



Agriculture and Food Research Initiative (AFRI) FY 2016 Annual Review

ESTABLISHED BY THE 2008 FARM BILL and re-authorized in the 2014 Farm Bill, the Agriculture and Food Research Initiative (AFRI) is the nation's leading competitive grants program for agriculture. It is the flagship funding program the National Institute of Food and Agriculture (NIFA) uses to combat major agriculture-related societal challenges through research, education, and extension. AFRI is one of NIFA's major programs through which to address the six [Farm Bill priority areas](#).

USDA-NIFA APPROACH

AFRI, with its broad funding portfolio, addresses every facet of agriculture, including food production, farming and ranching, renewable energy, aquaculture, nutrition, forestry, food safety, rural communities, farm efficiency and profitability, and traditional and innovative breeding techniques. AFRI advances fundamental sciences as well as translational research and development in support of agriculture and coordinates research opportunities to build on these new discoveries. In addition, AFRI-awarded programs deliver this science to communities through extension programs, which allows the public to make informed decisions that impact their daily lives.

With the world's population expected to exceed nine billion by 2050, NIFA works to solve the challenges of meeting the food, clothing, fuel, and shelter needs of all people. In order for NIFA to address these critical issues, we partnered with food and agricultural scientists and educators with expertise in: plant health and production and plant products; animal health and production and animal products; food safety, nutrition, and health; bioenergy, natural resources, and environment; agricultural systems and technology; and agricultural economics and rural communities. NIFA partners with the scientific community to provide federal financial assistance grants to address critical issues in United States agriculture in the areas of global food security, water for agriculture, childhood obesity prevention, food safety, sustainable bioenergy, and climate change.

FUNDING PORTFOLIO

The **Agriculture and Food Research Initiative (AFRI)** is NIFA's flagship competitive grants program. The purpose of AFRI is to support research, education, and extension work that address key problems of national and regional importance in sustaining all components of food and agriculture. AFRI is authorized under the 2014 Farm Bill and supports work in six priority areas: 1) plant health and production and plant products; 2) animal health and production and animal products; 3) food safety, nutrition and health; 4) bioenergy, natural resources and environment; 5) agriculture systems and technology; and 6) agriculture economics and rural communities.

In FY 2016, AFRI received \$350,000,000 to administer and support basic and applied research, education, and extension programs (Table 1, Page 5). These programs expanded our existing investments and created new opportunities to address the food and agricultural sciences. Due to the type of funds AFRI receives, the program can continue to expend funds until they are all applied to scientific projects; therefore, all funds may not be obligated in one year. However, AFRI has a scientifically-based annual approach to the expenditures of all funds to support the challenges of food and agriculture.

Over the past five years (Figure 1, Page 4), AFRI has received \$1,531,447,906 to advance research, education, and extension activities. This level of investment shows a gradual upward trend in funding, representing a 32 percent increase in funding from \$264,470,000 in 2012 to \$350,000,000 in 2016.

NIFA works continuously to ensure the public understands the relationship between the AFRI portfolio and the six Farm Bill priorities. While it is easy to see the relationship within the Foundational programs, the Challenge Areas and Fellowships programs aren't as obvious. Therefore, a breakout of the expended funds (Figure 2, Page 4) to date shows the multiple disciplinary work of the entire AFRI program.

AFRI offers Food and Agricultural Science Enhancement (FASE) grants (Table 5, Page 9) to enhance institutional capacity and attract new scientists into careers of high-priority areas of national need in agriculture, food, and environmental sciences. FASE grants provide support for postdoctoral fellowships; new investigators; and project directors at small, mid-sized, or minority-serving institutions with limited institutional success or at degree-granting institutions and state agricultural experiment stations in states where institutions have been less successful in receiving AFRI funding (NIFA identifies these states as Experimental Program to Stimulate Competitive Research states). In FY 2016, approximately 15 percent of AFRI program funds were set-aside to support FASE grants.

AWARDS OVERVIEW

OVERVIEW OF THE APPLICATION PROCESS

FY 2016 was the eighth year that AFRI solicited competitive grant applications; 45 programs solicited applications addressing the six AFRI priority areas and 6 challenge areas. A total of 2,719 competitive grant applications, requesting \$1,847,959,564, were received and reviewed through a competitive peer review process (Table 2, Page 5). Awards totaling \$307,146,459 were made to the 664 highest-ranked applications distributed across the program (Table 3, Pages 6-8). An additional 757 proposals were recommended—rated as Outstanding, High Priority, and/or Medium Priority—for funding by review panels and could have been supported, provided an additional \$682,014,317 was available to the program.

The success rate for AFRI applications in FY 2016, calculated in terms of number of proposals funded (excluding conferences, supplements, continuing increments of the same grant, and NIFA Fellowships) divided by the number of proposals submitted for review, was 20 percent.

AWARD TYPES

AFRI awards are made in the form of single-function research; single-function education; single-function extension; and integrated research, education, and/or extension grants (Table 4, Page 8). The mean award size for research projects was \$602,139 for up to five years, excluding FASE grants and Conference grants. These excluded grant types are often shorter in duration and have lower budget limitations than standard research awards. The average award for integrated projects was \$628,562 for up to five years, excluding FASE grants and Conference grants. AFRI provided funds totaling \$1,080,112 in support of 36 Conference grants. These conferences brought scientists together to identify research, education, and extension priorities; provide an update on research information; and/or advance an area of science important to U.S. agriculture, food, forestry, the environment, and rural communities. Fifty-two percent of AFRI awards support fundamental research to deliver basic knowledge to advance applied research and conceptual breakthroughs in fields relevant to agriculture. Mission-oriented awards accounted for the remaining 48 percent to fund applied work to address specific problems, needs, or opportunities. Multidisciplinary awards encourage collaborations between institutions, agencies, and fields of study to solve complex problems and seek to initiate research in new areas of science and engineering that are relevant to agriculture, food, forestry, the environment, and rural communities. Multidisciplinary teams conducted 75 percent of the AFRI awards made in 2016.

INSTITUTION TYPE DEMOGRAPHICS

AFRI engages a broad range of entities including land-grant universities (1862, 1890, and 1994), public non-land-grant universities, private colleges and universities, private research foundations, federal institutions, individuals, and industry. A breakdown of submitted applications, funded applications, and FY 2016 dollars awarded is available by institution type (Table 7, Page 9).

STUDENT SUPPORT BY PROGRAM AREA

Competitive grants administered by AFRI provide jobs to train the next generation of agricultural professionals. In 2016, AFRI provided funding for more than 1,889 students and postdoctorates for more than 1,960 years, cumulatively (Table 8, Page 10).

CROSSCUTTING SCIENTIFIC AREA

AFRI makes awards that span several topics of major importance to USDA. Table 6 (Page 9) includes the crosscutting areas, number of awards, and total amount of funding for each area.

AFRI 2016 ANNUAL REVIEW DATA

FIGURE 1: AFRI HISTORICAL FUNDING

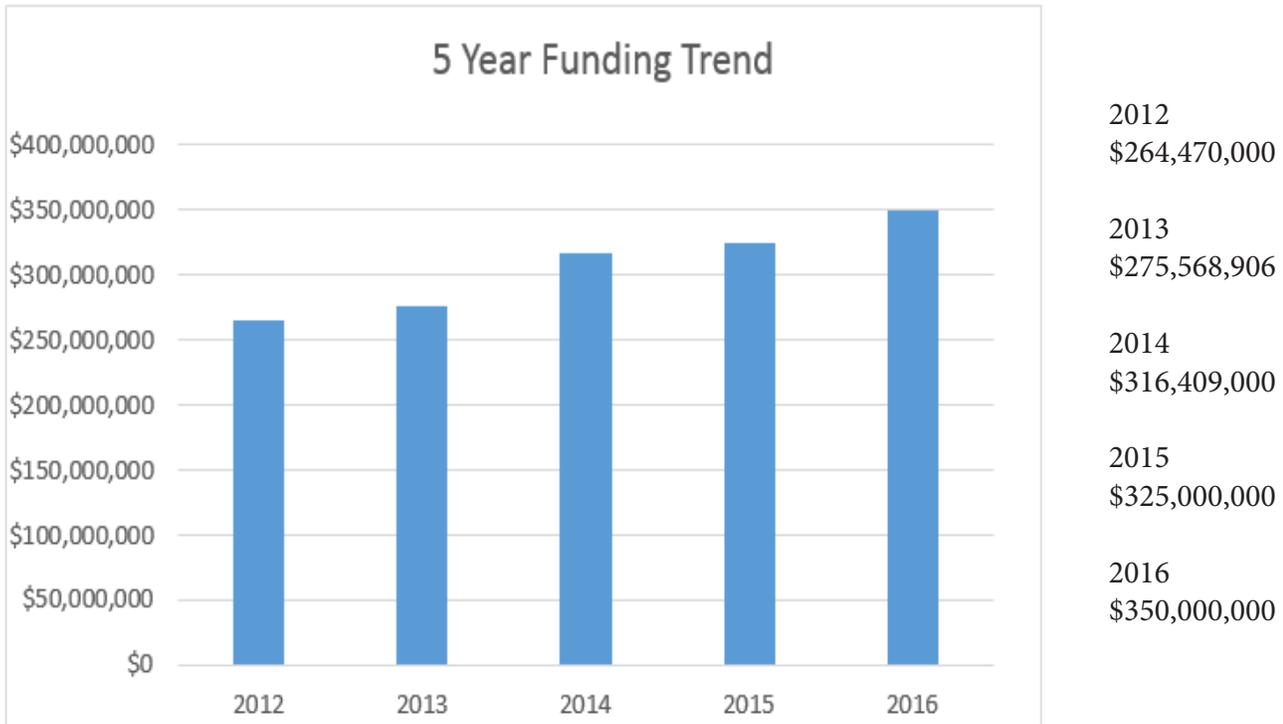
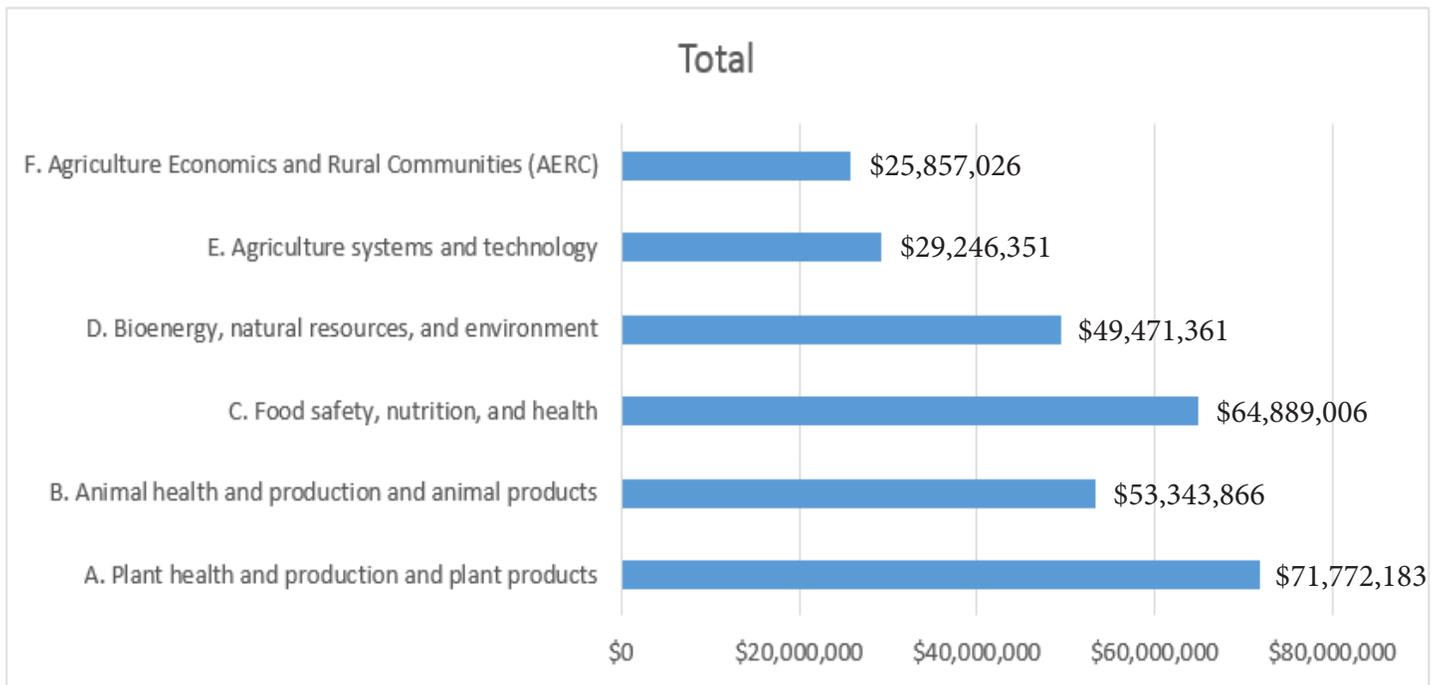


FIGURE 2: AFRI FUNDING BY FARM BILL PRIORITY



Grand Total = \$294,579,794

TABLE 1: AFRI PROGRAM FUNDS

AFRI funding allocations by Program Area

AFRI Programs	Rounded to the nearest Million
Bioenergy	\$ 25
Childhood Obesity Prevention	23
Climate Change	14
Food Safety	14
Food Security	42
Water for Agriculture	22
Foundational Programs	130
Education and Literacy Initiative	19
Inter-agency Agreements	31
Program Administration	30
TOTAL	\$350

TABLE 2: NUMBER OF AFRI APPLICATIONS AND TOTAL DOLLARS REQUESTED, RECOMMENDED FOR FUNDING, AND AWARDED FOR FY 2016 FUNDS

Applications	Number	Funding
Requested	2,719	\$1,847,959,564
Recommended for Funding	757	682,014,317
Awarded	664	307,146,459

TABLE 3: NUMBER OF APPLICATIONS, AWARDS, AND TOTAL DOLLARS AWARDED FOR EACH AFRI PROGRAM, BY AREA

Programs by Request for Application (RFA)	Number of Applications	Number of Awards	Fiscal Year 2016 Funding
Plant Health and Production and Plant Products			
Foundational Knowledge of Agricultural Production Systems	47	11	\$5,122,374
Insects and Nematodes	2	0	0
Pests and Beneficial Species in Agricultural Production Systems	152	18	7,586,717
Understanding Plant-Associated Microorganisms	1	1	39,173
Plant Breeding for Agricultural Production	72	18	5,155,661
NIFA International Wheat Yield Partnership	22	7	3,446,000
Physiology of Agricultural Plants	149	24	7,489,119
Plant Biotic Interactions	10	10	6,442,828
Biology of Agricultural Plants	1	0	0
Animal Health and Production and Animal Products			
Animal Breeding, Genetics, and Genomics	30	9	2,980,000
Animal Reproduction	65	17	6,237,383
Animal Health and Disease	154	35	12,379,358
Ecology and Evolution of Infectious Diseases	4	4	4,644,700
Tools and Resources	3	1	500,000
Improved Nutritional Performance, Growth, and Lactation of Animals	94	18	6,509,027
Dual Use of Animals for Dual Benefit	3	2	3,246,109
Animal Well-Being	19	3	1,500,000
Food Safety, Nutrition, and Health			
Improving Food Safety	117	17	6,167,132
Function and Efficacy of Nutrients	87	15	6,037,061
Food Manufacturing Technologies	1	1	112,500
Food Specific Molecular Profiles and Biomarkers of Food and Nutrient Intake, and Dietary Exposure	3	0	0
Improving Food Quality	93	16	5,665,211
Understanding Antimicrobial Resistance	30	2	887,500
Renewable Energy, Natural Resources, and Environment			
Microbial Communities in Soil	51	11	4,645,925
Cover Crops for Bioenergy and Bio-based Products	10	5	2,377,378
Socioeconomic Implications and Public Policy Challenges of Bioenergy and Bio-products Market Development and Expansion	22	5	2,489,048
Agro-Ecosystem Management	57	12	5,145,649
Agriculture Systems and Technology			
Nanotechnology for Agricultural and Food Systems	87	13	4,503,661
Agricultural Engineering	53	7	2,860,752
Bioprocessing and Bioengineering	72	9	3,884,215
National Robotics Initiative	5	5	3,444,874
Agriculture Economics and Rural Communities			
Small and Medium-Sized Farms	31	9	3,499,752
Markets and Trade	46	10	3,409,775
Environment	37	10	4,548,990
Pilot Program: Behavioral and Experimental Economic Applications for Agri-Environmental Policy Design	4	2	499,909
Joint ERS-NIFA Pilot Program	2	0	0
Innovation for Rural Entrepreneurs and Communities	52	16	5,513,338

TABLE 3: NUMBER OF APPLICATIONS, AWARDS, AND TOTAL DOLLARS AWARDED FOR EACH AFRI PROGRAM, BY AREA (CONTINUED)

Programs by Request for Application (RFA)	Number of Applications	Number of Awards	Fiscal Year 2016 Funding
Critical Agricultural Research and Extension (CARE) Program			
CARE	35	11	2,957,261
Exploratory Program			
Exploratory Research	75	22	1,905,334
Challenge Area Program			
Childhood Obesity Prevention			
Integrated Research, Education, and Extension to Prevent Childhood Obesity	89	29	17,518,995
Extension Interventions to Prevent Childhood Obesity	14	4	3,767,028
Transdisciplinary Graduate Education and Training in Nutrition and Family Sciences or Child Development or Related Fields to Prevent Childhood Obesity	1	0	0
Community-based Childhood Obesity Prevention	2	0	0
Climate Change			
Regional Approaches to Climate Change	10	2	3,552,974
Climate and Microbial Processes in Agroecosystems	1	1	820,000
Climate Outreach and Extension	10	4	998,800
Interagency Climate Change	6	5	5,000,000
Climate and Land Use	33	5	7,062,126
Climate Change Mitigation and Adaptation in Agriculture	11	0	0
Food Safety			
Enhancing Food Safety through Improved Processing Technologies	12	5	5,128,681
Effective Mitigation Strategies for Antimicrobial Resistance	52	9	6,435,805
Assessment of the AFRI Food Safety Challenge Area	1	1	300,000
Prevention and Control of <i>Salmonella</i> and <i>Campylobacter</i> in Poultry Flocks and Poultry Products, Including Eggs	3	0	0
Prevention, Detection, and Control of Shiga toxin-producing <i>Escherichia coli</i> (STEC) from Pre-Harvest through Consumption in Beef Products	2	0	0
Prevention, Detection, and Control of Food-borne Viruses in Food: A Focus on Noroviruses	3	0	0
Global Food Security			
Translational Genomics for Improved Fertility of Animals	7	3	1,797,192
Translational Genomics for Disease Resistance in Animals	10	3	1,683,753
Extension-Driven Disease Prevention and Control in Animals	7	2	1,187,472
Minimizing Diseases due to Fungal Pathosystems	9	3	3,241,666
Management of Arthropod - or Nematode - Vecteded Plant Pathogens	4	2	1,425,000
Improved Sustainable Food Systems to Reduce Hunger and Food Insecurity Domestically and Globally	25	6	4,666,667
Mitigating Crop and Livestock Losses	8	3	3,114,705
Minimizing Losses from Pests and Diseases of Livestock	5	2	2,922,500
Agricultural Production Systems	4	4	3,000,000
Breeding and Genomics	2	2	2,000,000
New Frontiers in Pollinator Health: From Research to Application	35	7	6,800,000
Breeding and Phenomics of Food Crops and Animals	22	9	7,485,795
Early Concept Grants for Exploratory Research (EAGERS) to Develop and Enable Breakthrough Technologies for Animal and Plant Phenomics and Microbiomes	11	10	2,710,000
Cyber-Physical Systems	6	6	4,770,576
Improving Sustainability by Improving Feed Efficiency of Animals	3	0	0

TABLE 3: NUMBER OF APPLICATIONS, AWARDS, AND TOTAL DOLLARS AWARDED FOR EACH AFRI PROGRAM, BY AREA(CONTINUED)

Programs by Request for Application (RFA)	Number of Applications	Number of Awards	Fiscal Year 2016 Funding
Global Food Security (Continued)			
Minimizing Losses from Dairy Diseases with Major Impact on Production, Marketing, and/or Trade	1	0	0
Oomycete Pathosystems in Crop Plants to Minimize Disease	2	0	0
Program Delivery and Implementation of Wide-area Pest Monitoring	1	0	0
Sustainable Bioenergy			
Development and Sustainable Production of Regionally Appropriate Biomass Feedstocks	41	5	18,084,000
Sustainable Bioenergy Research	1	0	0
Investing in America's Scientific Corps: Stimulating a New Era of Students and Faculty in Bioenergy	21	3	7,000,000
Plant Feedstock Genomics for Bioenergy	2	2	2,000,000
Education and Literacy Initiative			
Predoctoral Fellowships	124	53	4,752,524
Postdoctoral Fellowships	132	44	6,358,356
Undergraduate Research and Extension Experiential Learning Fellowships	75	18	5,000,189
Professional Development Opportunities for Secondary School Teachers (PD-STEP)	31	14	2,000,000
Water for Agriculture			
Water for Agriculture	53	11	15,562,431
Water for Agriculture: Understanding Decisions and Behaviors Connected with Agriculture and Post-harvest Processing Industry Water Use	11	5	2,299,958
Water for Agriculture: Understanding the Human Health Impacts to Exposure from Non-Traditional Water Used in Agriculture	18	6	2,865,553
Grand Total	2,719	664	\$307,146,458

TABLE 4: TOTAL DOLLARS AND PERCENT OF FUNDING FOR DIMENSIONS OF FY 2016 AFRI AWARDS

Award Dimension	Funding	%
Fundamental Research Mission-Linked	\$154,176,860	52
Applied Research	139,991,651	48
Multi-Disciplinary	224,696,403	75
Single Discipline	73,692,625	25
Integrated Research		
Education and Extension	2,004,517	1
Research and Education	14,577,172	5
Research and Extension	30,524,298	10
Research, Education, and Extension	96,206,237	32
Single Function Projects		
Research	152,860,803	51
Education	1,217,200	0
Extension	998,800	0

TABLE 5: NUMBER AND TOTAL DOLLARS OF FY 2016 AWARDS PROVIDED FOR EACH CATEGORY FASE GRANT

Award Type	Number	Funding
Postdoctoral Fellowships	44	\$6,358,356
Predocctoral Fellowships	53	4,752,524
New Investigator Awards (9)	3	1,109,930
Strengthening Awards		
Research Career Enhancement Awards	2	86,273
Equipment Grants*	2	80,000
Seed Grants*	30	4,310,045
Standard Strengthening Research Project Awards*	19	10,024,983
Strengthening Coordinated Agricultural Projects	2	1,517,205
Other	41	15,911,889
Total	196	44,151,205

*Number Includes New Investigators.

TABLE 6: CROSSCUTTING AREAS OF SCIENCE IMPORTANT TO AFRI AND USDA

Award Type	Number	Funding
Animal Genome	28	\$12,914,295
Animal Health	76	31,886,146
Food Safety	62	27,918,339
Forest Biology	10	3,026,157
Global Change	45	53,450,769
Integrated Pest Management	25	16,202,708
Plant Genome	29	12,495,260
Sustainable Agriculture	97	75,393,908
Water Quality	38	30,428,530

TABLE 7: APPLICATIONS BY TYPE OF INSTITUTION

Type of Institution	% of Applications Submitted	% of Applications Awarded	% of Total Dollars Awarded
Land-Grant University			
1862 Land-Grant University	75.87	79.67	82.81
1890 Land-Grant University (including Tuskegee)	3.24	1.36	1.21
1994 Land-Grant University	0.33	0.00	0.00
Non-Land-Grant University or College	6.80	6.02	4.95
Private University or College	5.81	6.17	5.85
Federal Agency/Department	2.54	2.56	2.26
Industry/Other*	5.41	4.22	2.92
<i>*Includes Non-Federal Government, Private For-Profit, and Other Entities</i>			

TABLE 8: NUMBER AND LENGTH OF TIME OF UNDERGRADUATE, GRADUATE, AND POSTDOCTORAL JOBS PROVIDED BY AFRI FY 2016 AWARDS

Program	Supported	Undergraduate Students	Graduate Students	Postdoctoral Students	Subtotal
Foundational Programs					
Plant Health and Production and Plant Products	Number Months	76 966	220 1,818	102 1,241	398 4,025
Animal Health and Production and Animal Products	Number Months	52 261	59 1,210	19 432	130 1,903
Food Safety, Nutrition, and Health	Number Months	5 39	37 262	1 6	43 307
Bioenergy, Natural Resources, and Environment	Number Months	28 176	38 1,054	12 247	78 1,477
Agriculture Systems and Technology	Number Months	54 206	86 1,052	22 200	162 1,458
Agriculture Economics and Rural Communities	Number Months	23 39	67 713	6 16	96 768
Exploratory Research Program	Number Months	5 51	10 148	1 10	16 209
Critical Agricultural Research and Extension	Number Months	11 226	11 215	3 78	25 519
Challenge Area Programs					
Sustainable Bioenergy	Number Months	18 45	0 0	9 12	27 57
Climate Change	Number Months	19 151	75 793	23 185	117 1,129
Food Safety	Number Months	13 144	70 716	15 108	98 968
Global Food Security	Number Months	211 1,691	154 3,383	73 1,573	438 6,647
Childhood Obesity Prevention	Number Months	53 441	40 733	7 214	100 1,388
Water for Agriculture	Number Months	25 30	27 202	12 116	64 368
Fellowships					
Education and Literacy Initiative	Number Months	0 0	53 1,248	44 1,050	97 2,298
Total	Number Months	593 4,486	967 13,547	349 5,488	1,889 23,521