of the total life cycle cost. For facilities to reach their expected service life, adequate operations and maintenance funding is vital. The Council has also noted that for every $1 invested in deferred maintenance the owner will avoid a $4 to $5 capital liability. Short term savings from the continued deferral of needed maintenance will result in even greater capital investment needs over the long term.

Outcomes

ARS will be able to provide critically needed repairs to selected facilities.

AGRICULTURAL RESEARCH SERVICE

Proposed FY 2012 Program Increases and Decreases

(Funding in Millions)

FY 2011 Continuing Resolution	Product Quality/ Value Added	Livestock Production	Crop Production	Food Safety	Livestock Protection	Crop Protection	Human Nutrition	Environmental Stewardship	NAL	Repair and Maintenance	Total
FY 2011 Base	$111.056	$87.883	$240.124	$107.597	$90.216	$205.710	$89.734	$207.583	$22.233	$17.503	$1,179.639
Reductions:											
Earmarks	-5.896	-6.400	-5.983	0.000	-10.770	-2.265	-4.158	-5.763	-0.654	0.000	-41.889
Ongoing Research	-4.693	-10.804	-5.827	-4.002	-3.417	-11.305	-3.937	-14.798	0.000	0.000	-58.783
Subtotal	-10.589	-17.204	-11.810	-4.002	-14.187	-13.570	-8.095	-20.561	-0.654	0.000	-100.672
Increases:											
Bioenergy/Biomass	6.000										6.000
Animal Production		4.000									4.000
Animal and Microbial Collections		0.500									0.500
Crop Breeding			4.723								4.723
Plant and Microbial Collections			3.300								3.300
Food Safety				10.650							10.650
Livestock Protection					3.600						3.600
Animal and Microbial Collections					0.500						0.500
Crop Protection						3.250					3.250
Plant and Microbial Collections						1.700					1.700
Child and Human Nutrition							7.500				7.500
Global Climate Change								4.000			4.000
Production Sys for Sustainable Agric								4.500			4.500
Digital Information Services									1.500		1.500
Repair and Maintenance										3.000	3.000
Subtotal	6.000	4.500	8.023	10.650	4.100	4.950	7.500	8.500	1.500	3.000	58.723
Total, FY 2012 Budget	106.467	75.179	236.337	114.245	80.129	197.090	89.139	195.522	23.079	20.503	1,137.690

AGRICULTURAL RESEARCH SERVICE

Geographic Breakdown of Obligations and Staff Years
2010 Actual and Estimated 2011 and 2012

Location	2010 Amount	2010 Staff Years	2011 Amount	2011 Staff Years	2012 Amount	2012 Staff Years
ALABAMA, Auburn	$7,904,272	55	$7,819,000	55	$6,729,000	54
ALASKA, Fairbanks	5,099,970	24	5,476,000	29	--	--
ARIZONA						
Maricopa	9,614,802	78	9,745,000	78	10,307,000	81
Tucson	5,150,310	43	4,956,000	43	5,136,000	44
Total	14,765,112	121	14,701,000	121	15,443,000	125
ARKANSAS						
Booneville	5,081,692	21	4,881,000	21	2,443,000	21
Fayetteville	1,746,528	15	1,631,000	15	1,901,000	16
Little Rock	10,225,165	11	6,483,000	11	6,361,000	11
Stuttgart	8,493,755	71	8,743,000	71	7,559,000	68
Total	25,547,140	118	21,738,000	118	18,264,000	116
CALIFORNIA						
Albany	40,620,211	285	40,615,000	281	42,363,000	296
Davis	11,927,633	93	10,976,000	89	12,056,000	92
Parlier	12,583,546	103	11,800,000	103	12,676,000	109
Riverside	5,765,790	46	5,891,000	46	5,585,000	44
Salinas	5,027,511	48	4,917,000	48	4,917,000	48
Shafter	1,457,495	14	1,458,000	16	--	--
Total	77,382,186	589	75,657,000	583	77,597,000	589
COLORADO						
Akron	2,027,126	22	2,053,000	22	2,053,000	22
Fort Collins	15,596,349	141	15,574,000	139	16,879,000	151
Total	17,623,475	163	17,627,000	161	18,932,000	173
DELAWARE						
Newark	2,111,838	17	2,074,000	17	2,074,000	17
DISTRICT OF COLUMBIA						
National Arboretum	12,059,860	77	11,535,000	77	11,436,000	77
Headquarters Federal Administration	84,527,304	510	78,143,000	510	76,917,000	492
Total	96,587,164	587	89,678,000	587	88,353,000	569
FLORIDA						
Brooksville	2,187,940	11	2,182,000	10	--	--
Canal Point	2,899,815	36	2,894,000	36	2,894,000	36
Fort Lauderdale	2,628,509	27	2,557,000	27	2,322,000	27
Fort Pierce	13,394,309	127	11,649,000	127	14,748,000	152
Gainesville	14,314,854	128	13,408,000	128	12,099,000	125
Miami	4,859,788	49	4,579,000	49	4,579,000	49
Winter Haven	2,786,460	23	2,650,000	23	--	--
Total	43,071,675	401	39,919,000	400	36,642,000	389

AGRICULTURAL RESEARCH SERVICE

Geographic Breakdown of Obligations and Staff Years
2010 Actual and Estimated 2011 and 2012

Location	2010 Amount	2010 Staff Years	2011 Amount	2011 Staff Years	2012 Amount	2012 Staff Years
GEORGIA						
Athens	27,932,091	221	28,192,000	221	25,710,000	199
Byron	3,624,056	37	3,658,000	37	3,597,000	37
Dawson	4,646,553	42	4,967,000	42	3,887,000	35
Griffin	2,433,571	21	2,324,000	21	2,684,000	24
Tifton	10,191,193	100	9,713,000	100	11,513,000	110
Total	48,827,464	421	48,854,000	421	47,391,000	405
HAWAII, Hilo	11,172,254	60	11,488,000	60	8,253,000	60
IDAHO						
Aberdeen	6,214,457	57	6,024,000	57	6,474,000	60
Boise	2,315,742	23	2,147,000	23	2,147,000	23
Dubois	2,596,516	21	2,154,000	21	2,154,000	21
Kimberly	3,464,108	36	3,592,000	36	3,592,000	36
Total	14,590,823	137	13,917,000	137	14,367,000	140
ILLINOIS						
Peoria	35,328,666	258	35,958,000	257	35,659,000	255
Urbana	5,956,936	44	5,742,000	44	5,742,000	44
Total	41,285,602	302	41,700,000	301	41,401,000	299
INDIANA, W. Lafayette	8,041,019	70	7,768,000	70	7,634,000	70
IOWA, Ames	52,393,319	438	51,189,000	438	53,287,000	460
KANSAS, Manhattan	16,062,548	103	16,529,000	103	14,527,000	103
KENTUCKY						
Bowling Green	2,640,184	16	2,589,000	16	2,095,000	16
Lexington	2,684,489	16	2,641,000	16	2,161,000	16
Total	5,324,673	32	5,230,000	32	4,256,000	32
LOUISIANA						
Baton Rouge	2,840,327	25	2,586,000	25	2,586,000	25
Houma	4,347,323	49	4,077,000	49	4,077,000	49
New Orleans	30,175,455	197	30,736,000	197	21,879,000	165
Total	37,363,105	271	37,399,000	271	28,542,000	239
MAINE, Orono	3,432,554	26	3,255,000	26	3,480,000	27
MARYLAND						
Beltsville	145,243,174	943	141,857,000	946	147,843,000	970
Frederick	5,768,581	46	5,642,000	46	6,047,000	48
Total	151,011,755	989	147,499,000	992	153,890,000	1,018
MASSACHUSETTS, Boston	15,567,649	9	15,604,000	9	16,009,000	9
MICHIGAN, East Lansing	5,042,581	42	4,606,000	42	4,606,000	42

AGRICULTURAL RESEARCH SERVICE

Geographic Breakdown of Obligations and Staff Years
2010 Actual and Estimated 2011 and 2012

Location	2010 Amount	2010 Staff Years	2011 Amount	2011 Staff Years	2012 Amount	2012 Staff Years
MINNESOTA						
Morris	2,863,750	27	2,649,000	27	2,649,000	27
St. Paul	7,822,532	67	7,520,000	67	8,067,000	74
Total	10,686,282	94	10,169,000	94	10,716,000	101
MISSISSIPPI						
Mississippi State	9,331,149	76	9,235,000	76	9,685,000	78
Oxford	14,303,336	94	14,366,000	94	13,385,000	93
Poplarville	5,312,564	39	5,179,000	39	5,179,000	39
Stoneville	38,677,960	303	38,298,000	302	37,229,000	304
Total	67,625,009	512	67,078,000	511	65,478,000	514
MISSOURI, Columbia	9,002,663	73	9,122,000	73	9,527,000	75
MONTANA						
Miles City	3,531,052	28	3,345,000	28	3,345,000	28
Sidney	5,213,549	52	5,147,000	52	5,147,000	52
Total	8,744,601	80	8,492,000	80	8,492,000	80
NEBRASKA						
Clay Center	19,309,393	115	19,624,000	115	21,112,000	126
Lincoln	6,046,796	63	5,996,000	63	8,246,000	77
Total	25,356,189	178	25,620,000	178	29,358,000	203
NEW MEXICO						
Las Cruces	6,059,630	50	6,044,000	50	5,874,000	50
NEW YORK						
Geneva	4,045,000	33	3,934,000	33	4,789,000	39
Greenport	5,919,640	31	5,214,000	31	3,848,000	31
Ithaca	11,193,216	58	10,616,000	58	11,021,000	63
Total	21,157,856	122	19,764,000	122	19,658,000	133
NORTH CAROLINA						
Raleigh	9,766,977	82	9,420,000	82	9,420,000	82
NORTH DAKOTA						
Fargo	15,500,463	132	15,815,000	132	15,815,000	132
Grand Forks	9,705,427	50	9,581,000	50	9,581,000	50
Mandan	3,910,297	41	3,938,000	41	3,449,000	39
Total	29,116,187	223	29,334,000	223	28,845,000	221
OHIO						
Columbus	1,579,107	17	1,481,000	17	1,886,000	20
Coshocton	1,420,803	14	1,253,000	13	--	--
Wooster	6,261,365	51	5,069,000	51	5,069,000	51
Total	9,261,275	82	7,803,000	81	6,955,000	71

AGRICULTURAL RESEARCH SERVICE

Geographic Breakdown of Obligations and Staff Years
2010 Actual and Estimated 2011 and 2012

Location	2010 Amount	2010 Staff Years	2011 Amount	2011 Staff Years	2012 Amount	2012 Staff Years
OKLAHOMA						
El Reno	5,411,664	47	5,372,000	47	5,372,000	47
Lane	2,097,013	20	1,967,000	23	--	--
Stillwater	3,691,135	33	3,668,000	33	3,668,000	33
Woodward	1,691,928	17	1,649,000	17	1,649,000	17
Total	12,891,740	117	12,656,000	120	10,689,000	97
OREGON						
Burns	3,120,517	25	2,732,000	25	2,732,000	25
Corvallis	13,671,406	119	11,883,000	119	12,196,000	121
Pendleton	1,878,569	17	1,965,000	17	1,965,000	17
Total	18,670,492	161	16,580,000	161	16,893,000	163
PENNSYLVANIA						
University Park	4,866,068	39	4,539,000	39	4,225,000	39
Wyndmoor	35,240,184	215	35,008,000	213	33,435,000	214
Total	40,106,252	254	39,547,000	252	37,660,000	253
SOUTH CAROLINA						
Charleston	4,444,978	42	4,444,000	42	4,444,000	42
Clemson	2,360,582	25	2,361,000	28	--	--
Florence	4,224,101	34	4,157,000	34	4,967,000	38
Total	11,029,661	101	10,962,000	104	9,411,000	80
SOUTH DAKOTA						
Brookings	4,065,556	38	4,099,000	38	2,974,000	35
TEXAS						
Beaumont	1,360,461	14	1,432,000	14	1,432,000	14
Bushland	6,951,651	47	6,974,000	47	6,974,000	47
College Station	16,669,562	148	16,144,000	147	16,963,000	154
Houston	14,138,221	7	13,975,000	7	14,515,000	7
Kerrville	5,697,166	46	5,675,000	46	5,945,000	47
Lubbock	9,038,787	101	9,057,000	101	9,057,000	101
Temple	3,569,997	32	3,593,000	32	3,593,000	32
Weslaco	10,369,106	107	9,717,000	107	1,620,000	12
Total	67,794,951	502	66,567,000	501	60,099,000	414
UTAH, Logan	9,365,518	84	9,027,000	84	8,880,000	84
WASHINGTON						
Prosser	3,778,952	28	3,506,000	28	3,326,000	28
Pullman	16,931,640	129	16,547,000	129	17,830,000	136
Wapato	4,545,944	50	4,475,000	50	4,475,000	50
Wenatchee	2,110,354	23	2,112,000	23	2,112,000	23
Total	27,366,890	230	26,640,000	230	27,743,000	237

AGRICULTURAL RESEARCH SERVICE

Geographic Breakdown of Obligations and Staff Years
2010 Actual and Estimated 2011 and 2012

Location	2010 Amount	2010 Staff Years	2011 Amount	2011 Staff Years	2012 Amount	2012 Staff Years
WEST VIRGINIA						
Beaver	7,257,186	51	7,392,000	52	- -	- -
Kearneysville	7,846,842	65	7,560,000	65	7,470,000	65
Leetown	7,111,732	35	7,172,000	35	5,405,000	35
Total	22,215,760	151	22,124,000	152	12,875,000	100
WISCONSIN, Madison	18,471,783	114	18,370,000	114	16,120,000	112
WYOMING, Cheyenne	2,366,290	24	2,318,000	24	2,318,000	24
PUERTO RICO						
Mayaguez	2,851,958	33	2,843,000	33	2,843,000	33
OTHER COUNTRIES						
Argentina,						
Buenos Aires	578,145	- -	533,000	- -	533,000	- -
France, Montpellier	3,086,472	2	3,085,000	2	3,085,000	2
Total	3,664,617	2	3,618,000	2	3,618,000	2
Extramural and Funds						
Administered from						
Headquarters-Held Funds	22,978,273	- -	54,212,000	- -	49,064,000	- -
Repair & Maintenance						
of Facilities	17,461,413	- -	17,503,000	- -	20,503,000	- -
Funds included for Homeland						
Security	[39,170,000]	- -	[39,170,000]	- -	[43,808,000]	- -
Unobligated Balance	8,299,632	- -	- -	- -	- -	- -
Subtotal, Available						
or Estimate	1,186,585,633	8,282	1,179,639,000	8,282	1,137,690,000	8,100
Miscellaneous Fees	-4,801,633	- -	- -	- -	- -	- -
Transfer from Office						
of Congressional Relations	-145,000	- -	- -	- -	- -	- -
Transfer from Health and						
Human Services	-2,000,000	- -	- -	- -	- -	- -
Total, Available or Estimate	1,179,639,000	8,282	1,179,639,000	8,282	1,137,690,000	8,100

AGRICULTURAL RESEARCH SERVICE
Salaries and Expenses

Classification by Objects
2010 Actual and Estimated 2011 and 2012

		2010	2011	2012
Personnel Compensation:				
Headquarters		$20,785,325	$20,783,000	$20,326,000
Field		543,209,038	543,158,000	531,222,000
11	Total personnel compensation	563,994,363	563,941,000	551,548,000
12	Personnel benefits	168,178,758	168,938,000	166,081,000
13	Benefits for former personnel	775,522	- -	- -
	Total pers. comp. & benefits	732,948,643	732,879,000	717,629,000
Other Objects:				
21	Travel and transportation of persons	18,403,323	18,897,000	18,340,000
22	Transportation of things	854,089	864,000	806,000
23.1	Rent payments to GSA	47,056	- -	- -
23.2	Rental payments to others	1,389,422	1,397,000	1,312,000
23.3	Communications, utilities and misc. charges	48,390,722	49,070,000	45,735,000
24	Printing and reproduction	1,482,457	1,636,000	1,390,000
25.1	Advisory and assistance services	1,034,272	1,040,000	977,000
25.2	Other services	16,249,927	17,074,000	15,975,000
25.3	Purchases of goods and services from Government Accounts	467,449	- -	- -
25.4	Operation and maintenance of facilities	35,942,436	36,603,000	33,937,000
25.5	Research and development contracts	165,057,671	166,682,000	154,886,000
25.6	Medical care	616,939	621,000	583,000
25.7	Operation and maintenance of equipment	7,576,430	7,672,000	7,153,000
25.8	Subsistence and support of persons	161,503	- -	- -
26	Supplies and materials	86,417,584	88,218,000	81,495,000
31	Equipment	39,873,269	40,609,000	37,292,000
32	Land and structures	4,956,401	5,017,000	4,680,000
41	Grants, subsidies, and contributions	16,416,408	16,512,000	15,500,000
	Total other objects	445,337,358	451,912,000	420,061,000
Total direct obligations		1,178,286,001	1,184,791,000	1,137,690,000
Position Data:				
Average Salary, ES positions		$163,404	$163,388	$159,798
Average Salary, GS positions		$68,092	$68,092	$69,622
Average Grade, GS positions		10.4	10.4	10.4

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 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:

Grass genome sequenced. ARS scientists, in collaboration with Department of Energy (DOE) and other researchers, completed the sequencing and annotation of the entire *Brachypodium* genome. A paper describing the results was published in *Nature* and the genomic information is now publically available on several databases. In addition, a project to resequence additional accessions was initiated. To date, four lines have been resequenced and the analysis of the sequences has been initiated. Knowledge of the genome sequence of *Brachypodium* and the linear order of genes in the genome relative to other grasses will help researchers improve traits in energy crops and grain species.

Increasing yield of ethanol from corn stover. One reason why cellulosic ethanol is much more expensive than corn-based ethanol is that biomass contains both hexoses, such as glucose, and pentoses, such as xylose. Corn-based ethanol is produced with brewers yeast, which converts only glucose. Although new microorganisms have been developed to convert both hexoses and pentoses to ethanol, these recombinant organisms ferment glucose preferentially and do not begin to metabolize pentoses until low glucose concentrations have been reached. As a result, fermentation times are long and the pentoses are not fully converted. To overcome these hurdles, researchers at ARS and Iowa State University co-developed a two-stage simultaneous saccharification and fermentation process. In the first stage, pentoses are released and fermented to ethanol using an organism capable of highly efficient pentose metabolism; in addition, glucose is released and simultaneously converted to ethanol with brewers yeast. Using this process, an ethanol yield of 85 gallons per ton was achieved from corn stover. If the traditional process that ferments only glucose had been used, the yield would have been only 65 gallons per ton.

Switchgrass grown for biomass energy results in significant soil carbon sequestration. The impact of growing large acreages of switchgrass on soil carbon is important in assessing the environmental consequences of biofuels production. In 1998, ARS scientists at Lincoln, Nebraska and Ft. Collins, Colorado initiated a switchgrass soil carbon sequestration study in eastern Nebraska. The study included two switchgrass cultivars, three nitrogen fertilizer rates, and two harvest treatments. In the nine years following grass establishment, soil carbon increased at rate of 0.9 U.S. tons per acre per year in plots in which best management practices were used. Biomass yields and carbon sequestration was significantly greater in plots in which nitrogen fertilizer was used than in plots where no fertilizer was applied. These results build upon switchgrass soil carbon sequestration data previously obtained in a five year study on 10 farms in Nebraska, South Dakota, and North Dakota. These finding demonstrate that growing large acreages of switchgrass will sequester significant quantities of carbon while producing high quality biofuel feedstocks.

Starch-oil composite gel fat replacer for ground meat applications. This technology was developed by scientists at Peoria, Illinois and commercialized resulting in large scale production of a fat replacer gel and reduced fat ground beef patties. Use of the gel enables the conversion of 93 to 95 percent lean beef, which tends to yield a chewy and dry cooked patty, to a low fat alternative which consistently provides tenderness, juiciness, and flavor (delivered in the lipid phase of the gel). Similar results of this technology were also demonstrated in meatballs and pork sausages. The company plans to expand the marketing of the low fat patties to large volume institutional customers as well as broaden the product line to include emulsified meat products, such as frankfurters and lunch meats. The availability of this technology, which delivers significant fat (and calorie) reduction while enhancing product quality, will ultimately enable progress in addressing consumer obesity, and increasing acceptance of healthier alternatives to traditionally high fat foods.

Commercialization of estolides as a biobased lubricant. There is a demand in the U.S. and worldwide for increased development and use of biobased products. Scientists at Peoria, Illinois developed and patented biobased lubricants called "estolides" as biobased lubricants. A private sector partner has advanced commercialization, production, and availability of the product to future customer/industry users. The first commercial production will take place in early FY 2011. Development of estolides will lessen U.S. demand on foreign oil while decreasing the amounts of petroleum-based pollutants being released into the environment.

Adapting NIRS grain technology for detecting traits of disease vectors. Engineers in Manhattan, Kansas developed a technology to measure traits of single wheat kernels using near-infrared spectroscopy (NIRS). This technology can also determine traits of single insects, such as their species and age. In cooperative work with the Centers for Disease Control (CDC) in Atlanta, Georgia and the Ifakara Health Institute in Ifakara, Tanzania, researchers demonstrated that the NIRS technology can determine mosquito species and age with about 90 percent accuracy. These findings are important in monitoring control programs and reducing the proportion of older mosquitoes that have the ability to transmit malaria. The technology has been adopted by the CDC, and researchers in England, Austria, Australia, and Tanzania.

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:

Turkey genome assembly completed for the industry. Scientists from ARS, Virginia Tech's Bioinformatics Institute and the University of Maryland's Center for Bioinformatics and Computational Biology completed the genomic map of turkey which will serve as the cornerstone for the development of sophisticated genomic technologies for the turkey industry. The turkey genome assembly was further strengthened when physical, comparative, and genetic maps built by researchers from Michigan State University and the University of Minnesota were used to match the DNA sequences to the turkey chromosomes. At completion, the original partnership expanded to include 68 scientists affiliated with 28 national and international research institutions. This project illustrates the rapid pace of genomic

sequencing technology improvements. The turkey genome was sequenced in less than a year at a fraction of the cost of the chicken or bovine genomes. The information gleaned from this project will help breeders develop improved commercial turkey lines and significantly increase genetic progress for economically important traits, increasing the value of turkey products for both producers and consumers.

Commercial genotyping tools impact bovine livestock research and the dairy artificial insemination industry. A Single Nucleotide Polymorphism (SNP) is a variation or mutation in a DNA sequence occurring when a single nucleotide in the genome differs between members of a species or paired chromosomes in an individual. SNPs are responsible for much of the genetic variation between and within a species. ARS led in the development of a low density (3000 SNPs) and a high density (777,000 SNPs) beadchip product. Their impact on the industry has been dramatic and will become more so as the cost continues to decrease for the SNP beadchips. The BovineSNP50 assay, (a beadchip with 50,000 SNPs), developed by ARS, remains the global standard for cattle genomics research and genetic prediction use, with sales surpassing 500,000 samples. ARS received the USDA Secretary's Honor Award for Excellence in 2010 for implementing genome selection in dairy cattle using these technologies. Adoption of these technologies has had a tremendous economic impact on the dairy industry and has resulted in significantly improved genetic prediction accuracies and enhanced genetic progress.

Laboratory infection models to assess pathogenesis of Viral Hemorrhagic Septicemia. Viral Hemorrhagic Septicemia (VHS) emerged as a new disease threat to fish in the Midwest in 2003. Lack of tools and infection models has hampered development of countermeasures against this disease. Over the past two years, collaborations among scientists from ARS; University of Wisconsin-Milwaukee; and the U.S. Geological Survey (USGS), Western Fish Research Center, Fish Health Laboratory have led to development of the standard model for the Midwest VHS virus strain using the yellow perch. Standardized exposure route, viral dose range, and exposure time for subsequent studies to evaluate differences in yellow perch broodstock VHS susceptibility have been determined. These methods will enable systematic testing of vaccines and development of countermeasures.

A method for determining whether piglets receive adequate colostrum from the sow. Preweaning mortality of piglets represents a substantial loss to swine producers. One possible factor contributing to this loss is the failure of neonatal piglets to obtain sufficient colostrum from the sow which can be caused by either failure of the piglet to nurse, or failure of the sow to initiate lactation. An inexpensive and rapid method, the "immunocrit," was developed and validated by ARS scientists to measure newborn piglet serum immunoglobulin G (IgG), which reflects whether a piglet has received adequate colostrum. Results indicated that immunocrit measurements are predictive of piglet mortality, and litter average immunocrit indicated the ability of the sow to transmit IgG (via colostrum production). Low immunocrit values were primarily due to the failure of individual piglets to nurse and not due to failure of the sow to produce colostrum. Litter average immunocrit can be used to identify sows that fail to initiate colostrum production enabling selection for efficient IgG transfer (presumably efficient colostrum production) from sow to piglet. The immunocrit has been adopted by industry to monitor and manage newborn piglet colostrum intake which will increase piglet survivability to weaning, increasing production efficiencies for the pork industry.

Noninvasive tenderness prediction system accurately predicts tenderness of most major beef muscles. The U.S. beef industry and the Agricultural Marketing Service (AMS) have sought implementation of standards for tenderness. ARS scientists previously developed a noninvasive method to predict tenderness of the ribeye muscle of beef carcasses based on visible and near infrared (VISNIR) spectroscopy. Under a research agreement between ARS and the National Cattlemen's Beef Association, ARS scientists determined that the existing system could also predict tenderness of other muscles of the carcass. Similar results were obtained with the application of VISNIR directly to the exposed *gluteus medius* on the anterior end of top sirloin subprimals, either during carcass fabrication or after aging. These results suggest this technology can be efficiently and cost effectively utilized by industry to control variation in tenderness which will greatly enhance consumer acceptance and consumption of U.S. beef products.

Split-pond aquaculture systems may increase catfish production by two to three times over traditional earthen ponds. A split-pond aquaculture system has been developed that may increase channel catfish production by two or three times that achieved in traditional earthen ponds. The new system splits an existing earthen pond into two unequal sections with an earthen levee and then links the two systems by circulating water that is pumped with a large, efficient, slow turning paddlewheel. Fish are held in the small section; the larger section provides waste treatment and oxygen production. Annual catfish production has averaged more than 15,000 kilograms per hectare during the study. Several commercial growers have implemented similar systems.

Improved catfish feed conversion through pond oxygen management. Dissolved oxygen (DO) is the most critical water quality parameter in warmwater aquaculture. Controlled studies on the impact of DO fluctuations on channel catfish have been lacking. ARS researchers at Stoneville, Mississippi examined the impact of DO concentrations on catfish growth, food consumption, and food conversion. Results showed that higher DO concentrations (2.5-3.0 milligrams per liter) are required for optimum food conversion and growth, and this improved growth will significantly shorten the production cycle. Increased growth resulting from improved DO management can reduce food conversion ratios from an estimated industry-wide 2.5-3.0 down to 2.0, greatly improving the profitability of catfish farming.

Development of modified live *Edwardsiella tarda and Aeromonas hydrophila* vaccines for prevention of diseases in aquaculture. ARS researchers at Auburn developed and patented *Edwardsiella tarda* and *Aeromonas hydrophila* vaccines under a Cooperative Research and Development Agreement (CRADA) with a vaccine manufacturer. These modified live vaccines can be effectively used by a bath immersion method to cost effectively immunize large numbers of fish. The new *A. hydrophila* vaccine may be especially useful in preventing huge losses of food size catfish (over one million pounds in 2009) that caused considerable economic hardship to Alabama catfish producers.

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:

Cacao genome sequenced. Cacao, the source of chocolate, is a multi-billion dollar international commodity grown by several million small farmers in tropical developing nations. Threatened by many virulent diseases and damaging pests, cacao requires new tree types with inherent resistance to pests and diseases, plus high yields and fine cocoa quality. Currently, cacao breeders lack DNA genetic markers required for rapid selection of trees with desired traits at the seedling stage, rather than at maturity. ARS scientists in Miami, Florida and Stoneville, Mississippi, with collaborators at Mars, Inc., IBM, and several U.S. universities enlisted a novel mixture of traditional and leading edge techniques to fully sequence the

genome of a particular cacao variety that shares ancestry with many of the trees grown worldwide. This genome sequence can now be compared with genetic information from other cacao varieties with different properties to rapidly identify many thousands of genetic markers, and thereby accelerate cacao genetic improvement to benefit farmers and cocoa processors globally.

New sorghum germplasm developed with improved value as a bioenergy feedstock. Sorghum use as a bioenergy feedstock can be improved by increasing biomass digestibility. ARS scientists in Lincoln, Nebraska have determined the effects of inserting and combining brown midrib mutations into a grain sorghum hybrid. These mutations lowered the content of lignin, a polymer that provides rigidity to the cell wall and hinders cell wall decomposition, in a grain sorghum hybrid. Effects of the genetic changes to sorghum biomass composition and whole plant physiology were assessed in a two year field experiment. Overall, the results demonstrated that sorghum brown midrib mutants have reduced lignin and increased biomass digestibility while having a minor impact on plant fitness and yield in hybrid backgrounds. This sorghum germplasm with reduced lignin content and increased biomass digestibility provides a new genetic resource to develop sorghum for use as a bioenergy feedstock.

HoneySweet plum conditionally registered by EPA. There are limited sources of Plum Pox Virus (PPV) resistance in stonefruits. "HoneySweet," a plum genetically engineered for resistance to PPV, which had previously been deregulated by the Animal and Plant Health Inspection Service (APHIS) and the FDA, is now conditionally registered by EPA. HoneySweet is the result of over 20 years of research by ARS researchers in Kearneysville, West Virginia and other ARS and European collaborators. It has been found to be resistant to PPV in test plots in Europe over the last 10 or more years. When commercially available, it will be the first genetically engineered disease resistant temperate fruit tree available to U.S. growers, providing a high quality, fresh market, PPV-resistant plum. It can also serve as a breeding parent to reliably and efficiently introduce the resistance trait into new plum varieties.

Development of "intragenic" potatoes containing a late blight-resistance gene. The commercial introduction of crop plants improved by using biotechnology has been limited by problems associated with public perceptions of transgenic foods. These limitations are being addressed in part by development of novel methods for in vitro genetic modification, referred to as "intragenic" technology. This method of gene introduction results in all native transgenic lines, i.e., lines that contain no foreign DNA. ARS scientists in Albany, California, in cooperation with scientists at the J.R. Simplot Co., in Boise, Idaho have successfully developed intragenic potatoes that contain a gene from wild potatoes known to confer resistance to the most devastating of potato diseases, late blight, the cause of the Irish potato famine which still plagues growers today with new, virulent genotypes. These potatoes do not contain any non-potato DNA, and were generated without using selection (i.e., they do not contain antibiotic/herbicide resistance genes as markers). Intragenic lines with late blight-resistance in the greenhouse and under field conditions will be an important option for preventing losses to late blight.

Commercialization of varroa-resistant honey bees selected for pollination performance. Varroa mites are an external parasite of honey bees and the major cause of colony losses throughout the United States. Bees with varroa sensitive hygiene (VSH), which have good resistance to varroa mites, were tested by ARS researchers in Baton Rouge, Louisiana for two seasons in a commercial migratory beekeeping operation focused on crop pollination. Bee colonies were created from VSH queens which were outcrossed, i.e., matings were not controlled, a method used by most large scale beekeepers. Bee colonies were shipped nationwide and used for spring pollination of almonds in California, apples in New York, low bush blueberries in Maine, and cranberries in Massachusetts, as well as late summer honey production in New York. VSH bee colonies performed well in terms of survival, populations, and resistance to varroa mites. The best surviving VSH bee colonies from each year were propagated to form a breeding population which had enhanced genetics for both mite resistance and behavior related to crop pollination. These bees are now being marketed by a CRADA partner (Glenn Apiaries). The use of their germplasm should improve adoption of mite-resistant bees by commercial beekeepers that pollinate crops.

New plant acid-based varroa mite treatment developed. ARS scientists in Tucson, Arizona created a formulation using plant acids that is highly effective in reducing varroa mite populations in bee colonies. These plant acids are food grade compounds and are on the FDA's "generally recognized as safe" list. The product delivery system causes bees throughout the colony to have levels of the product that result in varroa mite mortality in less than 48 hours which does not cause mortality in either adults or immature life stages nor disrupt queen egg laying or colony growth. The product does not accumulate in the wax comb and, in most cases, was not found in honey samples; when it was found it was in very low amounts, less than 100 parts per billion. The product was developed under a CRADA and is in commercial production under the name "HopGuard." This product should significantly improve mite control in a manner that is non-toxic to the bees.

Development of high oleic acid soybeans. Soybean oil can be improved for its nutritional value in human foods and for industrial biodiesel use by altering its fatty acid composition. Vegetable oils with high oleic acid contents are desirable for the health benefits of the monounsaturated fatty acids which have recently made olive and canola oils very popular. High oleic acid content also dramatically improves oxidative and temperature stability of the oil, and improves cold flow properties in diesel engines. ARS scientists in Columbia, Missouri identified and combined mutant alleles of two soybean fatty acid desaturase genes resulting in high oleic acid soybean oil. The researchers developed a technology to directly select the genes conferring the desired fatty acid profile, thus accelerating the rate at which new soybean varieties containing this important trait can be made available to producers.

New genetic information on corn kernel quality traits. Information on the genes and the genomic regions that control corn quality, including kernel starch, protein, and oil content, is needed by researchers to improve the nutritional and product quality of corn products. ARS researchers in Columbia, Missouri analyzed the kernel content of over 5,000 recombinant inbred lines from diverse types of corn. The lines were grown in seven locations. Researchers then used 1.6 million molecular markers and statistical analyses to identify regions of the genome that control each of the three kernel traits. The research resulted in successful identification of many genetic variants that strongly affect each kernel trait. Notably, new corn lines with a wide range in oil quality were identified. These results provide new tools and genetic resources to develop new corn lines and hybrids with a wide range of oil, starch, and protein content.

Discovery of the two genes responsible for the soybean low phytate trait. Much of the phosphate in soybean seeds is present as a component of phytic acid, an anti-nutritional factor which impedes the bio-availability of inorganic elements in food and feed containing soybean. This presents contamination issues via runoff from animal waste disposal. Determination of the molecular genetic basis of a soybean line containing the low phytate trait by ARS scientists in Columbia, Missouri resulted in the discovery of two mutant genes that lower phytate by acting in combination. An additional low phytate soybean line was also characterized and found to contain a dramatic mutation in one of the genes. A method was developed to directly select for the mutations discovered. Application of this method should simplify development and release of soybean varieties with improved nutritional quality as a trait important for feed and food applications. Such varieties would have a significant impact on the livestock protection industry.

A broccoli gene that impacts nutritional content in vegetable crops. Selenium is an essential trace mineral. Both biosynthesis and volatilization of selenium compounds affect the accumulation of the bioactive forms of selenium in crop plants. Broccoli accumulates high level of bioactive forms of selenium. To reduce selenium volatilization for producing healthy and more nutritious crops, ARS scientists in Ithaca, New York isolated a novel broccoli gene whose product mediates selenium volatilization, and utilized this knowledge to manipulate the nutritional value of crops via reduced nutrient loss due to natural volatilization. This discovery opens up new avenues toward increasing the accumulation of bioactive compounds in plants.

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:

Toxigenic E. coli in produce growing areas in California. Many outbreaks of fresh produce associated foodborne illness have been linked to California's Salinas Valley, which has been called "the salad bowl of the world." The initial source of the contamination in outbreaks of E. coli O157 linked to leafy greens produced in the Salinas Valley remains unknown. There has been a need to establish a baseline for the environmental prevalence of E. coli O157 and non-O157 E. coli in this important agricultural region. In collaboration with the University of California, Davis, and the California/USDA Animal and Plant Health Inspection Service Wildlife Services, ARS researchers at Albany, California isolated over 3,000 strains of E. coli O157 and non-O157:H7 Shiga-toxin-positive E. coli from 12,000 samples from water, animals and their feces, crops, and soil, and have determined the pathogens' genotypes and virulence gene profiles. ARS has submitted data to the FDA and to the CDC PulseNet. Data indicates that O157 and non-O157 E. coli prevalence varies considerably among sources, with the highest prevalence associated with cattle feces (7 percent and 33 percent, respectively), but that other animal species are also a significant source of the pathogens. This information, which provides the industry and public health agencies with the first epidemiological data for E. coli in the Salinas Valley, will be used to develop good agricultural practices for produce production.

Assays for ricin and clostridium botulinum toxins. The potential use of ricin and botulinum neurotoxins as bioweapons in foods highlights the necessity for developing detection methods that work well for food samples. ARS scientists in Albany, California validated a new ARS method for the detection of ricin in economically important food matrices. The method exploits the specificity of antibodies with the enormous amplification provided by the polymerase chain reaction (PCR) technique, to enable measurement of about one billionth of a gram of this toxin in a golf ball sized portion of food. ARS scientists also developed a sensitive test for botulinum neurotoxin serotype B, the second most common form of this toxin. The test uses new monoclonal antibodies developed in the Albany laboratory and could detect less than one billionth of a gram of toxin in a teaspoonful of milk. This neurotoxin assay is 50 times more sensitive than the standard mouse bioassay. These two technologies could be used in regulatory laboratories by investigators seeking the source of foodborne contaminants and by the DHS and related agencies to assure the safety of the food supply.

Mycotoxin biological control agents native to Africa. Aflatoxins are potent fungal toxins that frequently contaminate foods. Improved methods to prevent aflatoxin contamination are needed particularly in the United States and Africa. To date, the most successful strategy for limiting aflatoxin contamination of crops is a biocontrol where atoxigenic strains of *Aspergillus flavus* (strains that lack the ability to produce aflatoxins) competitively exclude aflatoxin producers from environments where crops are grown. In the U.S., atoxigenic strains native to North America are commercially available for aflatoxin management. In several African nations the staples, corn and peanuts, frequently are contaminated with aflatoxins; humans there consume unsafe aflatoxin levels. ARS researchers in Tucson, Arizona, in collaboration with colleagues at the International Institute of Tropical Agriculture, Nigeria and the University of Arizona have selected atoxigenic strains of *Aspergillus flavus* useful in biological control. Tests of the Nigerian strains in farmers' fields in Nigeria demonstrated excellent efficacy at reducing contamination. The research demonstrates that effective atoxigenic strains can be isolated even from areas with severe contamination. The identified strains are a potential resource for reducing human exposure to aflatoxins in both East and West Africa. Advances made in biological control in Africa will help optimization of biocontrol in the U.S. and serve to improve food safety and security worldwide. These scientific endeavors are strongly supported by various agencies within the USDA, the Gates Foundation, the European Commission, and the World Health Organization (WHO).

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:

Babesiosis and horses. Equine piroplasmosis is a disease caused by blood parasites of the babesia family. It is considered a foreign animal disease in the United States and every effort has been made to prevent its entry into the U.S. horse population. The presence of this organism would prove very expensive to the equine industry due to blocking the export and importation of horses. During 2010 the U.S. encountered the reemergence of babesiosis, also known as piroplasmosis in the equine population. Babesiosis in horses is caused by two distinct parasites, *Babesia equi* and *Babesia caballi*. In order to begin developing strategies to control and re-eliminate the organism for the U.S. equine population and in response to the needs of the APHIS, scientists developed a method to eliminate persistent infection and transmission risk from horses infected with *Babesia caballi.* This has proven critical to the equine industry as it has resulted in owners of infected horses being able to treat their horses to enable them to resume their prior functions. In contrast the second parasite, *Babesia equi*, has proven more difficult to clear from infected horses.

Research by scientists has resulted in the sequencing and annotating the genome of *Babesia equi*. It was discovered that this parasite is taxonomically between other Babesia organisms and a different blood borne parasite, Thieleria. The genetic information also determined that *Babesia equi* lacks a gene family that produces a classical antigenic variation. This discovery will enable scientists to begin further research exploring and developing alternative intervention strategies to control this foreign disease entity in the U.S. equine population.

Foot-and-Mouth Disease Virus in cattle. It is well established that the respiratory tract is the most important route of infection of Foot-and-Mouth Disease Virus in cattle. However, conflicting data from different research groups have implicated regions of either upper respiratory tract (nasopharynx) or lower respiratory tract (lungs) as the primary sites of infection. Recent work by scientists at the Plum Island Animal Disease Center has demonstrated that after aerosol exposure to the virus the early pathogenesis events involve: (1) primary replication in epithelial cells of the pharyngeal mucosa-associated lymphoid tissue crypts and (2) subsequent widespread replication in pneumocytes in the lungs, which coincides with (3) the establishment of sustained viremia. This infection model demonstrated that massive viral amplification occurs in the lungs (with associated shedding to the environment) prior to appearance of the first vesicle. Viremia is established coincidently with further viral amplification in the lungs and at lesion (vesicle) predilection sites. This scientific information is critical to the development of Foot-and-Mouth Disease countermeasures as it is critical that prophylactic products target these previremic events in the pharynx and lungs. Based on this information, it is speculated that enhancement of mucosal immunity has a high probability of improving protection. Once viremia is established, on an individual animal basis, the battle has already been lost. Continued efforts to improve the understanding of virus host interactions during early phases of infection will greatly contribute to the development of effective tools to block viral infection.

Brucella suis infection in cattle. The elimination of *Brucella abortus* from cattle in the United States was the result of a national eradication program that began in 1934 with total costs exceeding 10 million dollars. Although several wildlife reservoirs remain a threat for reintroduction, ongoing monitoring activities are designed to detect any transmission events to domestic cattle. Although *Brucella abortus* has been largely eliminated from domestic cattle, the prevalence of *Brucella suis* in feral swine has emerged as a significant problem for domestic cattle. *Brucella abortus* infection of cattle is a regulatory issue and can lead to the loss of a State's brucellosis-free status and economic costs to producers and State regulatory agencies. Feral swine populations continue to increase in the U.S. and illegal transportation continues to expand their range into new States or regions. Contact with infected feral swine has led to *Brucella suis* infections in a large number of cattle, particularly in the south and southeastern United States. Cattle infected with *Brucella suis* test seropositive (indicating previous exposure) on brucellosis surveillance tests and antibody responses cannot be readily differentiated from those due to infection with *Brucella abortus*. At this time, data is lacking on the time course for the antibodies to *Brucella suis* in the serologic responses of cattle after acute infection. In many States, vaccination for *Brucella abortus* using the vaccine RB51 is still utilized in domestic cattle. However, the efficacy of RB51 vaccination in protecting cattle against *B. suis* infection is unknown. In this study the serologic responses of cattle to *Brucella suis* infection and lesions and tissue localization of *Brucella suis* in pregnant RB51-vaccinated and control cattle after experimental challenge was assessed. The *Brucella* species remains an important disease in some areas of the United States. This study found that there was variation in the ability of various brucellosis screening or confirmatory tests in detecting infection of cattle with *Brucella suis.* Although experimental challenge with *Brucella suis* did not cause abortions in cattle, there was an increased incidence of retained placentas. In addition, cattle vaccinated with RB51 were not protected against *Brucella suis* infection. There was a high occurrence for *Brucella suis* to be found in the mammary gland with shedding in milk increasing the potential of transmission to humans. Research is ongoing to further develop vaccines strategies against *Brucella suis* in swine and cattle.

Monovalent vaccine for Swine influenza A virus. The gene constellation of the 2009 pandemic A/H1N1 virus is a unique combination from swine influenza A viruses of North American and Eurasian lineages, but prior to April 2009 this new and emerging virus had never before been identified in swine or other

species. Although its hemagglutinin gene is related to North American H1 swine influenza A virus, it is unknown if vaccines currently used in U.S. swine would cross protect against infection with the pandemic A/H1N1. Scientists in Ames, Iowa evaluated the efficacy of inactivated vaccines prepared with North American swine influenza viruses as well as an experimental homologous A/H1N1 vaccine to prevent infection and disease from 2009 pandemic A/H1N1. All vaccines tested provided partial protection ranging from reduction of pneumonia lesions to significant reduction in virus replication in the lung and nose. The multivalent vaccines demonstrated partial protection, however, none were able to prevent all nasal shedding or clinical disease. An experimental homologous 2009 A/H1N1 monovalent vaccine provided optimal protection with no virus detected from nose or lung at any time point. Based on cross protection demonstrated with the vaccines evaluated in this study, the U.S. swine herd likely has significant immunity to the 2009 A/H1N1 from prior vaccination or natural exposure. However, consideration should be given for development of monovalent homologous vaccines to best protect the swine population, thus limiting shedding and the potential transmission of 2009 A/H1N1 from pigs to people.

Survey of cattle parasites and resistance to drug therapy. Intestinal parasites have been a problem for livestock for many years. Conservative estimates are that gastrointestinal parasites cost the American cattle industry over $2 billion dollars per year. This cost is based on the treatment with chemicals (anthelmintics) to kill intestinal worms and the decreased productivity and growth of livestock infected with parasites. This easily makes gastrointestinal worms or nematodes the most costly parasitic infection of American cattle. Although the drugs currently used to control cattle intestinal worms worldwide are generally effective and safe, global resistance by parasites to drugs is rapidly on the rise. A national survey of cattle intestinal parasites and their response to anti-parasiticide treatment was conducted in collaboration with the APHIS and two university collaborators. The results of a study of randomly selected cattle operations demonstrated a wide distribution of resistance to anthelmintic treatment. In nearly all cases, the species of parasite was Cooperia species, in particular *Cooperia punctata*. While historically this parasite was a minor species infecting cattle, with the emergence of resistance to anti-parasiticide treatment, it has become a predominant pathogen. These results demonstrate that overuse of anthelmintics has not only selected for drug resistant intestinal parasites, but has also changed the population dynamics of parasites on pasture and has resulted in a species with increased ability to cause damage to livestock. These results clearly demonstrate that there has been a rapid rise in the prevalence of cattle gastrointestinal parasites that are resistant to some of the most commonly used anthelmintics. Additional research is being conducted to assess potential genetic markers that can be used to identify anthelmintic resistant parasites which will aid in developing new intervention and control strategies to control important species of intestinal parasites in cattle.

A potential savings by strategic releases of screwworm flies. The screwworm fly lays eggs in wounds and then burrows into the flesh of humans, cattle, and other mammals, often with fatal results. This horrific pest was eradicated from the entire continent of North America by systematic release of sterile males. A barrier of sterile males continuously released in Panama prevents reintroduction of the screwworm fly from South America. Scientists in Kerrville, Texas and Panama reviewed and analyzed release technologies to improve screwworm fly dispersal relative to where, when, and how many sterile flies are released in the barrier zone. Quantitative calculations were based on screwworm biology and modeling of results as well as application of global information systems. Recommendations with supporting data presented to the Panama – U.S. Commission for Eradication of Screwworm would: (1) result in updated equipment on-board dispersal aircraft, (2) strategically reduce the number of flies dispersed, and (3) save up to $1 million in Federal funds annually. Recommended improvements to the navigational software and equipment are currently being implemented by APHIS' International Services and the Panama – U.S. Commission for Eradication of Screwworm.

Vaccines to stop the cattle fever tick. Cattle fever ticks are a worldwide pest of cattle that decimate the industry by the bleeding to death of animals, and by transmission of key diseases like babesiosis and anaplasmosis. These diseases not only reduce the efficiency of production, they also prevent trade in live animals. The cattle fever tick is a current threat to international food security and an imminent threat to the cattle industry in the southern United States where the tick was eradicated between 1907 and 1943.

Scientists in Kerrville, Texas, collaborating with scientists from EMBRAPA (the Brazilian Agricultural Research Corporation) identified two anti-cattle tick vaccine candidates in cattle trials. These candidates had been prioritized in a prior ARS project through bioinformatic and molecular biological approaches. In the cattle trials conducted in Brazil, the candidates outperformed the recombinant Bm86 Campo Grande antigen which is an antigen similar to that used in the only current commercially available anti-tick vaccine. An invention disclosure was filed; cattle trials are scheduled to evaluate various parameters in the vaccination protocol to optimize efficacy. The worldwide use of a consistently effective anti-tick vaccine in cattle would reduce production costs associated with tick treatment, increase the ability of under-developed countries to feed the hungry, and contribute to the maintenance of the eradication of cattle fever tick in the United States.

Gene silencing, a novel method for mosquito control. Toxicants with new modes of action and high specificity are being investigated for mosquito control. Using gene silencing technology or RNA interference (RNAi), scientists in Gainesville, Florida have designed molecules that inhibit expression of critical proteins in mosquitoes that result in mortality. It was shown that these molecules can be delivered to adult mosquitoes through the cuticle, with other possible delivery methods under investigation. A new CRADA with industry will enable large scale production of RNAi molecules to investigate new carriers and delivery methods to mosquitoes. This technology will provide completely safe insecticides based on natural chemicals and will be easily modified for different purposes.

Cutting edge genomics applied to stable fly control. Scientists in Kerrville, Texas have used more streamlined methods of gene identification to find 21 genes associated with host seeking and egg laying in stable flies, including the first olfactory and taste receptors to be reported for this significant livestock pest. They were also able to find the specific change in a gene that results in resistance to the commonly used veterinary pesticide, permethrin. Through laboratory selection, University of Florida researchers previously obtained a 15-fold resistance to permethrin in a strain of stable flies. In collaboration with researchers in Gainesville, Florida an ARS scientist at Kerrville, Texas identified a mutation in the stable fly sodium channel gene that associates with the observed resistant phenotype. Among the many potential products from these discoveries are highly specific molecular pesticides, design of chemicals that alter stable fly behavior, and methods for field detection of insecticide resistance.

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:

Mystery of the life cycle of wheat and barley stripe rust solved and protected wheat varieties released. Stripe rust (also called yellow rust) of wheat and barley causes significant wheat and barley crop losses

worldwide but the life cycle of the rust fungus has long baffled scientists. ARS scientists in St. Paul, Minnesota have made the first identification of an alternate host for any type of stripe rust pathogen by demonstrating that several species of barberry serve as alternate hosts for the cereal rust. Stripe rust is known to be one of the most variable cereal rust pathogens. This discovery suggests that recombination on susceptible barberry species is playing a key role in contributing to pathogen variability. This information can assist crop breeders in developing entirely new strategies to protect cereals from stripe rust losses. Another advance in cereal stripe rust protection was made by ARS researchers at Pullman, Washington who exploited stripe rust resistance assays and molecular markers to develop more than 10 new stripe rust-resistant wheat varieties.

New varieties of table grapes and raisins with high fruit quality and Pierce's disease resistance. Introduction of Pierce's disease resistance from wild grape species into table grapes and raisins results in small berries and poor fruit quality. ARS scientists in Parlier, California have used traditional breeding techniques to generate desired *Vitis vinifera* table grape and raisin varieties that retain Pierce's disease resistance from the less desired grape, *Vitis arizonica*, but that have fruit of high vinifera quality. The current advanced selections will be developed into new table grape and raisin cultivars with Pierce's disease resistance.

Multiple approaches are being used to combat the citrus greening disease. It is difficult to cultivate the bacteria (*Candidatus Liberibacter asiaticus*) presumed to cause Huanglungbing (HLB) or citrus greening disease and in propagating and maintaining a large number of HLB-infected plants. Recent advances by ARS scientists in Fort Pierce, Florida include: identifying a combination of two chemicals that eliminates the pathogen associated with citrus HLB in the plant; developing a method for rapid detection of the presumed pathogen; and fully sequencing the genome of the presumed pathogen. These new developments will greatly facilitate HLB research and the development of new strategies for control of this devastating disease.

Identification of the causal agent associated with the almond brown line disease. Almond brown line disease was discovered in California in the 1990s as a graft union disorder in almonds grown on plum rootstock in orchards on marginal land. When the trees are infected by Peach yellow leafroll phytoplasma, a bacterium without cell walls, they develop a brown necrotic line at the graft union resulting in tree death. It has been difficult to prove the association of phytoplasma in infected almond trees because of the absence of a suitable detection assay. ARS scientists in Davis, California developed a molecular assay and successfully detected this phytoplasma in almond extracts. This assay will be used to monitor the trees in a commercial orchard impacted by almond brown line disease.

Mobile pathogenicity chromosomes identified that explains how harmless fungi can change into plant killers in wheat and barley scab. Keeping plants healthy is all about keeping one step ahead of the microbes that can harm them. Fungi that cause plant disease have an uncanny knack for changing and overcoming disease resistance genes that scientists work so hard to breed into plants. Fusarium species are among the most important pathogenic fungi and include *Fusarium graminearum* that causes wheat Fungal Head Blight or scab. Using comparative genomics, ARS researchers in St. Paul, Minnesota have determined that Fusarium fungal pathogens have the unusual ability to pass particular chromosomes between strains and convert harmless fungi into pathogens. This process explains why new strains of fungi can arise quickly and threaten crops. The discovery means scientists can now start working on a means to thwart the trading of chromosomes and the disease causing ability that comes with them.

Insect and mite systematics help safeguard the Nation's agriculture. Invasive species cause hundreds of billions of dollars in losses in the United States each year. Systematics collections are essential for addressing these threats. During the past year, ARS scientists in Beltsville, Maryland used these insect and mite collections to conduct 46,000 identifications, including over 6,000 considered urgent by APHIS, from specimens collected at U.S. ports. The researchers produced electronic identification tools for invasive fruit flies; descriptions of new parasitic wasps that attack leaf-mining flies and other wasps used for biocontrol of the invasive weed, Old World climbing fern; and identification of flea beetles used for

biocontrol of other invasive weeds. In addition, this research produced additional knowledge on moths that is assisting in the "Discover Life in America" effort documenting life in the Great Smoky Mountains National Park. The scientists also are discovering clues to host-parasite evolution through leaf-mining fly systematics, and conducting extensive biological and ecological studies of a new parasitic wasp found on the important invasive emerald ash borer. These applications are being used to prevent the introduction of new invasive species and manage established ones.

New control solutions for aphids developed based on neuropeptide hormone technology. Pest aphids cause hundreds of millions of dollars of crop damage every year; many populations have already acquired resistance against insecticides used for control. ARS researchers at College Station, Texas, in cooperation with British colleagues, developed an entirely new approach for the control of pest aphids. The technology is based on developing versions of natural aphid hormones (known as neuropeptides) that resist metabolism (inactivation) by natural aphid body enzymes. Natural neuropeptides in aphids and other insects regulate critical life processes, such as water balance and digestion. Some of the neuropeptide "mimics" developed by this work match or even exceed the potency of current insecticides used in aphid control. While the development of commercially viable neuropeptide technology for aphid control has not yet been realized, this accomplishment is moving the research forward and is catalyzing related work by other scientists in industry, academia, and government.

Newly designed cover crop roller-crimpers results in minimal weed management inputs for soybean production. The use of zero-till systems for weed management continues to be a major goal in achieving sustainable organic crop production systems. ARS scientists in Urbana, Illinois have demonstrated that the use of newly designed cover crop roller-crimpers results in minimal weed management inputs for soybean production. This newly designed cover crop produces soybean yields similar to that of chemically terminated cover crops followed by post-emergent applications of the herbicide glyphosate. Other accomplishments by ARS scientists in Beltsville, Maryland demonstrated that the combination of early weed suppression by rye mulch, with the late weed suppression of densely sown soybeans, can provide high levels of soybean production. These results are leading to more effective and sustainable zero-till systems for organic cropping systems.

Discovery and release of biological control agents of invasive species in Florida. Florida has been hit hard by invasive species because of its subtropical climate. State and individual water management districts actively attempt to manage select invasive species of plants that threaten natural habitats using a combination of mechanical, chemical, and biological control, and through the development of natural enemies of invasive weeds and insect pests. In many cases, that involves finding biological control agents in the native range of the invasive species. When biological control is successful, it solves the weed or pest problem without the addition of chemicals to the environment and sustains itself through the creation of a natural balance between species. ARS scientists at the Australian Biological Control Laboratory in Brisbane, Australia, the South American Biological Control Laboratory in Buenos Aires; Argentina, and the Invasive Plant Research Laboratory in Fort Lauderdale, Florida developed natural enemies against key invasive weed species in Florida. This included the establishment of a gall fly population, *Lophodiplosis trifida*, as a new biological control agent of the melaleuca paperbark tree; the discovery of a rove beetle that attacks skunkvine, an invasive weed that displaces native vegetation; and the completion of years of research to successfully release a new leafhopper biological control agent of waterhyacinth in Florida. These achievements will help preserve the native vegetation and wildlife in Florida at low cost and with minimal management in the future.

Development of data to support the registration of pesticides for specialty crop uses. Growers of specialty crops such as fruits, vegetables, mint, hops, herbs, spices, and other minor acreage crops generally lack the pesticides that are available for major acreage crops such as corn, wheat, and other small grains, soybeans, and cotton. Pesticide manufacturers do not have the economic incentive to develop the data for labeling pesticides for their uses on these minor acreage crops which are generally grown on less than 300,000 acres per crop. ARS participates in a State-Federal program known as IR-4 to assist in the development of data to support pesticide residue tolerances established by the EPA, used by the pesticide registrants to add the

crops as approved uses. In 2010, ARS scientists established 137 pesticide/crop combinations at field locations in seven States (South Carolina, Arizona, California, Georgia, Washington, Texas, and Ohio) to treat with pesticides. In laboratories in Beltsville, Maryland; Wapato, Washington; and Tifton, Georgia, ARS scientists analyzed 163 pesticide/crop combinations for pesticide residue tolerances. ARS contributed data for pesticide residue tolerances on 26 specialty crops and 15 pesticides that can be used by registrants to label these as available to specialty crop growers.

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:

Adequate vitamin D reduces the risk of falls in the elderly. Falls are a major cause of fractures and other injuries in the elderly. Vitamin D deficiency was determined to be a major risk factor for falling. Conversely, supplementing the diet with vitamin D and correcting vitamin D deficiency, combined with moderate home-based exercise, significantly decreased the risk of falling. Scientists at the ARS laboratory in Boston, Massachusetts conducted a meta-analysis on all available data and concluded that at least 700 international units of vitamin D was needed daily. These data were recently used by the National Academy of Science's Institute of Medicine to increase the recommended amount of vitamin D for people over the age of 70.

Moderate exercise alone does not increase overall energy expenditure in teens. In the debate over the relative roles of diet and exercise in controlling weight, it is unclear what effect each has on maintaining healthy body weight. Researchers at the ARS laboratory in Houston, Texas found that 12 weeks of moderate intensity exercise for 30 minutes four times per week in lean and obese sedentary adolescents did not change overall energy expenditure. Fat oxidation increased in the lean subjects. However, fat accumulation in the liver and abdomen decreased in obese adolescents. The data suggests that even more exercise and/or calorie restriction is an essential component of a successful weight loss strategy and that obese teens require more exercise than their lean counterparts to increase fat burning.

A variation in a common gene is associated with food intake and obesity. The epidemic of obesity and overweight has resulted in a critical need for methods of predicting risk to an individual as well as predicting the possible benefit of therapeutic interventions. ARS funded researchers in Boston, Massachusetts conducted a large study to investigate the role of variation in a specific gene (APOA2 - 265T) for regulation of food intake and body weight. People carrying this genetic variation only developed obesity when they consumed a diet high in saturated fat. This finding will contribute to efforts to identify individuals susceptible to diet induced obesity, and will ultimately allow for specifically tailored dietary recommendations to reduce their risk of obesity and cardiovascular diseases.

New national dietary intake results, data briefs, and database released. ARS scientists at Beltsville, Maryland released nationally representative information for 2007-2008 from the "What We Eat in America" diet survey portion of NHANES for use by other researchers. In addition, 36 data tables summarizing those results and data briefs on milk consumption and adolescent snacking provide useful information to researchers, clinicians, and policymakers. A new version of the "USDA Food and Nutrient Database for Dietary Studies (FNDDS)," along with a search tool to use FNDDS, were also made available to other government agencies that enable them to calculate nutrient intakes from food consumption data. All of these products provide the most accurate and current knowledge of food and nutrient intake in the U.S.

Controlling stress may result in selection of a better diet. The roles of stress or stress hormones and their relationship to food choices and body weight/body composition of middle aged women are unknown. ARS researchers at Davis, California found that greater perceived stress was associated with lower fruit, vegetable, and protein intake; greater consumption of salty snacks; lower participation in physical activity; and a higher intake of sweets, particularly in those with type 2 diabetes. Many of these effects were related to concentrations of the hormone cortisol. These findings demonstrate that stress reactivity influences food choice and food intake, and that controlling stress may have a large impact on factors associated with obesity.

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 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.

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 land research includes the conservation and restoration of the Nation's range land and pasture ecosystems and agroecosystems through improved management of fire, invasive weeds, grazing, global change, and other agents of ecological change. The agency is currently developing improved grass and forage legume germplasm for livestock, conservation, bioenergy, and bioproduct systems as well as grazing-based livestock systems that reduce risk and increase profitability. In addition, ARS is developing whole system management strategies to reduce production costs and risks.

Selected Examples of Recent Progress:

Climate change affects intermountain hydrology. A variety of studies have demonstrated links between increasing temperatures, declining snowpacks, and earlier streamflow in snow fed streams in the western U.S., but in all of these studies the linkages are based on observations collected from multiple locations. ARS scientists at the Northwest Watershed Research Center in Boise, Idaho analyzed 45 years of air

temperature, snow, precipitation, and streamflow data measured at the same location, the Reynolds Creek Experimental Watershed. Over the period of record, average air temperature has increased about two degrees centigrade, snow disappears more than a month earlier at lower elevations, and while total annual precipitation has remained constant, the onset of streamflow now occurs earlier in the season. Because they demonstrate the inadequacy of current management approaches, these changes have major implications for reservoir management in the West where the vast majority of agriculture is irrigated.

Potential of drainage water management to improve water quality in the midwestern U.S. quantified. Drainage water management (DWM) is a promising technology for reducing nitrate losses from artificially drained or "tiled" fields. While there is an extensive history for the practice in North Carolina, little is known about the efficacy or cost effectiveness of the practice under Midwest conditions where artificial drainage is widely used. ARS scientists at Ames, Iowa used soil and land cover databases combined with modeling to estimate that 4.8 million hectares of land currently used to grow corn in the Midwest would be suitable for DWM, with the potential to reduce nitrate loss by approximately 83,000 metric tons (91,300 tons) per year. Considering the cost of control structures, redesign of new drainage systems, and payments to farmers to adjust the control structures to reduce nitrate losses, the cost per kilogram of nitrate reduced in drainage water for DWM was estimated at $2.71 ($1.23/lb). This information will be useful to farmers and State and Federal action agencies in setting priorities for the expenditure of conservation monies to improve surface water quality.

No evidence found that Bt corn residues decompose more slowly than non-Bt residues. ARS scientists at Brookings, South Dakota have completed a series of studies published in three papers that found no evidence that the decomposition of corn residues was linked to the presence of the Bt gene in the corn hybrid. These studies examined multiple corn hybrids from a single manufacturer, hybrids from different seed manufacturers, and hybrids grown under conditions of differential insect pressure. With the rapid expansion of genetically modified crops, controlled studies evaluating the potential for unintended effects due to genetic modification provide a firm basis for evaluating the advantages and disadvantages of this technology.

Corn yield increased by applying fertilizer with strip tillage. Strip tillage is a conservation practice that can incorporate fertilizer into the soil while leaving much of the surface undisturbed. This tillage practice can potentially increase corn yield by applying fertilizer directly beneath the corn row. ARS researchers at Kimberly, Idaho determined that applying nitrogen and phosphorus fertilizer with strip tillage increased corn yield on eroded soils 12 percent compared to broadcast fertilizer application, and 26 percent compared to surface banding with the planter. Reduced tillage costs and potential increased corn yield with strip tillage could increase the economic productivity of eroded land in the Pacific Northwest.

New method to "fingerprint" particulate matter emitted from cattle feedlots. Current methods to evaluate particle concentrations from cattle feedlots fail to identify the sources, thus limiting progress towards strategies to reduce particulate emissions. Using Raman microscopy methods, ARS scientists from Beltsville, Maryland examined the chemical profile of individual particles captured downwind from a cattle feedlot and compared them with the chemical profiles of particles taken from potential sources within the feedlot. Positive matches enabled sourcing of airborne samples to a specific location within the field lot. This approach can be used to determine the most important sources of particles to the total particle emission flux. Detailed information on particle sources will be useful for evaluating the efficacy of existing and future improved dust management practices.

Rising atmospheric CO2 favors weedy rice over cultivated rice. Rising atmospheric CO2 increases the growth of many crops and enhances the growth of weeds. Weedy red rice is a troublesome weed in cultivated rice fields that reduces the quantity and quality of rice harvested for food. Research showed that weedy red rice growth increased more with additional CO2 than cultivated rice. Further, higher CO2 increased the ability of weedy red rice to compete with cultivated rice to the detriment of rice yield. These results document greater susceptibility of rice production to in-field competition from greater weed vigor

driven by rising atmospheric CO2, and highlight the need to assess the combined impacts of increasing atmospheric CO2 and rising air temperatures on global rice production.

Recovering phosphorus from solid manure. ARS scientists in Florence, South Carolina developed a process called "quick wash" to recover phosphorus and reduce its impact in poultry litter. This technology provides an alternative poultry litter management when application onto land is not an option in areas such as Georgia, North Carolina, and Chesapeake Bay. The quick wash technology is comprised of a process to form a concentrated phosphorus solid material, and a washed poultry litter residue containing low phosphorus with most of the original organic carbon and nitrogen. This technology will help the poultry producer to better manage manure and nutrient on their farms. It can facilitate economic phosphorus transport in concentrated form from areas where it is in excess to areas where it is needed for its effective utilization as plant fertilizer. Renewable Organics LLC has applied for exclusive licensing of ARS patent rights.

Manure nutrient losses are reduced by stiff-stemmed grass hedges. ARS scientists in Lincoln, Nebraska measured the effectiveness of narrow grass hedges in reducing runoff nutrient transport from sites on which beef cattle manure was applied to meet 0, 1, 2 or 4-year corn phosphorus requirements. Manure application rate significantly affected the transport of phosphorus in runoff on the treatments without a grass hedge. However, phosphorus transport on the treatments where manure was applied to plots containing a grass hedge was similar to the treatments that did not receive manure. This research indicates that stiff-stemmed grass hedges reduce the transport of nutrients in runoff occurring soon after manure application, and an adoption of grass hedges would decrease phosphorous runoff into streams and enhance water quality.

Native grasses from Northeastern CRP lands for biofuel production. Concerns about finding sufficient land for biofuel production have led to the evaluation of Conservation Reserve Program (CRP) lands as potential production sites. An extensive study by ARS scientists at University Park, Pennsylvania of grassland sites across major northeastern ecoregions determined the effects that plant species composition, diversity, above ground biomass, and chemical composition had on potential biofuel yield. The study found that CRP lands with a high proportion of native warm-season prairie grasses have the potential to produce more than 600 gallons of ethanol per acre while still maintaining the ecological benefits of grasslands.

Water savings from conservation tillage of peanut and cotton. ARS scientists at Dawson, Georgia demonstrated that the use of conservation tillage for peanut and cotton lowered crop water usage by 20 percent versus conventional tillage while crop yield and quality were maintained. Conservation tillage also resulted in lower emissions and lower production costs.

Annual forages are profitable alternatives to summer fallow in semi-arid dryland farming operations. Economics are driving the replacement of wheat-summer fallow cropping systems by diversified and continuous (every year) cropping systems in dryland crop production areas of the semi-arid Northern Great Plains. A five year study conducted by ARS scientists at Sidney, Montana showed that replacement of the summer fallow with annual spring-seeded forage crops resulted in less water and nitrogen for the following wheat crop. Durum grain yields were reduced by 10.8 bushels per acre. However, annual forage yields averaged 2.5 tons per acre and greatly reduced herbicide use resulting in annualized net returns in the three annual forage-durum systems of $51 (forage barley), $31 (forage barley inter-seeded with field pea), and $14 (foxtail millet) per acre greater than for fallow-durum.

Effective methyl bromide alternatives demonstrated in production of raspberry nursery stock. Raspberry nurseries have relied on pre-plant fumigation with methyl bromide to produce approximately seven million plants annually for an annual fruit crop worth about $278 million. Methyl bromide is used to control plant pathogens, weeds, and nematodes which would severely reduce the quantity and quality of the crop, but use of this fumigant is being phased out worldwide under the Montreal Protocol. ARS researchers in Davis, California tested fumigant alternatives to methyl bromide, including Inline® (1,3-D+chloropicrin formulated for drip application), Telone C35® (1,3-D + chloropicrin, shank-applied), Midas® (iodomethane + chloropicrin, shank-applied), and plastic mulch sealing films at an experiment station and

three commercial nurseries in California and Washington. These combinations emerged as effective alternatives to methyl bromide and chloropirin, and matched the methyl bromide standard for plant production and pest and pathogen control. Virtually impermeable film (VIF) generally improved efficacy of the alternative fumigants compared to standard high density polyethylene, but solarization was not effective. Transition from methyl bromide to Midas®, although technically feasible, may be complicated by uncertain registration status and relatively high material cost. However, Telone C35®, especially in combination with VIF, was validated as an effective methyl bromide alternative for raspberry farmers and nurseries.

Low permeable films reduce fumigant emissions. In comparison with the use of standard polyethylene films, the use of low permeability films enables lower doses of fumigant to be used and also reduces the amount of fumigant, which might cause unintended environmental damage. A new low permeable film, referred to as totally impermeable film or "TIF" effectively reduced fumigant emissions in laboratory tests. ARS scientists in Parlier, California conducted a large field trial to test the new film for reducing fumigant emissions. The TIF peak emission rate was as much as 10 times lower than that from standard polyethylene (PE) film. Over a six day field covering period, the total emission loss with TIF was reduced below two percent of total fumigant applied, compared to 30 percent emission with the PE film. However, the emission surge upon cutting the TIF tarp was much higher than with the PE film, indicating that a longer waiting time would be needed with TIF to reduce potential exposure risks. The research showed that using this new film will help improve buffer zone restrictions and enable many fields to be fumigated under the newly amended EPA regulations.

New Web-based database on *Phytophthora* genus will aid in worldwide disease management. The fungal genus *Phytophthora* is responsible for many diseases of crop plants worldwide and consists of approximately 106 species which are difficult to identify. ARS scientists with university collaborators have developed a Web site to support research on *Phytophthora* that includes complete morphological descriptions, information on host range and geographical distribution, a comprehensive molecular phylogeny using seven nuclear genes, and a section on molecular identification and detection. Expansion of the database Web portal to include the related Oomycete pathogens Pythium, downy mildews, and Albugo was also initiated. This database will serve as a resource for researchers working on the genus, as well as a repository for future work. The Web-based database will enhance the understanding of the *Phytophthora* genus, simplify species identification, and stimulate further research on the genus in aid of disease management.

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 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 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:

Delivering information and research services. NAL provides free access to agricultural information, primarily through its core Web site, www.nal.usda.gov. NAL's FY2010 total volume of direct customer transactions exceeded 90 million transactions. Services delivered digitally continued to grow while services based entirely on physical materials continued to decline. Examples of accomplishments and progress include:

- DigiTop usage increased while document delivery services decreased. USDA staff executed 1,353,306 full text downloads from NAL's DigiTop (Digital Desktop for USDA) service, posting a 7.5 percent increase in downloads from FY 2009. In contrast, document delivery requests received by NAL decreased by 20 percent (34,469) as more material became available online. One hundred percent of document delivery requests were received electronically and 84 percent delivered electronically. Reference transactions increased 15.6 percent to 15,451.
- Outreach and instruction increased. There was a 13.8 percent increase in presentations and a more than 100 percent increase in the number of customers reached. NAL staff exhibited at numerous events and conferences to increase visibility of NAL services and products. Venues included: Future Farmers of America annual conference; USDA People's Garden; USDA Earth Day; USDA Agricultural Festival; USDA National Nutrition Month; Preservation Week; Charles Valentine Memorial Lecture; Sustainable Agriculture & Food Systems Association; Joint Annual Meetings of the American Dairy Science Association; Poultry Science Association; American Society of Animal Science, Asociacion Mexicana de Produccion Animal, and the Canadian Society of Animal Science; 20th Annual Social Marketing in Public Health Conference; and the Food Safety Education Conference. NAL continues to look strategically at how it can increase its reach by targeting high impact events.
- Directory of Chefs Partnering with Let's Move! The NAL Food and Nutrition Information Center's Directory of Chefs was selected by the White House to use as the basis for the First Lady's Chefs Move to Schools Web site. The Directory matches chefs with schools to improve meals, enhance food workers' skills, and teach children about better nutrition. Working under a very short timeline, NAL staff made improvements and enhancements to the existing database. Two new features were created: a geographic display; and a browsable list by State. The May launch was followed by other events which featured the new directory and encouraged new registration. As of the end of FY 2010, over 1,897 chefs and more than 1,415 schools had signed up to participate.
- NAL supports USDA's "Know Your Farmer Know Your Food Initiative." NAL provided staff to triage and respond to reference requests which come to the KYF2 site and helped create a seasonal poster series promoting Farm-to-Table healthy eating and eating local. The posters and associated educational materials complement the KYF2 concept and promote access to NAL food, nutrition, and sustainable agriculture information services.
- Heirloom Apple Event Focuses on Diversity and NAL Collections. On September 17, PSD hosted a roundtable discussion on heirloom apples that drew over 100 people from across the Washington area. Seven noted apple experts addressed the issue of dwindling apple varieties and the steps being taken to preserve them. NAL's unparalleled collections in pomology helped shape and inform their research over the years. Speakers from ARS and NIFA provided context, addressing the important relationship between USDA and private growers and the role of USDA in apple research. PSD staff mounted an exhibition of heirloom apples varieties from the USDA Pomological Watercolor Collection, produced a special bibliography, and reproduced images for sale.

Building a digital repository**.** During FY 2010, NAL added approximately 10,000 items to its digital repository. By the end of FY 2010, NAL's digital repository included about 42,000 items; about 750 items are added each month. In June, 2010, the Library began a re-engineering project to unify the existing three platforms into a single platform with a simplified search interface and a streamlined process for adding items and descriptions. This project should be completed in June 2011.

Enriching AGRICOLA**.** At the end of FY 2010, AGRICOLA included 4,937,064 records of which 1,004,968 were online catalog records and 3,932,096 were indexing records. NAL added 5,814 cataloging records and 34,312 indexing records in FY2010. This is a slower pace than previous years and reflects the reallocation of indexers from production to implementing automated indexing as well as the end of funding for contract cataloging projects.

Program Evaluations

Each year, ARS conducts a number of Program Evaluation Initiatives and/or National Program Reviews, principally to address program progress, any gaps or shortfalls, and to obtain recommendations for future direction of the research. In FY 2010, ARS' Office of Scientific Quality Review conducted peer reviews of five national programs: Air Quality, Global Change; Manure and Byproduct Utilization; Crop Protection and Quarantine; and Quality and Utilization of Agricultural Products. For FY 2011, three peer reviews are scheduled: Animal Health; Food Safety; and Climate Change, Soils, and Emissions. In FY 2012, four reviews are scheduled: Food Animal Production; Water Availability and Water Management; Plant Diseases; and Methyl Bromide Alternatives. In addition, three Stakeholder Workshops (another tool used for review and feedback of national research programs) were conducted in FY 2010 on: Food Animal Production; Plant Diseases; and the Grape Initiative.

ARS also conducts Retrospective Reviews to gain a "programmatic report card" on the accomplishments of all research projects within each program. Due to a reorganization of the Retrospective Review Process, no reviews were conducted in FY 2010. In FY 2011, there are four scheduled: Food Animal Production; Rangeland, Pasture, and Forages; Plant Genetic Resources, Genomics, and Genetic Improvement; and Methyl Bromide Alternatives. For FY 2012, six reviews are scheduled: Animal Health; Human Nutrition; Water Availability and Water Management; Agricultural System Competitiveness and Sustainability; Plant Diseases; and Crop Production.

AGRICULTURAL RESEARCH SERVICE

Lead-Off Tabular Statement

BUILDINGS AND FACILITIES

Annualized Continuing Resolution, 2011	$70,873,000
Budget Estimate, 2012	0
Change in Appropriations	-$70,873,000

AGRICULTURAL RESEARCH SERVICE

Summary of Increases and Decreases
(On basis of appropriation)

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

AGRICULTURAL RESEARCH SERVICE

Project Statement
(On basis of availibility)

	2010 Actual	2011 Estimated	Increase or Decrease	2012 Estimated
Total Obligations……	$180,552,504	$29,703,203	-$25,284,269	$4,418,934
Unobligated Balances:				
Available Start of Year……	-371,947,372	-257,961,280	-41,169,797	-299,131,077
Unobligated Balance Permanently Reduced…… 1/	--	--	223,748,899	223,748,899
Expiring…….	4,825,996			
Available End of Year……	257,961,280	299,131,077	-228,167,833	70,963,244
Total Available or Estimate……	71,392,408	70,873,000	-70,873,000	0

1/ The table on the next page reflects a proposed rescission of unobligated appropriated funds for partially funded new buildings and facilities projects, and remaining balances from completed facilities.

Justification of Increases and Decreases

Buildings and Facilities

a) The budget does not include funding for ARS' Buildings and Facilities and proposes to cancel $223,749,000 in available balances from prior unrequested projects.

ARS proposes the rescission of unobligated balances from partially funded new buildings and facilities projects, and remaining balances from completed ARS facilities. Providing partial funding to more than 20 projects in a year results in the build-up of large unobligated balances. It also masks the full cost of completing all of the projects, which at this point would be about $1.4 billion, excluding additional staff and operating costs. Funding for these projects has been identified for termination given that they have not been fully funded.

Location	Amount
AL, Auburn, ARS Research & Development Center	$ -3,500,000
AZ, Maricopa, U. S. Water Conservation Research & Western Cotton Research Laboratory	-254,880
CA, Davis, Center for Advanced Viticulture & Tree Crop Research	-16,062,114
CA, Davis, Western Human Nutrition Research Center	-1,771,471
CA, Parlier, San Joaquin Valley Agricultural Research Center	-788,193
CA, Riverside, U. S. Salinity Laboratory	-14,370
CA, Salinas, U. S. Agricultural Research Station	-14,937,644
CT, Storrs, Center of Excellence for Vaccine Research	-7,221,296
DC, Washington, U. S. National Arboretum – Modernization	-4,816,573
FL, Canal Point, U. S. Agricultural Research Laboratory	-4,106,211
FL, Ft. Pierce, Subtropical Horticultural Research Center	-121
HI, Hilo, Pacific Basin Agricultural Research Center	-7,730,452
ID, Aberdeen, Advanced Genetics Laboratory	-223
ID, Hagerman, Aquaculture Facility	-2,890,427
KY, Bowling Green, Animal Waste Management Research Laboratory	-5,880,338
KY, Lexington, Forage Animal Production Research Laboratory	-9,678,689
MD, Beltsville, Beltsville Agricultural Research Center – Modernization	-8,415,708
MD, Beltsville, National Agricultural Library - Modernization	-115,175
ME, Franklin/Orono, Aquaculture Research Facilities	-2,012,504
MI, East Lansing, Avian Disease & Oncology Laboratory	-63,193
MN, Morris, Soil & Water Laboratory	-2,604
MN, St. Paul, Cereal Disease Laboratory	-71,508
MO, Columbia, National Plant and Genetics Security Center	-15,590,075
MS, Lorman, Biotechnology Laboratory	-5,786,418
MS, Oxford, Plant Propagation Facility	-92,427
MS, Poplarville, Southern Horticulture Laboratory	-9,178
MS, Starkville, South Central Poultry Research Laboratory	-10,347,673
MS, Stoneville, Jamie Whitten Delta States Research Center	-6,032,365
MS, Stoneville, National Biocontrol Laboratory	-38,409
MT, Bozeman, Animal Bioscience Facility	-12,720,879
MT, Miles City, Ft. Keogh Livestock & Range Research Laboratory	-57,996
MT, Sidney, Northern Plains Agricultural Research Laboratory	-29,505
ND, Grand Forks, Human Nutrition Research Center	-263,041
NE, Lincoln, Systems Biology Research Facility	-5,782,528
NM, Las Cruces, Jornada Experimental Range Management Laboratory	-28,256
NY, Geneva, Center for Grape Genomics	-14,806,870
NY, Ithaca, Center for Crop-Based Genomics	-7,314,491
OH, Toledo, University of Toledo	-9,356,845
OK, El Reno, U. S. Grazinglands Research Laboratory	-4,038

OK, Woodward, Southern Plains Range Research Station	-152,556
SC, Charleston, U. S. Vegetable Laboratory	-517
SD, Brookings, Northern Grain Insects Research Laboratory	-174
TX, Kerrville, U. S. Livestock Insects Research Laboratory	-2,768,214
TX, Lubbock, Plant Stress Laboratory	-882
TX, Weslaco, Subtropical Agricultural Research Laboratory	-18,503
UT, Logan, ARS Agricultural Research Center	-13,839,929
WA, Pullman, ARS Research Laboratory	-17,240,830
WI, Madison, Cereal Crops Research Center	-3,554
WI, Marshfield, Nutrient Management Research Laboratory	-18,229
WI, Prairie du Sac, Dairy Forage Agricultural Research Center	-7,675,381
WV, Kearneysville, Appalachian Fruit Research Facility	-3,430,725
WV, Leetown, National Center for Cool & Coldwater Aquaculture	-4,717

AGRICULTURAL RESEARCH SERVICE
Buildings & Facilities

Classification by Objects
2010 Actual and Estimated 2011 and 2012

		2010	2011	2012
Other Objects:				
23.2	Rent Paid to Others……	$14,280	0	0
25.2	Other Services……	29,131,862	$29,703,203	$4,418,934
25.4	Operation and Maintenance of Facilities……	147,810,887	0	0
25.5	Research and Development Contracts……	3,800	0	0
25.7	Operation and Maintenance of Equipment….	7,901	0	0
26.0	Supplies and Materials……	2,340	0	0
31.0	Equipment……	1,036,759	0	0
32.0	Land and Structure……	3,314,052	0	0
43.1	PPA - Interest……	5,929	0	0
Total B & F obligations……....		181,327,810	29,703,203	4,418,934

AGRICULTURAL RESEARCH SERVICE
Status of Construction Projects as of January 2011

Status of research facilities authorized or funded in prior years and reported as uncompleted in the 2011 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.
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, FY 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	
	Total	16,310,639	
California, Salinas	2004 Planning and Design	$4,473,450	Design (100%) was completed in the 2nd Quarter, FY 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	
	Total	18,754,019	
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	
	Total	7,715,819	
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 FY 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	
	Total	18,848,566	
Florida, Canal Point	2008 Planning and Design	$521,325	POR is scheduled to be completed 2nd Qtr 2011 . Lease agreement has been

Agricultural Research Service Lab	2009 Planning and Design	1,096,000	finalized.
	2010 Construction	3,422,000	
	Total	5,039,325	
Georgia, Athens	2008 Planning and Design	$2,780,400	
Southeast Poultry Research	2009 Planning and Design	2,427,000	Draft POR was completed 1st Qtr 2007.
Laboratory	Total	5,207,400	
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, FY 2007. Construction contract for Phase 2 was awarded in 4th Qtr 2010.
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	
	Total	39,668,326	
Idaho, Hagerman	2005 Planning and Design	$992,000	Lease agreement is in place. POR was completed in the 3rd Quarter, FY 2007.
Aquaculture Facility	2006 Construction	990,000	
	2008 Construction	695,100	
	2009 Construction	544,000	
	Total	3,221,100	
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.
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	
Iowa, Ames	2001 Design & Construction	$8,980,200	The accelerated plan for the completion of the modernization of ARS/APHIS

National Centers for Animal Health	2002 Design & Construction	40,000,000	animal facilities is in progress. The status of major components of the modernization are as follows: -Phase 1 Lab/Office (APHIS) was completed in FY 2004. -Large Animal BSL-3Ag facilities construction was completed in the 2nd Quarter. FY 2007. -Central Utility Plant & Infrastructure, Phase 1 and 2 construction is complete. Phase 3 construction was completed in the 1st Qtr, 2009. -Construction of the Consolidated Laboratory Facility was completed in the 2nd Quarter. FY 2009. -Low Containment Large Animal Facility construction was completed in the 1st Qtr of 2009.
	2002 Construction	50,000,000	
	2002 APHIS Transfers	15,753,000	
	(Supplemental)	(14,081,000)	
	(Other Transfers)	(1,672,000)	
	2002 Construction	25,000,000	
	2003 Construction	32,785,500	
	2003 Construction	110,000,000	
	2005 Construction	121,024,000	
	2006 Construction	58,212,000	
	Total	461,754,700	
Kentucky, Bowling Green Animal Waste Management Research Laboratory	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 FY 2008. Lease agreement is in place. Construction of the GH/HH was awarded in the 4th Qtr 2010.
	2006 Construction	2,970,000	
	2008 Construction	1,390,200	
	2009 Construction	1,088,000	
	2010 Construction	2,000,000	
	Total	9,729,800	
Kentucky, Lexington Forage Animal Research Laboratory	2005 Planning and Design	$2,976,000	POR is complete. Lease agreement is in progress. Design (100%) was completed 2nd Qtr FY2011.
	2006 Construction	3,960,000	
	2008 Construction	2,085,300	
	2009 Construction	1,632,000	
	2010 Construction	2,000,000	
	Total	12,653,300	
Louisiana, Houma Sugarcane Research	2004 Planning and Design	$1,342,035	Design (100%) completed 4th Quarter, FY 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 FY2010. Phase 1b construction award is scheduled for 2nd Qtr 2011.
	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 Southern Regional Research Center (Industrial Wing)	1998 Planning and Design	$1,100,000	The FY 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, FY 2008. Construction of the LTR was awarded 3rd Qtr, FY 2009 with scheduled completion 3rd Qtr 2011.
	1999 Modernization	6,000,000	
	2000 Modernization	5,500,000	
	2006 Supplemental (design)	4,900,000	
	2006 Supplemental (construction)	20,000,000	
	Total	37,500,000	
Maine, Orono/Franklin	2001 Planning and Design	$2,494,500	Construction of all facilities at Franklin (Pump House, Storage Tanks,

National Cold Water Marine Aquaculture Center	2002 Construction	3,000,000	Lab/Office/Tank Bldg.) is complete. Program for the laboratory facility located at the University Campus in Orono, ME needs to be developed.
	2003 Construction	9,090,525	
	2004 Design & Construction	2,684,070	
	2005 Design & Construction	2,976,000	
	2006 Design & Construction	2,475,000	
	Total	22,720,095	
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, FY 2009. Construction contract for repairs to boiler plants and portions of the steam distribution system was awarded 4th Qtr FY2010 with ARRA funding. Design-Build contract for major renovations to Building 306 was awarded 4th Qtr 2010 with ARRA funding.
	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	
	Total	178,494,228	

**Appropriated under USDA Rental Payments Account

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, FY 2010 using ARRA funding.
	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	
	Total	16,008,468	
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	
	Total	2,262,000	
Mississippi, Lorman	2006 Planning and Design	$1,980,000	A lease agreement with Alcorn State University for the new facility is in progress.
Biotechnology Laboratory	2008 Planning and Design	1,390,200	POR was completed in 3rd Qtr FY 2008.
Alcorn State University	2009 Construction	1,176,000	
	2010 Construction	1,500,000	
	Total	6,046,200	
Mississippi, Poplarville	2002 Design	$800,000	Construction of the Headhouse/Greenhouse was awarded in the 4th Quarter,
Thad Cochran Southern	2003 Construction	9,140,200	FY 2007 and completed in the 1st Quarter, FY 2008.
Horticultural Laboratory	2006 Supplemental	4,300,000	
	Total	14,240,200	
Mississippi, Starkville	2005 Planning and Design	$2,976,000	Lease agreement is in place. Design (100%) was completed in the 1st Quarter, FY
Poultry Science	2006 Construction	4,950,000	2008. The Starkville facility is being downscoped to construct within funds
Research Facility	2008 Construction	1,390,200	currently available.
	2009 Construction	3,177,000	
	Total	12,493,200	
Mississippi, Stoneville	2004 Construction	$4,831,326	Design (100%) is complete. Construction of Phase 1 is complete. Construction of
Jamie Whitten Delta	2005 Construction	2,976,000	mechanical, electrical, and plumbing systems for phases 2 thru 5 (of 5 total) and
States Research Center	2008 Construction	2,780,400	repair of deteriorated building envelope was awarded 3rd Qtr, FY 2010.
	2009 ARRA	36,347,783	
	2010 Construction	4,000,000	
	Total	50,935,509	
Missouri, Columbia	2004 Planning and Design	$2,415,663	Design (100%) was completed in the 4th Qtr, FY 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	
	Total	18,281,713	
Montana, Bozeman	2005 Planning and Design	$1,984,000	Lease agreement is in place. Conceptual Design (35%) was completed 3rd Qtr,
Animal Bioscience Facility	2006 Construction	3,960,000	FY 2008.
	2008 Construction	1,869,819	
	2009 Construction	2,192,000	
	2010 Construction	3,654,000	
	Total	13,659,819	
Montana, Sidney	1998 Planning and Design	$606,000	Construction of Phase 1 (Lab/Office Building) was completed in 2003 and Phase 2
Northern Plains Agricultural	1999 Construction	7,300,000	(Quarantine Lab) was completed in the 4th Quarter, FY 2008.

Research Laboratory	2004 Design and Construction	2,505,132	
	Total	10,411,132	
Nebraska, Lincoln	2008 Planning and Design	$1,390,200	POR is scheduled for completion 3rd Qtr, FY 2011.
Systems Biology Research Facility	2009 Planning and Design	1,088,000	
	2010 Construction	3,760,000	
	Total	6,238,200	
New York, Geneva	2004 Planning and Design	$2,415,663	Design (100%) was completed in the 4th Quarter, FY 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	
	Total	16,696,232	
New York, Ithaca	2004 Planning and Design	$3,847,167	Design (100%)was completed in the 2nd Quarter, FY 2008.
Crop-based Health Genomics	2005 Construction	2,976,000	
	2006 Construction	3,588,750	
	Total	10,411,917	
Ohio, Toledo	2005 Planning and Design	$1,984,000	Design (100%) completed 1st Qtr FY 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	
	Total	11,283,819	
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	
	Total	12,424,000	
Pennsylvania, Wyndmoor	1997 Construction	$4,000,000	Modernization of the Center is being accomplished in nine phases, with
Eastern Regional Research Center	1998 Construction	5,000,000	construction of Phases 1 through 7 completed. Construction award for Phases 8
	1999 Construction	3,300,000	and 9 was made in the 4th Qtr. FY 2010 with ARRA funding.
	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

U.S. Vegetable Laboratory	1990 Planning and Construction	1,135,000	2B (Greenhouse) construction was awarded in the 2nd Quarter, FY 2007 & completed in the 4th Otr FY 2008.
	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	
	Total	33,440,315	
***Reprogrammed from Horticultural Crop and Water Management Research Laboratory, Parlier, CA			
Texas, Kerrville Knipling Bushland Lab	2008 Planning and Design	$1,390,200	POR was completed 2nd Qtr. FY 2010.
	2009 Planning and Design	1,957,000	
	Total	3,347,200	
Utah, Logan Agricultural Research Center	2008 Planning and Design	$5,560,800	POR was completed in the 4th Qtr. FY 2010.
	2009 Design and Construction	4,351,000	
	2010 Construction	4,527,000	
	Total	14,438,800	
Washington, Pullman ARS Research Lab	2004 Planning and Design	$3,936,636	Lease agreement with University is in place. Conceptual Design (35%) is complete.
	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	
	Total	18,303,205	
West Virginia, Kearneysville Appalachian Fruit Lab	2003 Planning and Design	$471,913	Construction of Phases 1 and 2 (immediate laboratory repairs and renovation) was completed in the 3rd Quarter, FY 2007. The construction of the Greenhouse was completed the 1st Quarter, FY 2008. POR for the new laboratory was completed 2nd Qtr FY2010. Conceptual design for new laboratory is scheduled for completion 3rd Qtr 2011.
	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	
	Total	12,206,959	
West Virginia, Leetown	2002 Design & Construction	$2,200,000	Construction was completed in the 3rd Quarter, FY 2008.

National Center for Cool and Cold Water Aquaculture (Broodstock Facility)	2006 Construction	891,000	
	Total	3,091,000	
Wisconsin, Marshfield Nutrient Management Laboratory	2003 Planning, Design and Construction	$2,980,500	Design (100%) of Phase 1 and Phase 2 is complete. Phase 1 (Nutrient Lab) construction was completed in the 4th Qtr, FY 2008. Phase 2 construction (Animal Holding Facility) was awarded in the 4th Qtr, FY 2007. Phase 2 construction was completed 1st Qtr FY 2010.
	2004 Construction	3,668,229	
	2005 Construction	4,860,800	
	2006 Construction	7,920,000	
	Total	19,429,529	
Wisconsin, Prairie du Sac Dairy Forage Agriculture Research Center	2008 Planning and Design	$2,502,360	POR is scheduled for completion 3rd Qtr., FY 2011
	2009 Construction	2,002,000	
	2010 Construction	4,000,000	
	Total	8,504,360	

AGRICULTURAL RESEARCH SERVICE
Buildings and Facilities

SUMMARY OF RECOVERY ACT FUNDING
(On basis of appropriation)

Program/Project/Activity	2009	2010	2011	2012
Improve Real Property Management…..	$176,000,000	0	0	0
Total Appropriated……	176,000,000	0	0	0

Project Statement
(On basis of available funds)

	2009 Actual Amount	2010 Actual Amount	2011 Estimated Amount	Increase or Decrease	2012 Estimated Amount
Total Obligations……	$7,799,420	$163,374,584	0	0	0
Unobligated Balances:					
Estimated Start of Year……	0	-168,200,580	-$4,825,996	$4,349,516	-$476,480
Obligations in Expired Accounts…….	0	0	4,349,516	-3,873,036	476,480
Estimated End of Year……	168,200,580	4,825,996	476,480	-476,480	0
Total Estimate……	176,000,000	0	0	0	0

Program Implementation Activities:

ARS has established a Coordination and Communication team and charged them with monitoring the implementation of the ARS Recovery Act program to ensure consistent and strict compliance with the intent of the Recovery Act, as well as the OMB Implementation Guidelines. The team is overseen by an ARS Associate Administrator and includes representation from the Research, Education and Economics Undersecretary's Office.

The goal of the ARS Recovery Act program is to reduce the backlog of critical deferred maintenance at ARS facilities. Through completion of $176 million of critical deferred maintenance work at ARS facilities across the country, the Agency's Recovery Act program will create almost 2,500 jobs contributing directly to the principal objective of the Recovery Act. A second objective of the program is to ensure that ARS research programs can be effectively and efficiently conducted at facilities that currently have deferred maintenance needs. This work will reduce the backlog of deferred maintenance at ARS facilities by approximately 56 percent and slow the growth in deferred maintenance throughout ARS.

Total deferred maintenance needs (other than normal minor maintenance) is about $316 million. There are more ARS facilities with critical deferred maintenance needs than the $176 million that ARS was appropriated in the Recovery Act can support. Therefore criteria were developed to determine which facilities would be included in the program. The first criterion was whether or not a facility already had a design in progress or on the shelf for addressing the deferred maintenance work. Having an existing design allows the construction phase of work to begin much earlier than for a facility without a design resulting in faster job creation. All facilities with an existing design that met at least one of the program related criteria below were selected. This represented a total of 15 facilities and $154 million.

1. Unique national resources critical to meeting the needs of US Agriculture: germplasm repositories, containment facilities, and critical human nutrition clinical facilities;

2. High priority research programs: human nutrition/obesity prevention, climate change, and bioenergy feedstock production;

3. Essential research capacity: locations with a critical mass of scientists that resolve complex problems of agriculture through multidisciplinary research: "utilization centers" and other large campuses; or

4. Research programs critical for ARS support of action and regulatory agencies: biocontrol laboratories,

food safety, and watersheds.

The designs for all the facilities in the ARS Recovery Act program will meet current building codes, including those related to energy conservation.

At the end of FY 2010, ARS successfully awarded 285 contract actions (including administrative actions) for a cumulative total of $171,174,004. The balance of funds, $4,825,996, will be used for contingency items.

AGRICULTURAL RESEARCH SERVICE
Summary of Budget and Performance
Statement of Department Goals and Objectives

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.

AGRICULTURAL RESEARCH SERVICE
Summary of Budget and Performance
Statement of Department Goals and Objectives

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

- Worked under a Cooperative Research and Development Agreement (CRADA) with a local California mushroom producer to scale up, implement, and optimize processing conditions to naturally produce Vitamin D in mushrooms by brief exposure to ultraviolet B light. Vitamin D deficiency is believed to affect 60 percent of the U.S. adult population.
- Worked with collaborators to systematically investigate the effects of rice milling mechanisms and parameters on rice milling quality. The adoption of the new rice sample milling procedure adds an estimated value of over $20 million each year to the rice industry in the United States.
- Developed high performance mulches for the green industry utilizing cotton gin byproducts under a CRADA with private industry. This could result in a revenue stream of $20 to $30 per ton to cotton gins within the region of the plant.
- Transferred the technology of the Seedcotton Moisture Measurement System (SMMS) to industry. SMMS is capable of being utilized in both seed cotton moisture sensing as well as cotton bale lint moisture sensing.

Selected Accomplishments Expected at the FY 2012 Proposed Resource Level

- Develop four Regional Biofuels Feedstocks Research and Demonstration Centers.
- Develop local food systems for the urban Eastern Seaboard Region.
- 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.
- 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

ARS enhanced the genetic security of animal germplasm through increases in the cryopreserved National Germplasm collection at Fort Collins, Colorado, and through improvements in fertilization success when using cryopreserved semen samples. Semen extenders for turkey and artificial insemination procedures for swine have improved the recovery of animals from stored genetic resources. Important genomic discoveries include identification of regions of the cattle genome which affect the amount and type of fat, and meat tenderness in beef. ARS scientists developed a panel of markers for determination of parentage and animal identification for swine. Work by ARS scientists was crucial to the determination that genome diversity has been seriously eroded in commercial poultry, with loss of over 70 percent of the genetic diversity once present. ARS research also contributed key quantitative genetic progress, such as enabling the first genetic evaluations of U.S. cattle including crossbreds. Inclusion of crossbreds increased accuracy of evaluation for all animals, and particularly improved breed comparisons. Other research discovered that there are genetic differences in the resistance to bovine respiratory disease that would be amenable to improvement through selective breeding. Research on rainbow trout demonstrated that growth and resistance to bacterial coldwater disease could be improved simultaneously by selection on both traits.

Selected Accomplishments Expected at FY 2012 Proposed Resource Level

- Improve beef cattle and swine germplasm.
- Provide dairy cattle and trout improvement.
- 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 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.
- Collect phenotypic data and use genome sequence derived markers to characterize germplasm for traits of importance in food animals.
- Use genetics and production systems approaches to improve health, feed efficiency, and productivity in food animals.
- Expand the capacity for high value animal trait evaluation and marker analyses to rapidly identify key genes.

Crop Production

Selected Past Accomplishments toward Achievement of the Key Outcome

ARS researchers developed several strategies for plant disease control. These include: planting new resistant crop varieties, providing crop cultural control practices or storage conditions to those less favorable for disease development, and employing biological control through integrated disease management. ARS researchers developed several rapid detection and diagnostic tests which provide producers and scientists with tools to quickly detect and identify new and emerging pathogens before a disease outbreak advances. ARS researchers advanced our understanding about the genetic, biochemical, and physiological processes that operate in the host and pathogen as infection and disease progress. In

addition, ARS researchers identified new strains of plant pathogens that threaten U.S. crops and then identified new sources of genetic resistance to these emerging crop threats.

Selected Accomplishments Expected at the FY 2012 Proposed Resource Level

- Determine causes of Colony Collapse Disorder and develop means of mitigating its impact.
- Finance administrative costs associated with the World Food Prize activities.
- Expand knowledge and tools needed for classical plant breeding.
- Enhance plant breeding for sustainable production and climate change protection.
- 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 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.
- Strengthen high priority grain disease research to protect the world grain supply.
- Expand the crop genebanks of the U.S. National Plant Germplasm System.
- Expand the capacity for high-value crop trait evaluation and marker analyses to rapidly identify key genes.

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

- Developed a rapid, nondestructive detection/identification method for melamine and its derivatives.
- Developed an imaging system to detect cracks in shell egg shells.
- Determined that cattle fed wet distiller grain had greater prevalence of *E. coli* O157:H7.
- Developed a laser system to identify bacteria from colonies on a plate, without the need for expensive and time consuming biochemical or microbiological tests.

- Developed and validated a new liquid chromatographic-tandem mass spectrometric (LC-MS/MS) multi-residue method for the simultaneous quantification and identification of the most widely used anthelmintic veterinary drugs.
- Determined that mechanical blade tenderization transfers *E. coli* O157:H7 into the interior of steaks.
- Demonstrated that a dose of 1 kGy radiation can achieve at least 99.999% reduction of *E. coli* O157:H7 inoculated onto the surface of fresh produce.
- Determined that Salmonella *enteritidis* were able to penetrate from the exterior of the yolk to the yolk contents during as little as 12 hours of incubation at room temperature.
- Determined that hydrogen peroxide may be useful in removing natural and synthetic estrogens from agricultural and municipal waste streams.

Selected Accomplishments Expected at the FY 2012 Proposed Resource Level

- 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.
- Develop sensitive detection/sensing technologies for pathogens, toxins, and chemical contaminants.
- Develop/evaluate alternatives to antibiotics on food animals.

Livestock Protection

Selected Past Accomplishments toward Achievement of the Key Outcome

ARS researchers performed research on priority diseases of livestock (i.e., cattle, sheep, swine, and poultry). Researchers also worked to solve problems associated with integrated pest management of arthropods that affect humans and animals. Among the problems addressed were the ticks that transmit pathogens causing bovine babesiosis, Lyme disease, and rickettsial diseases; flies that mechanically carry enteric pathogens; mosquitoes that transmit dengue virus, malaria, and West Nile Virus; biting midges that transmit bluetongue virus and vesicular stomatitis virus; screwworm flies that infest wounds; blood-sucking flies that attack cattle; fire ants that create a public health threat and that disrupt pastures; and termites that

destroy structures and trees. Animal health results included identification of a new anti-infective protein secreted by activated avian lymphocytes; identification of H2N3 influenza, a virus from swine in the United States; demonstration that domestic pigs have low susceptibility to H5N1 highly pathogenic avian influenza viruses; determination that reducing the dose of avian influenza vaccines results in a product that is insufficiently immunogenic; characterization of H5N1 pathogenic avian influenza viruses from North America; development of avian influenza viruses rapid diagnostic tests; discovery that wildlife present a potential source of bovine viral diarrhea virus (BVDV) for cattle; development of a new protective vaccine for brucellosis in bison; documentation and diagnosis of a unique *Leptospira* pathogen in California sea lions; identification of novel antigens in Johne's disease; and stable transfection of a foreign gene into *Babesia bovis*. The entomological results included new devices for treating ticks on wild deer, selection of better fly traps; invention of new insecticides; demonstration of the interaction of pathogens and insect saliva; genetic sequencing of the screwworm fly; distribution of new biological control agents of fire ants; and demonstration of areawide termite control.

Selected Accomplishments Expected at the FY 2012 Proposed Resource Level

- Develop new tools to control Bovine Tuberculosis.
- Develop new tools to control Bovine Respiratory Diseases.
- Develop rapid responses to issues/emergencies relating to animal health, and food safety and security.
- Identify functional genes that convey specific disease resistance traits.
- Identify and characterize gene functions/mechanisms responsible for disease resistance traits.
- Implement an integrated emerging zoonotic research program (bovine spongiform encephalopathy) 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 with the objective of providing practical tools for those charged with the responsibility of 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 for fire ants.
- 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.
- Discover and transfer new technologies for protection of property from structural pests.
- Conduct research on countering biological threats.

Crop Protection

Selected Past Accomplishments toward Achievement of the Key Outcome

- Identified risk factors for produce contamination.
- Found that naval orange worm is a major contributor to promoting infection of almonds by *Aspergillus* strains that produce aflatoxin. This finding has an immediate impact on the almond industry through the use of host-plant volatiles which trap, confuse, or distract the insects from locating the host plant.
- The glassy-winged sharpshooter insect has resulted in destructive epidemics of Pierce's disease on California's grapes. ARS scientists have identified how to control the glassy-winged sharpshooter and Pierce's disease.
- Discovered a novel insecticidal toxin from the genomic sequence of *Pseudomonas fluorescens* Pf-5.
- Characterized, patented, and licensed a novel bacterial insecticidal isolate which is effective against a wide range of agricultural insect pests.
- Implemented four new 5-year areawide pest management projects that include management of weedy annual grasses on rangelands; the Asian tiger mosquito, a vector of West Nile Virus; naval orangeworm on nut trees; and honeybee parasites and diseases.
- Discovered a natural enemy (a leafmining, aquatic fly) of the Brazilian Water Weed, a significant threat to biodiversity and water use in Florida and elsewhere.

Selected Accomplishments Expected at the FY 2012 Proposed Resource Level

- Develop rapid response to issues and emergencies relating to plant health, and food safety and security.
- Enhance capacity to conserve insect germplasm.
- Enhance insect systematics capacity.
- Enhance microbial germplasm and systematics collections capacity.
- Enhance plant breeding for disease and insect protection.
- 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.
- Deploy new resistance genes to pests/pathogens.
- Provide new information on host and pest/pathogen interaction to develop protective mechanisms.

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

- Reported that soy-based infant formula as the sole food for six months did not impair brain development. These findings should reduce parental and food industry concerns regarding the use of soy infant formula.
- Found that low vitamin D levels in the blood were associated with a doubling of the risk for cardiovascular disease. This is important as the National Academy of Sciences is currently revising the Dietary Reference Intake for vitamin D, the national standards for the U.S. and Canada.
- Expanded the Porcine Immunology and Nutrition Database that is used by researchers around the world. Information in the database demonstrates that the intestine of pigs share far more genes with humans than do the rodents commonly used as models in nutrition research.
- Released a new MyPyramid for Older Adults. This food guide developed by scientists at the USDA Human Nutrition Research Center on Aging adapts the USDA food pyramid and the 2005 Dietary Guidelines for Americans for older adults. This simple education tool enables older Americans to make healthier dietary choices.

Selected Accomplishments Expected at the FY 2012 Proposed Resource Level

- Discover barriers and facilitators to follow the *Dietary Guidelines for Americans*.
- Provide enhanced nutritional information to consumers through Nutrition.gov.
- 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.
- 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.
- Conduct studies that use the *Dietary Guidelines for Americans* as the basis for healthy diets.
- Determine nutrient requirements for children.

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 an improved technique to apply satellite sensor information for monitoring of agricultural drought and improved crop yield.
- Provided methods to better assess conservation practices through the use of satellite imagery to measure annual variations in land cover in agricultural landscapes and to identify wetlands. Also, a process-based model (HYDRUS-1D) to predict fate and transport of contaminants in soils and ground waters was developed. The model allows management decisions to be made when using degraded waters in both agricultural and industrial applications.
- Developed a model (BSTEM) for land managers and decision-makers as an aid in the design of stream bank vegetation to reduce erosion and sediment.
- Provided an extensive database of current and historic (50 year) watershed data, making it assessable for model development of erosion, sediment transport, and climate change.
- Evaluated and identified industrial waste products that can be used in designed bioreactors to remove nutrient and pesticide contamination from agricultural drainage waters.
- Designed a process to denitrify drainage waters using immobilized sludge.
- Made a quantitative assessment of the value of in-stream grade stabilization structures to control erosion.
- Evaluated and quantified the value of enrolling land in the Conservation Reserve Program (CRP) to control erosion in highly erodible lands.
- Evaluated fertilizer recommendations based on a new soil test for crop production resulting in reduced costs (ranging from $2,000 to $40,000, depending on farm size) with no reduction in yield.
- Invented a sensor for unmanned airborne vehicles that predicts crop nutrient status and weed populations.
- Developed a prototype machine to imbed and incorporate poultry litter below the surface of pastures thereby improving nutrient use efficiency and reducing odors and water contamination.
- Developed a condensed tannin product to reduce odors and greenhouse gas emissions from stored swine manure.
- Isolated a bacterium that increases the ability of swine and poultry to better digest fiber resulting in improved feed efficiency and decreased fecal output.
- Developed technology for the subsoil injection of liquid diary manure resulting in a 50 percent reduction in ammonia losses, improved nutrient utilization, and improved air quality.
- Released an improved wheatgrass variety ('Vavilov II') that is adapted to harsh dry sandy soils on rangelands and is more competitive with invasive weeds.
- Evaluated and released a new cultivar of intermediate wheatgrass, ('Manifest'), with exceptional yield and enhanced grazing persistence.
- Released three new warm-season cultivars of Indiangrass ('Chief', 'Scout', and 'Warrior') with higher yield and digestibility potential, each tailored to different grazing land hardiness zones.

- Granted licenses for seed production and sales for an improved low-input bahiagrass variety ('TifQuik'). The variety is adapted to southern pastures, more competitive, and earlier maturing.

Selected Accomplishments Expected at the FY 2012 Proposed Resource Level

- Enhance agricultural sustainability and resource management in the Mississippi River Basin.
- Expand the ARS GRACEnet project into U.S. biomass and specialty crops, and into farming systems in one sub-Saharan or Asian country.
- Improve environmental quality and production efficiency by managing microorganisms in agricultural systems.
- 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 water.
- 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 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 one cost effective practice or strategy to restore degraded rangelands.
- Develop one method or strategy to measure and monitor pasture and rangeland health.

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.
- 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

Some of NAL's recent accomplishments include:

- 68 million pageviews/searches were delivered by NAL Web-based services; 13 million unique visitors came to the NAL Web site; and 1.3 million articles were downloaded by USDA staff via NAL's DigiTop desktop library for USDA.
- Delivering new and improved information services, including:
  - the Chefs Move to Schools database, which, as part of the White House *Let's Move!* initiative, helps pair chefs with schools to improve school meals and enhance nutrition education; and

- a food safety twitter feed (twitter.com/FoodSafety), which had 6,807 followers as of June 2010.

- Continuing leadership of numerous national and international "open government" initiatives, including the AgNIC Alliance (AgNIC.org), Nutrition.gov, InvasiveSpeciesInfo.gov, Science.gov, and WorldWideScience.org.
- Continuing to digitize and make available on the Web printed materials from the NAL collection and to add other digital content to NAL's digital repository.
- Continuing to adapt NAL's operations and services toward the Library's "Digital NAL" goals.

Selected Accomplishments Expected at the FY 2012 Proposed Resource Level

- Provide additional resources for NAL's digital information services.

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

Funding was provided to continue modernization/renovation projects and construction of new facilities at a number of locations. Construction projects included laboratories/facilities at the following locations: Davis, California (Grape Genomics Research Center); Salinas, California (U.S. Agricultural Research Station); Hilo, Hawaii (U.S. Pacific Basin Agricultural Research Center); Hagerman, Idaho (National Trout Production & Evaluation Facility); Peoria, Illinois (National Center for Agricultural Utilization Research); Bowling Green, Kentucky (Animal Waste Management Research Laboratory); Lexington, Kentucky (Forage Animal Research Laboratory); Houma, Louisiana (ARS Sugarcane Research Laboratory); Starkville, Mississippi (Poultry Science Research Facility); Stoneville, Mississippi (Jamie Whitten Delta States Research Center); 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); Prairie du Sac, Wisconsin (Dairy Forage Research Center).

Design projects included laboratories/facilities at the following locations: 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), and Logan, Utah (Agricultural Research Center).

Selected Accomplishments Expected at the FY 2012 Proposed Resource Level

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

AGRICULTURAL RESEARCH SERVICE
Summary of Budget and Performance
Key Performance Outcomes and Measures

USDA STRATEGIC GOAL 1: ASSIST RURAL COMMUNITIES TO CREATE PROSPERITY SO THEY ARE SELF-SUSTAINING, REPOPULATING, AND THRIVING ECONOMICALLY.

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

Objective 2.1: Expand Domestic Market Opportunities.

- Outcome: 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.

Key Performance Targets:

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
•Create new scientific knowledge and innovative technologies that represent scientific and technological advancements or breakthroughs applicable to bioenergy.	•Enabled new varieties and hybrids of bioenergy feedstocks with optimal traits. •Enabled new optimal practices and systems that maximized the sustainable yield of high quality bioenergy feedstocks. •Enabled new, commercially preferred biorefining technologies.	•Enabled new varieties and hybrids of bioenergy feedstocks with optimal traits. •Enabled new optimal practices and systems that maximize the sustainable yield of high quality bioenergy feedstocks. •Enabled new, commercially preferred biorefining tech.	•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. •Develop four Regional Biofuels Feedstocks Research and Demonstration Centers.	•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, preferred biorefining techs. •Develop four Reg.Bio-fuels Feedstocks R&D Ctrs.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 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 novel/enhanced uses.	•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 local food systems for the urban Eastern Seaboard Region. •Conduct an evaluation of ARS' facilities and co-located other USDA facilities, using the agency's Salaries and Expenses funds.	•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 Univ.'s Sustainable Food Systems Futures Center to integrate supply chain economic analyses. •Develop local food systems for the urban Eastern Seaboard Region.

Note: Space considerations prevent displaying 2007/2008 data.

Objective 2.2: Increase the Efficiency of Domestic Agricultural Production and Marketing Systems.

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

Key Performance Targets:

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 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. •Applied biocontrol technologies to crop plants to enhance disease resistance.	•Applied a computer decision support system for crop and animal production that reduces production risks/losses. •Applied biocontrol technologies to crop plants to enhance disease resistance.	•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.	•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 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 build stored populations and improve utilization of the National Animal Germplasm Program. •Used the completed chicken, cattle, and swine genome sequences to identify novel genes impacting efficiency of nutrient utilization and adaptation to the production environment. •Used the chicken and cattle haplotype maps to evaluate the efficacy of whole genome selection to facilitate genome enabled improvement while developing the haplotype map for swine.	•Continued to build stored populations and improve utilization of the National Animal Germplasm Program. •Used the completed chicken, cattle, and swine genome sequences to identify novel genes impacting efficiency of nutrient utilization and adaptation to the production environment. •Used the chicken and cattle haplotype maps to evaluate the efficacy of whole genome selection to facilitate genome enabled improvement while developing the haplotype map for swine.	•Continue to increase stored germplasm resources of National Animal Germplasm Prog. •Increase populations with adequate germplasm stores to enable reconstitution. •Develop improved semen extenders and artificial insemination methodologies. • Use the completed chicken, cattle, and swine genome sequences to identify genes impacting nutrient utilization and adaptation to the production environment.	•Continue to increase stored germplasm resources of NAGP. •Increase populations with adequate germ-plasm stores to enable reconstitution. •Develop improved semen extenders and artificial insemination methodologies. •Use the completed chicken, cattle, and swine genome sequences to identify novel genes impacting nutrient utilization/ adaptation to prod. environment.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
	•Used metagenomics to initially screen the rumen micrflora in cattle. •Developed genome sequence resources for sheep, rainbow trout, and catfish species.	•Used metagenomics to initially screen the rumen micrflora in cattle. •Developed genome sequence resources for sheep, rainbow trout, and catfish species.	• Develop reduced SNP chips to target specific livestock breeds and a particular suite of traits. • Increase sequence coverage in key genomic regions to identify causative mutations. • Use metagenomics to identify microbial genes/ pathways affecting feed efficiency/animal health/ odor emissions in animal production. • Collect phenotypic data/ use genome sequence markers to characterize germplasm for traits in food animals. • Use genetics/production systems to improve health, feed, efficiency, and productivity in food animals. • Develop genome sequence resources for catfish, rainbow trout, sheep, and turkey. •Improve beef cattle and swine germplasm.	• Develop reduced SNP chips to target specific livestock breeds and a particular suite of traits. • Increase sequence coverage in key genomic regions to identify causative mutations. • Use metagenomics to identify microbial genes/ pathways affecting feed efficiency/animal health/odor emissions in animal production. • Collect phenotypic data/use genome sequence markers to characterize germplasm for traits in food animals. • Use genetics/ production systems for health, feed, efficiency, and productivity in food animals. • Develop genome sequence resources for catfish, rainbow trout, sheep, and turkey.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
			•Provide dairy cattle and trout improvement. •Apply new genomic tools to accelerate genetic improvement of 'specialty crops' for superior product quality.	•Improve beef cattle and swine germplasm. •Provide dairy cattle and trout improvement. •Apply new genomic tools for genetic improvement of 'specialty crops' for superior quality. •Expand the capacity for high value animal trait evaluation and marker analyses to rapidly identify key genes.
•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. •Tested whether new breeding strategies or	•Applied new genomic tools to accelerate genetic improvement of 'specialty crops' for superior product quality. •Tested whether new breeding strategies or	•Deploy new breeding strategies or genetic engineering methods based on knowledge of gene function and expression enhance the effectiveness of crop improvement programs.	•Deploy new breeding strategies or genetic engineering methods based on knowledge of gene function and expression enhance the effectiveness of crop improvement programs.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
	genetic engineering methods based on knowledge of gene function and expression enhance the effectiveness of crop improvement programs. •Maintained USDA germplasm collections in a healthy, secure, and easily accessible form. • Distributed germplasm for research purposes. •Expanded collections of crop genetic stocks key to genomic research. •Increased crop genetic resource regeneration, and maintenance capacity and activity. •Secured more wild relatives of crops in gene banks.	genetic engineering methods based on knowledge of gene function and expression enhance the effectiveness of crop improvement programs. •Maintained USDA germplasm collections in a healthy, secure, and easily accessible form. • Distributed germplasm for research purposes. •Expanded collections of crop genetic stocks key to genomic research. •Increased crop genetic resource regeneration, and maintenance capacity and activity. •Secured more wild relatives of crops in gene banks.	•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. •Determine causes of Colony Collapse Disorder and develop means for mitigating its impact. •Finance administrative costs associated with the World Food Prize activities. •Enhance plant breeding for sustainable production and climate change protection. •Expand knowledge and tools needed for classical plant breeding.	• Distribute germplasm for research purposes. • Increase crop genetic resource regeneration, and safeguard collection. •Secure more wild relatives of crops in gene banks. •Determine causes of Colony Collapse Disorder and develop means for mitigating its impact. •Finance administrative costs associated with the World Food Prize activities. •Enhance plant breeding for sustainable production and climate change protection. •Expand knowledge and tools needed for classical plant breeding. • Strengthen high priority grain disease research to protect the world grain supply.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
			•Enhance capacity to conserve a broad diversity of National Plant Germplasm System resources. • Strengthen high priority grain disease research to protect the world grain supply. • Expand collections of crop genetic stocks key to genomic research.	• Expand collections of crop genetic stocks key to genomic research. •Expand the crop genebanks of the U.S. National Plant Germplasm System. •Expand capacity for high value crop trait evaluation/ marker analyses to identify key genes.

Note: Space considerations prevent displaying 2007/2008 data.

ARS 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 to USDA, the Nation, and the Global Agricultural Community via the National Agricultural Library.

- Outcome: Agricultural information which meets the needs of customers.

Key Performance Targets:

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
•The services and collections of the National Agricultural Library continue to meet the needs of its customers.	•Funding level impacted NAL's ability to expand and improve services, affecting document delivery services, print material acquisition, and filling vacant NAL positions.	•Funding level impacted NAL's ability to improve services, affecting reference services, document delivery services, material acquisition, and ability to fill vacant NAL positions.	•Provide additional resources for NAL's digital information services.	•Provide additional resources for NAL's digital information services.
•The National Agricultural Library and partners implement the National Digital Library for Agriculture.	•Funding level impacted NAL's ability to develop partnerships and content for the NDLA.	• Funding level impacted NAL's ability to develop partnerships and content for the NDLA.	• 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.

Note: Space considerations prevent displaying 2007/2008 data.

ARS 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.

- Outcome: Laboratories and facilities which meet the needs of ARS' scientists.

Key Performance Targets:

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
•Selected ARS laboratories/facilities are repaired/maintained with available R&M funds.	•Repaired/maintained ARS buildings/facilities using Repair and Maintenance funds.	•Repaired/maintained ARS buildings/facilities using Repair and Maintenance funds.	•Repair/maintain ARS buildings/facilities using Repair and Maintenance funds.	•Repair/maintain ARS buildings/facilities using Repair and Maintenance funds.

Note: Space considerations prevent displaying 2007/2008 data.

USDA STRATEGIC GOAL 2: ENSURE OUR NATIONAL FORESTS AND PRIVATE WORKING LANDS ARE CONSERVED, RESTORED, AND MADE MORE RESILIENT TO CLIMATE CHANGE, WHILE ENHANCING OUR WATER RESOURCES.

ARS 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.

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

Key Performance Targets:

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 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 and evaluated methods and technologies to assess and conserve water availability through more efficient sensing, supply, delivery, and reuse systems. •Developed and evaluated methods and technologies that reduced or prevented nutrient contamination of surface and ground waters. •Developed and evaluated methods and techniques that reduced sediment loads to waterways, improved farm land sustainability, and improved or restored stream corridors and riparian ecosystems.	•Developed and evaluated methods and technologies to assess and conserve water availability through more efficient sensing, supply, delivery, and reuse systems. •Developed and evaluated methods and technologies that reduce or prevent nutrient contamination of surface and ground waters. •Developed and evaluate methods and techniques that reduce sediment loads to waterways, improve farm land sustainability, and improve or restore stream corridors and riparian ecosystems.	•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	•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.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
	•Developed and assessed systems and practices that ameliorated, offset, or mitigated the impact of agricultural production and processing on water resources.	•Developed and assessed systems and practices that ameliorate, offset, or mitigate the impact of agricultural production and processing on water resources. •Developed recommendations for land management practices based on the ARS GRACEnet project and carbon sequestration models to reduce net greenhouse gas emissions in agricultural production systems by 15% to 25%. •Provided a management tool for farmers, ranchers, and communities to avoid water shortages based on predictive capabilities developed from decades of ARS watershed research and NASS cropland data.	and processing on water resources. •Expand the ARS GRACEnet project into U.S. biomass and specialty crops, and into 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. •Enhance agricultural sustainability and resource management in the Mississippi River Basin.	•Expand the ARS GRACEnet project into U.S. biomass and specialty crops, and into 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. •Enhance agricultural sustainability and resource management in the Mississippi River Basin.

Note: Space considerations prevent displaying 2007/2008 data.

Objective 6.2: Improve Soil and Air Quality to Enhance Crop Production and Environmental Quality.

- Outcome: Enhanced crop production and improved environmental quality.

Key Performance Targets:

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 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 decision tool to predict carbon sequestration in soil. •Developed one management practice and/or control technology to help reduce emissions from agricultural operations.	•Developed one decision tool to predict carbon sequestration in soil. •Developed one management practice and/or control technology to help reduce emissions from agricultural operations. •Projected the best deployment of agronomically desirable crop varieties in their optimal environments based on genetic and physiological information.	•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. •Improve environmental quality and production efficiency by managing microorganisms in agricultural systems.	•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. •Improve environmental quality and production efficiency by managing microorganisms in agricultural systems.

Note: Space considerations prevent displaying 2007/2008 data.

Objective 6.3: Conserve and Use Pasture and Range Lands Efficiently.

- Outcome: Pasture and range land management systems that enhance economic viability and environmental services.

Key Performance Targets:

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
• Improved management practices and technologies for managing pasture and rangelands to improve economic profitability and enhance environmental values.	•Developed one cost effective practice and/or strategy to restore degraded range lands. •Developed one methodology and/or technology to measure and monitor pasture and range land health. •Developed one environmentally acceptable practice or technology to control invasive weeds.	•Developed one cost effective practice and/or strategy to restore degraded range lands. •Developed one methodology and/or technology to measure and monitor pasture and range land health. •Developed one environmentally acceptable practice or technology to control invasive weeds.	•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.

Note: Space considerations prevent displaying 2007/2008 data.

USDA STRATEGIC GOAL 3: HELP AMERICA PROMOTE AGRICULTURAL PRODUCTION AND BIOTECHNOLOGY EXPORTS AS AMERICA WORKS TO INCREASE FOOD SECURITY.

ARS 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.

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

Key Performance Targets:

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 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. •Applied biocontrol technologies to crop plants to enhance disease resistance.	•Applied a computer decision support system for crop and animal production that reduces production risks/losses. •Applied biocontrol technologies to crop plants to enhance disease resistance.	•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.	•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 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 build stored populations and improve utilization of the National Animal Germplasm Program. •Used the completed chicken, cattle, and swine genome sequences to identify novel genes impacting efficiency of nutrient utilization and adaptation to the production environment.	•Continued to build stored populations and improve utilization of the National Animal Germplasm Program. •Used the completed chicken, cattle, and swine genome sequences to identify novel genes impacting efficiency of nutrient utilization and adaptation to the production environment.	•Continue to increase stored germplasm resources of National Animal Germplasm Prog. •Increase populations with adequate germplasm stores to enable reconstitution. •Develop improved semen extenders and artificial insemination methodologies.	•Continue to increase stored germplasm resources of NAGP. •Increase populations with adequate germ-plasm stores to enable reconstitution. •Develop improved semen extenders and artificial insemination methodologies.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
	•Used the chicken and cattle haplotype maps to evaluate the efficacy of whole genome selection to facilitate genome enabled improvement while developing the haplotype map for swine. •Used metagenomics to initially screen the rumen micrflora in cattle. •Developed genome sequence resources for sheep, rainbow trout, and catfish species.	•Used the chicken and cattle haplotype maps to evaluate the efficacy of whole genome selection to facilitate genome enabled improvement while developing the haplotype map for swine. •Used metagenomics to initially screen the rumen micrflora in cattle. •Developed genome sequence resources for sheep, rainbow trout, and catfish species.	• Use the completed chicken, cattle, and swine genome sequences to identify genes impacting nutrient utilization and adaptation to the production environment. • Develop reduced SNP chips to target specific livestock breeds and a particular suite of traits. • Increase sequence coverage in key genomic regions to identify causative mutations. • Use metagenomics to identify microbial genes/ pathways affecting feed efficiency/animal health/ odor emissions in animal production. • Collect phenotypic data/ use genome sequence markers to characterize germplasm for traits in food animals. • Use genetics/production systems to improve health, feed, efficiency, and productivity in food animals.	•Use the completed chicken, cattle, and swine genome sequences to identify novel genes impacting nutrient utilization/ adaptation to prod. environment. • Develop reduced SNP chips to target specific livestock breeds and a particular suite of traits. • Increase sequence coverage in key genomic regions to identify causative mutations. • Use metagenomics to identify microbial genes/ pathways affecting feed efficiency/animal health/odor emissions in animal production. • Collect phenotypic data/use genome sequence markers to characterize germplasm for traits in food animals. • Use genetics/ production systems for health, feed, efficiency,

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
			• Develop genome sequence resources for catfish, rainbow trout, sheep, and turkey. •Improve beef cattle and swine germplasm. •Provide dairy cattle and trout improvement. •Apply new genomic tools to accelerate genetic improvement of 'specialty crops' for superior product quality.	and productivity in food animals. • Develop genome sequence resources for catfish, rainbow trout, sheep, and turkey. •Improve beef cattle and swine germplasm. •Provide dairy cattle and trout improvement. •Apply new genomic tools for genetic improvement of 'specialty crops' for superior quality. •Expand the capacity for high value animal trait evaluation and marker analyses to rapidly identify key genes.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 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. •Tested whether new breeding strategies or genetic engineering methods based on knowledge of gene function and expression enhance the effectiveness of crop improvement programs. •Maintained USDA germplasm collections in a healthy, secure, and easily accessible form. • Distributed germplasm for research purposes. •Expanded collections of crop genetic stocks key to genomic research. •Increased crop genetic resource regeneration, and maintenance capacity and activity. •Secured more wild relatives of crops in gene banks.	•Applied new genomic tools to accelerate genetic improvement of 'specialty crops' for superior product quality. •Tested whether new breeding strategies or genetic engineering methods based on knowledge of gene function and expression enhance the effectiveness of crop improvement programs. •Maintained USDA germplasm collections in a healthy, secure, and easily accessible form. • Distributed germplasm for research purposes. •Expanded collections of crop genetic stocks key to genomic research. •Increased crop genetic resource regeneration, and maintenance capacity and activity. •Secured more wild relatives of crops in gene banks.	•Deploy new breeding strategies or genetic engineering methods based on knowledge of gene function and expression 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. •Determine causes of Colony Collapse Disorder and develop means for mitigating its impact. •Finance administrative costs of World Food Prize activities. •Enhance plant breeding for sustainable production and climate change protection.	•Deploy new breeding strategies or genetic engineering methods based on knowledge of gene function and expression enhance the effectiveness of crop improvement programs. • Distribute germplasm for research purposes. • Increase crop genetic resource regeneration, and safeguard collection. •Secure more wild relatives of crops in gene banks. •Determine causes of Colony Collapse Disorder and develop means for mitigating its impact. •Finance administrative costs associated with the World Food Prize activities. •Enhance plant breeding for sustainable production and climate change protection.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
			•Expand knowledge and tools needed for classical plant breeding. •Enhance capacity to conserve a broad diversity of National Plant Germplasm System resources. • Strengthen high priority grain disease research to protect the world grain supply. • Expand collections of crop genetic stocks key to genomic research.	•Expand knowledge and tools needed for classical plant breeding. • Strengthen high priority grain disease research to protect the world grain supply. • Expand collections of crop genetic stocks key to genomic research. •Expand the crop genebanks of the U.S. National Plant Germplasm System. •Expand capacity for high value crop trait evaluation/marker analyses to identify key genes.

Note: Space considerations prevent displaying 2007/2008 data.

USDA STRATEGIC GOAL 4: ENSURE THAT ALL OF AMERICA'S CHILDREN HAVE ACCESS TO SAFE, NUTRITIOUS, AND BALANCED MEALS.

ARS 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.

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

Key Performance Targets:

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
•Develop new technologies that assist ARS customers in detecting, identifying, and controlling footborne diseases that affect human health.	•Made significant improvements to previously developed food animal surveillance/ epidemiology programs. •Used molecular technologies to elucidate two additional ways to improve control of food pathogens in the preharvest stage. •Worked with industry to initiate implementation of control strategies for mycotoxins based on fungal genomic data. •Fine tuned the program to lower the costs of reducing antibiotic resistance. •Identified a fungal crop interaction that drives mycotoxin formation	•Used molecular technologies to elucidate two additional ways to improve control of food pathogens in the preharvest stage. •Worked with industry to initiate implementation of control strategies for mycotoxins based on fungal genomic information. •Identified a fungal crop interaction that drives mycotoxin formation which can be adapted to strategies to limit mycotoxin formation. •Developed sampling systems/protocols for food systems to detect intentional contamination.	•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.	•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.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
	which can be adapted to strategies to limit mycotoxin formation. •Developed sampling systems/protocols for food systems to detect intentional contamination. •Developed rapid systems for target amplification to detect food pathogens. •Developed detection and processing intervention systems for chemical or biological contamination of liquid egg products. •Developed models to provide simulations of the distribution of bio-security agents in foods. •Developed an innovative low cost, opto-electronic portable imaging device for food safety and food biosecurity use.	•Developed rapid systems for target amplification to detect food pathogens. •Developed detection and processing intervention systems for chemical or biological contamination of liquid egg products. •Developed an innovative low cost, opto-electronic portable imaging device for food safety and food biosecurity use. • Developed an automated/rapid sensing technology for discriminating bacterial species on petri plates for public health and industry use; panned microarrays for major foodborne pathogens and toxins; and developed new discriminatory methods for toxigenic *E. coli* non-0157:H7 serotypes that are emerging as potential foodborne risks.	•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 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	•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 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

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
		• Identified five major risk factors that lead to pathogen contamination of produce in the field: role of biofilms on plants; role of wildlife; role of source/type of water used; role of proximity of animal production facilities; and role of protozoa. • Established baseline data on costs of current food safety management practices at processor level and made available to the public. Identified five risk factors and critical control points where pathogens are introduced. Measured the effect/outcome of interventions implemented during processing on the reduction of contamination of foodborne pathogens, toxins, and chemicals.	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	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 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.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
			the end of production is estimated through various studies/approaches.	• 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. •Develop sensitive detection/sensing technologies for pathogens, toxins, and chemical contaminants. •Conduct research on emerging chemical threat agents. •Develop/evaluate alternatives to antibiotics in food animals.

Note: Space considerations prevent displaying 2007/2008 data.

Objective 4.2: Reduce the Number, Severity, and Distribution of Agricultural Pest and Disease Outbreaks.

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

Key Performance Targets:

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
• Provide scientific information to protect animals, humans, and property from the negative effects of pests, infectious diseases, and other disease causing entities.	•Characterized gene functions/mechanisms responsible for disease-resistance traits. •Implemented an integrated emerging zoonotic research program (BSE) in pathogenesis, diagnostics, and intervention. •Implemented a technology driven vaccinology research program for control and eradication of biological threat agents. •Discovered genetic profiles that convey protective immunity against infectious diseases/parasites. •Developed control programs for invasive drug-resistant nematodes, protozoa, and pests of livestock and poultry.	•Characterized gene functions/mechanisms responsible for disease resistance traits. •Implemented an integrated emerging zoonotic research program (BSE) in pathogenesis, diagnostics, and intervention. •Implemented a technology driven vaccinology research program for control and eradication of biological threat agents. •Discovered genetic profiles that convey protective immunity against infectious diseases/parasites. •Developed control programs for invasive drug resistant nematodes, protozoa, and pests of livestock and poultry.	•Identify and characterize gene functions/ mechanisms responsible for disease-resistance traits. •Implement an integrated emerging zoonotic research program (BSE) 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	•Identify and characterize gene functions/ mechanisms responsible for disease-resistance traits. •Implement an integrated emerging zoonotic research program (BSE) 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,

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
	•Developed methods for treating wild ungulates to suppress tick vectors of Lyme disease and Texas cattle fever. •Combined newly discovered attractants into fire ant bait. •Identified genetic location for insertion of genes to make male screwworm flies.	•Developed methods for treating wild ungulates to suppress tick vectors of Lyme disease and Texas Cattle Fever. •Combined newly discovered attractants into fire ant bait. •Identified the genetic location for insertion of genes to make male screwworm flies.	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 genetic improvement for animal health traits. •Develop rapid response to issues and emergencies relating to animal health, and food safety.	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; characterize biological control agents. •Provide genetic improvement for animal health traits.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
				•Develop rapid response to issues and emergencies relating to animal health, and food safety. •Provide new information on host and pest/pathogen interaction to develop protective mechanisms. •Develop strategies to improve animal well-being.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
•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.	•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. •Discover and transfer new technologies for protection of property from structural pests. •Develop new tools to control Bovine Tuberculosis and Respiratory Diseases.	•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. •Discover and transfer new technologies for protection of property from structural pests. •Develop new tools to control Bovine Tuberculosis and Respiratory Diseases. •Conduct research on countering biological threats.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 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 genomic approaches to control crop diseases, such as soybean rust.	•Developed genomic approaches to control crop diseases, such as soybean rust.	•Develop new genomic approaches to control crop diseases, such as soybean rust, cereal pests, and rusts, and rice blast. •Develop rapid response to issues and emergencies relating to plant health, and food safety and security.	•Develop new genomic approaches to control crop diseases, such as soybean rust, cereal pests, and rusts, and rice blast. •Develop rapid response to issues and emergencies relating to plant health, and food safety and security. •Deploy new resistance genes to pests/pathogens.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 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 key invasive species.	•Provided information on emerging diseases and invasive species that will enhance identification and detection. •Characterized pathogens and invasive species, and determined key events in disease development and infection processes.	•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. •Enhance capacity to conserve insect germplasm. •Enhance insect systematic capacity. •Enhance microbial germplasm and systematics collections capacity. •Enhance plant breeding for disease and insect protection.	•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. •Enhance capacity to conserve insect germplasm. •Enhance insect systematics capacity. •Enhance microbial germplasm and systematics collections capacity. •Enhance plant breeding for disease and insect protection. •Provide new information on host and pest/pathogen interaction to develop protective mechanisms.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 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.	•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. •Deploy new resistance genes to pests/ pathogens.

Note: Space considerations prevent displaying 2007/2008 data.

USDA STRATEGIC GOAL 4: ENSURE THAT ALL OF AMERICA'S CHILDREN HAVE ACCESS TO SAFE, NUTRITIOUS, AND BALANCED MEALS.

ARS Goal 5: Improve the Nation's Nutrition and Health.

Objective 5.2: Promote Healthier Eating Habits and Lifestyles.

- Outcome: Eating habits more consistent with the *Dietary Guidelines for Americans.*

Key Performance Targets:

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 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.	•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.	•Update 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. •Discover barriers and facilitators to follow the *Dietary Guidelines for Americans.*	•Update 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. •Discover barriers and facilitators to follow the *Dietary Guidelines for Americans.*
•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	•Evaluated dietary patterns useful for preventing obesity. •Conducted research on requirements/	•Evaluated dietary patterns useful for preventing obesity. •Conducted research on requirements/	•Evaluate dietary patterns useful for preventing obesity. •Conduct research on requirements/	•Evaluate dietary patterns useful for preventing obesity. •Conduct research on requirements/

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
the basis for and evaluates nutrition standards and Federal dietary recommendations.	bioavailability of nutrients to define their role in promoting health/preventing obesity. •Examined interaction of dietary intake with genetic predisposition for promoting health. •Released data from dietary supplement database.	bioavailability of nutrients to define their role in promoting health/preventing obesity. •Examined interaction of dietary intake with genetic predisposition for promoting health. •Released data from dietary supplement database.	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. •Provide enhanced nutritional information to consumers through Nutrition.gov.	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. •Provide enhanced nutritional information to consumers through Nutrition.gov. •Determine nutrient requirements for children.

Performance Measure	2009 Actual	2010 Actual	2011 Target	2012 Target
•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. •Published research on development of analytical methods for food composition and metabolism of nutrients.	•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. •Published research on development of analytical methods for food composition and metabolism of nutrients.	•Publish research on normal growth and aging processes 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.	•Publish research on normal growth and aging processes 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.

Note: Space considerations prevent displaying 2007/2008 data.

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 Thriving Economically.

PROGRAM	PROGRAM ITEMS	Dollars in thousands FY 2010	FY 2011	FY 2012
	Direct Costs:			
	Research and Development	267,641	279,270	268,479
	Indirect Costs:			
	Program and Administrative/Financial Management	22,575	23,555	22,644
	USDA Central Charges	6,756	7,050	6,778
	Task Force, Advisory Committees, and Other Support Costs	407	425	409
	Total Indirect Cost	29,738	31,030	29,831
	Total Costs	**297,379**	**310,300**	**298,310**
	FTEs	1,982	2,202	2,164

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.

Repair and Maintenance		17,461	17,503	20,503
	FTEs	0	0	0
Total Costs for Department Strategic Goal 1 (program, direct, indirect)		**314,840**	**327,803**	**318,813**
	FTEs	**1,982**	**2,202**	**2,164**

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	Dollars in thousands FY 2010	FY 2011	FY 2012
	Direct Costs:			
	Research and Development	185,975	186,825	175,970
	Indirect Costs:			
	Program and Administrative/Financial Management	15,686	15,758	14,842
	USDA Central Charges	4,695	4,716	4,442
	Task Force, Advisory Committees, and Other Support Costs	283	284	268
	Total Indirect Cost	20,664	20,758	19,552
	Total Costs for Department Strategic Goal 2 (program, direct, indirect)	**206,639**	**207,583**	**195,522**
	FTEs	1,891	1,649	1,586

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
	Direct Costs:			
	Research and Development	146,932	135,896	128,477
	Indirect Costs:			
	Program and Administrative/Financial Management	12,393	11,462	10,836
	USDA Central Charges	3,709	3,431	3,243
	Task Force, Advisory Committees, and Other Support Costs	224	207	196
	Total Indirect Cost	16,326	15,100	14,275
	Total Costs for Department Strategic Goal 3 (program, direct, indirect)	**163,258**	**150,996**	**142,752**
	FTEs	989	1,175	1,168

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
	Direct Costs:			
	Research and Development	442,769	443,932	432,543
	Indirect Costs:			
	Program and Administrative/Financial Management	37,346	37,442	36,483
	USDA Central Charges	11,177	11,207	10,919
	Task Force, Advisory Committees, and Other Support Costs	674	676	658
	Total Indirect Cost	49,197	49,325	48,060
	Total Costs for Department Strategic Goal 4 (program, direct, indirect)	**491,966**	**493,257**	**480,603**
	FTEs	2,908	2,969	2,895

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)		**1,176,703**	**1,179,639**	**1,137,690**
	FTEs	7,770	7,995	7,813
Total Costs for Buildings and Facilities		**71,392**	**70,873**	**0**
	FTEs	0	0	0
Grand Total Costs for all Department Strategic Goals		**1,248,095**	**1,250,512**	**1,137,690**
	FTEs	**7,770**	**7,995**	**7,813**