

Agriculture and Food Research Initiative (AFRI) FY 2017 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 leading competitive grants program for food and agricultural science in the United States. AFRI addresses the six [Farm Bill Priority Areas](#) and supports research, education, and extension activities to address agriculture-related societal challenges.

USDA-NIFA APPROACH

AFRI supports research, education, and extension work by awarding grants to solve key problems of local, regional, national, and global importance in conventional, organic, and urban agricultural systems. The AFRI portfolio is broad and includes projects on farm efficiency and profitability; sustainability; ranching; bioenergy; forestry; aquaculture; rural communities and entrepreneurship; human nutrition; biotic and abiotic constraints on food production; food safety; food waste and food loss; physical and social sciences; family and consumer sciences; rural human ecology; biotechnology; and plant and animal breeding. AFRI advances knowledge in both fundamental and applied sciences important to agriculture.

NIFA works to identify, understand, and solve the challenges of meeting the food, clothing, fuel, and shelter needs of all people. To address these critical issues, NIFA maintains partnerships 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 the 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 food production and profitability, nutritional security, sustainable value-added bioproducts, and climate change.

FUNDING PORTFOLIO

AFRI's funding portfolio supports research, education, and extension efforts that address key problems of national and regional importance in sustaining all components of the food and agricultural sectors. Since 2009 (Figure 1), AFRI has been appropriated \$2,634,900,000 to advance research, education, and extension activities in the United States. The level of investment shows a gradual upward trend in funding, with an increase in funding from \$201,500,000 in 2009 to \$375,000,000 in 2017.

AFRI is authorized under the 2014 Farm Bill and supports work in six priority areas: A) plant health and production and plant products; B) animal health and production and animal products; C) food safety, nutrition and health; D) bioenergy, natural resources and environment; E) agriculture systems and technology; and F) agriculture economics and rural communities (Figure 2).

In FY 2017, AFRI was appropriated \$375,000,000 to administer and support basic and applied research, education, and extension programs (Table 1). The programs expanded NIFA's existing investments and created new opportunities to address the food and agricultural sciences. AFRI's statute (7 U.S.C. 3157) gives NIFA the flexibility to implement the program, which can expend available funds outside of the year the funds were appropriated. Thus, all funds may not be obligated to grant awards in one year. Even so, AFRI has a science-based annual approach to the expenditure of all funds to support work that addresses the challenges facing food

and agriculture production in the United States.

NIFA works continuously to ensure the public understands the relationship between the AFRI portfolio and the six Farm Bill established priorities for AFRI. While it is easy to see the relationship within the Foundational programs, the Challenge Area and the Education and Literacy Initiative programs are not as obvious. Therefore, a breakout of the expended 2017 funds (Figure 2) shows the multidisciplinary work of the entire AFRI program.

AWARDS OVERVIEW

OVERVIEW OF THE APPLICATION PROCESS

In FY 2017, 60 AFRI programs solicited applications. A total of 2,699 competitive grant applications, requesting \$1,732,262,500 were received, and reviewed through [NIFA's competitive peer review process](#) (Table 2). Awards totaling \$337,200,430 were made to 592 highly ranked meritorious applications distributed across the entire AFRI program (Table 3). An additional 979 proposals were recommended for funding—rated as Outstanding, High Priority, or Medium Priority—by review panels and could have been supported, provided an additional \$604,031,323 was available to the program (Table 2). The success rate for AFRI applications in FY 2017, 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). Fifty-three percent of AFRI awards supported fundamental research to deliver basic knowledge to advance research and conceptual breakthroughs in fields relevant to agriculture. Applied Research awards accounted for the remaining 47 percent to fund work to address specific near-term problems, needs, or opportunities in the food and agricultural sciences. Multidisciplinary teams conducted 73 percent of the AFRI awards made in 2017. 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.

AFRI engages a broad range of entities including land-grant universities (1862, 1890, and 1994), public non-land-grant universities, private colleges and universities, public non-land-grant universities or colleges, federal agencies, individuals, and industry. In 2017, 1862 land-grant universities were the main recipients of AFRI funding, accounting for 75% of applications submitted and 78% of grants awarded (Table 5).

FOOD AND AGRICULTURAL SCIENCE

AFRI offers Food and Agricultural Science Enhancement (FASE) grants (Table 6) to enhance institutional capacity and attract new scientists into careers in food and agricultural sciences. FASE grants provide support for pre- and postdoctoral fellowships, new investigators, and Strengthening Grants. Strengthening Grants provide support to institutions and states that are underrepresented in terms of federal funding. Strengthening Grants are limited to small and mid-sized or minority-serving institutions with limited institutional success for receiving federal funds, or investigators at State Agricultural Experiment Stations or degree-granting institutions eligible for USDA Established Program to Stimulate Competitive Research (EPSCoR) funding. NIFA determines the states that are eligible for USDA EPSCoR each year based on a 3-year rolling average of AFRI funding levels, excluding FASE Strengthening funds granted to EPSCoR states and small-mid-sized and minority-serving, degree-granting institutions. In FY 2017, approximately 13 percent of AFRI funds were used to support FASE grants (excluding New Investigator grants).

STUDENT SUPPORT BY PROGRAM AREA

Competitive grants administered by AFRI also provide a continuum of support to train the next generation of agricultural professionals. In 2017, AFRI funding supported 1,263 undergraduate students, 1,021 graduate students, and 598 postdoctoral scholars for an average of four, 14, and 10 months, respectively (Table 7).

AREAS OF SCIENCE

AFRI makes awards that span 40 topics of major importance to USDA. A few of the overarching cross-cutting topics are shown in Table 8. The topics are addressed through single-function and integrated projects, single discipline-focused and multidisciplinary grants that span the entire spectrum of AFRI programs.

AFRI 2017 ANNUAL REVIEW DATA

FIGURE 1. AFRI HISTORICAL FUNDING

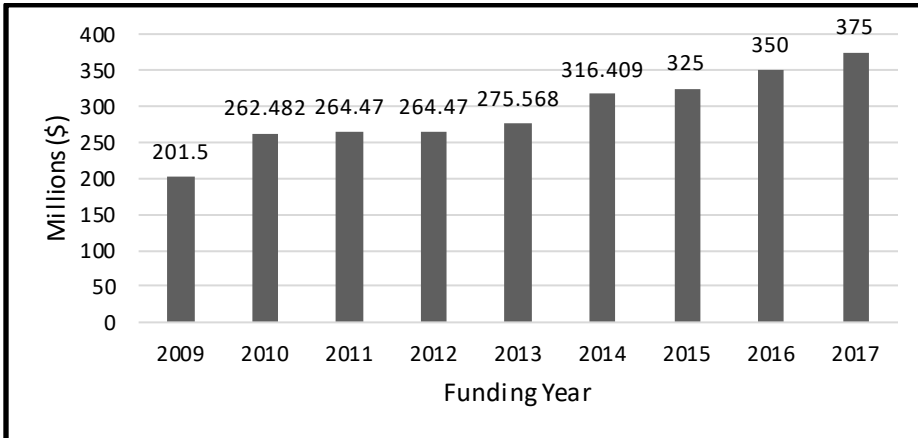
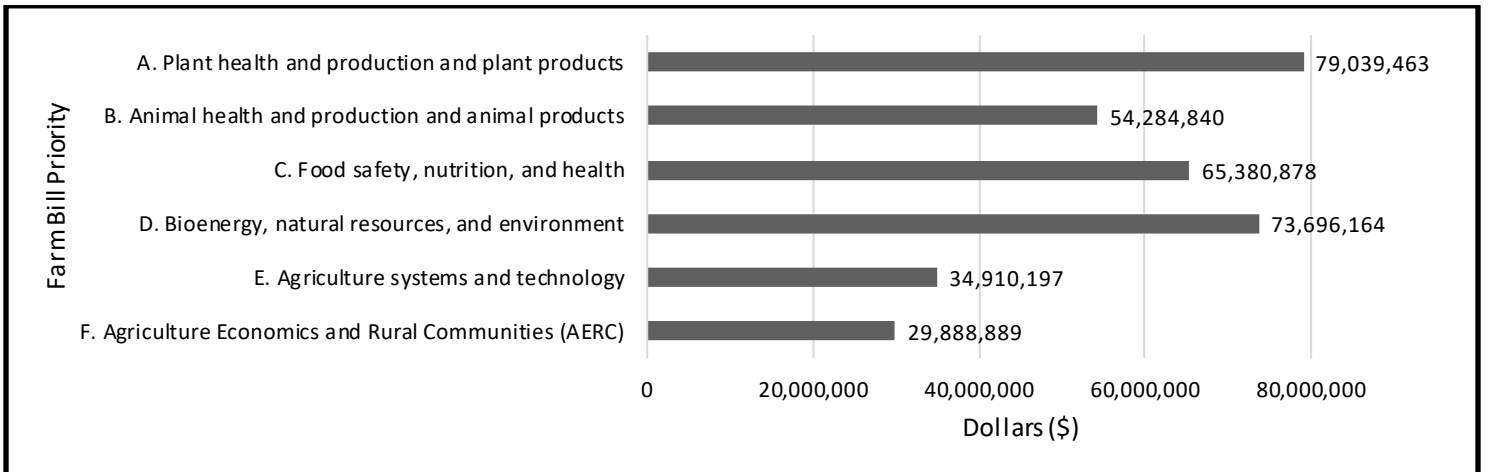


FIGURE 2. AFRI FUNDING BY FARM BILL PRIORITY



Total for awards = \$337,200,430. In any given fiscal year, funding available for awards is approximately 91% of that appropriated after accounting for NIFA administrative costs, salaries for Panel Managers, honoraria for panel reviewers, and Congressionally-mandated set-asides to support USDA’s Small Business Innovation Research and Biotechnology Risk Assessment Grants programs. Significant variation in funding among Farm Bill Priorities from year to year typically represents changes in funding for AFRI Challenge Areas, including funding commitments for continuation grants awarded in previous year, to support of the Administration’s priorities.

TABLE 1. FUNDING ALLOCATIONS BY AFRI PROGRAM AREA

AFRI Programs	Rounded to nearest million
Bioenergy Challenge Area	25
Childhood Obesity Prevention Challenge Area	20
Climate Change Challenge Area	14
Education and Literacy Initiative	19
Food Safety Challenge Area	16
Food Security Challenge Area	11
Foundational Programs	160
Interagency Agreements	31
Water for Agriculture Challenge Area	11
Water for Food Production Systems Challenge Area	34
Program Administration	34
TOTAL	375

TABLE 2. NUMBER OF AFRI APPLICATIONS AND TOTAL DOLLARS REQUESTED, RECOMMENDED FOR FUNDING, AND AWARDED FOR FY 2017 FUNDS¹

Applications	Number	Funding
Requested	2,699	\$1,732,262,500
Recommended for Funding¹	1,571	\$941,231,753
Awarded	592	\$337,200,430

¹ Includes all applications rated as fundable (i.e., rated as outstanding, high priority or medium priority) during peer review regardless of whether funds were available for awarding to those applications.

TABLE 3. NUMBER OF APPLICATIONS, AWARDS, AND TOTAL DOLLARS AWARDED FOR EACH AFRI PROGRAM

AFRI Program	Number of Applications	Number of Awards	Fiscal Year 2017 Funding
Plant Health and Production and Plant Products			
Foundational Knowledge of Agricultural Production Systems	39	14	\$5,088,376
Pests and Beneficial Species in Agricultural Production Systems	127	19	\$8,004,113
Pollinator Health: Research and Application	50	14	\$10,014,828
Plant Breeding for Agricultural Production	85	16	\$7,336,702
Physiology of Agricultural Plants	111	19	\$7,512,462
Plant Biotic Interactions	10	10	\$8,209,005
NIFA International Wheat Yield Partnership ¹	0	0	\$4,999,957
Animal Health and Production and Animal Products			
Animal Breeding, Genetics, and Genomics	16	6	\$1,903,200
Annotation of Agricultural Animal Genomes	11	3	\$6,000,000
Animal Reproduction	57	17	\$6,148,076
Animal Health and Disease	134	35	\$14,015,713
Improved Nutritional Performance, Growth, and Lactation of Animals	93	21	\$7,435,285
Animal Well-Being	19	6	\$1,424,511
Ecology and Evolution of Infectious Diseases ¹	2	2	\$84,899
Dual use of animals for dual benefit ¹	3	3	\$4,225,000
Food Safety, Nutrition, and Health			
Improving Food Safety	141	13	\$4,984,361
Function and Efficacy of Nutrients	89	18	\$5,636,876
Improving Food Quality	103	16	\$5,136,245
Understanding Antimicrobial Resistance	46	6	\$1,969,039
Food Manufacturing Technologies	21	8	\$5,263,531
Integrated Research, Education, and Extension to Prevent Childhood Obesity	64	6	\$23,464,896
Effective Mitigation Strategies for Antimicrobial Resistance	47	10	\$9,958,206
Food Specific Molecular Profiles and Biomarkers of Food and Nutrient Intake, and Dietary Exposure ¹	1	1	\$1,207,486
Enhancing Food Safety Through Improved Processing Technologies ¹	0	0	\$4,000,000
Bioenergy, Natural Resources, and Environment			
Foundational Program: Microbial Communities in Soil	153	35	\$15,021,390
BNRE Networks for Synthesis, Data Sharing and Management	7	3	\$1,329,400
Climate and Land Use	90	16	\$13,403,500
Biomass and Bioproduct Feedstock Genetic Development	17	6	\$5,600,000
Co-products from Biomass Feedstocks	113	10	\$5,009,654
Water for Food Production Systems	88	7	\$33,922,500
Plant Feed Stocks Genomics for Bioenergy	2	2	\$2,000,000
Interagency Climate Change	4	4	\$4,839,000
Interagency Climate Change NASA	8	8	\$ -
Development and Sustainable Production of Regionally Appropriate Biomass Feedstocks ¹	0	0	\$13,037,429
Global Food Security: Mitigating Crop and Livestock Losses ¹	0	0	\$3,077,500
Global Food Security: Minimizing Losses from Pests and Diseases of Livestock ¹	0	0	\$2,922,500
Global Food Security: Agricultural Production Systems ¹	0	0	\$5,000,000
Global Food Security: National strategy for sustainable production ¹	0	0	\$25,000
Agriculture Systems and Technology			

AFRI Program	Number of Applications	Number of Awards	Fiscal Year 2017 Funding
Nanotechnology for Agricultural and Food Systems	79	12	\$4,824,531
Agricultural Engineering	72	10	\$4,083,668
Bioprocessing and Bioengineering	86	11	\$4,897,759
National Robotics Initiative	3	3	\$2,769,222
Food and Agriculture Cyberinformatics and Tools ¹	0	0	\$24,813
Cyber-Physical Systems ¹	0	0	\$4,999,999
Bioenergy Feedstock Logistics Program ¹	0	0	\$60,000
Climate and Microbial Processes in Agroecosystems ¹	0	0	\$820,000
Water for Agriculture ¹	0	0	\$12,115,847
Water for Agriculture: Understanding the Human Health Impacts to Exposure from Nontraditional Water Used in Agriculture ¹	0	0	\$300,000
Agriculture Economics and Rural Communities			
Small and Medium-Sized Farms	54	11	\$5,514,112
Markets and Trade	43	10	\$3,733,224
Social Implications of Emerging Technologies	18	5	\$1,538,670
Environmental and Natural Resource Economics	25	6	\$2,728,094
Innovation for Rural Entrepreneurs and Communities	50	11	\$4,380,720
Crosscutting Programs			
Critical Agricultural Research and Extension: CARE	92	10	\$3,388,918
Exploratory Research	88	22	\$1,999,974
Rapid Response to Novel Coronavirus (SARS-CoV-2) Impacts Across Food and Agricultural Systems ¹	0	0	\$2,135,306
Education and Literacy Initiative			
Pre-doctoral Fellowships	99	52	\$6,142,258
Post-doctoral Fellowships	122	49	\$5,408,690
Undergraduate Research and Extension Experiential Learning Fellowships	79	18	\$4,999,991
Professional Development Opportunities for Secondary School Teachers (PD-STEP)	38	8	\$1,123,994
Total	2,699	592	\$337,200,430

¹ Indicates grants submitted in other fiscal years that were funded with FY 2017 funds

TABLE 4. TOTAL DOLLARS AND PERCENT OF TOTAL FUNDING FOR DIMENSIONS OF FY 2017 AFRI AWARDS

Award Dimension	Funding	Percent
Fundamental Research Mission-Linked	\$137,140,866	51.3%
Applied Research	\$130,223,432	48.7%
Multi-Disciplinary	\$245,894,557	72.9%
Single Discipline	\$91,305,874	27.1%
Integrated Research		
Education and Extension	\$1,438,588	0.4%
Research and Education	\$17,470,373	5.2%
Research and Extension	\$51,441,987	15.3%
Research, Education, and Extension	\$104,462,796	31.0%
Single Function Projects		
Research	\$160,531,808	47.6%
Education	\$1,854,877	0.6%
Extension	\$ -	0.0%

TABLE 5. 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	74.8%	78.4%	83.5%
1890 Land-Grant University (including Tuskegee)	3.9%	2.7%	1.7%
1994 Land-Grant University	0.0%	0.0%	0.0%
Public Non-Land-Grant University or College	5.8%	5.7%	5.4%
Private University or College	5.4%	5.2%	4.2%
Federal Agency/Department	2.3%	2.2%	1.9%
Other ¹	7.7%	5.7%	3.2%

¹ Includes Non-federal Government, Private For-Profit, Non-Profit, and other entities

TABLE 6. NUMBER AND TOTAL DOLLARS OF FY 2017 AWARDS PROVIDED FOR EACH CATEGORY FASE GRANT

Award Type	Number ²	FY 2017 Funding ²
Predocctoral Fellowships	52	\$ 6,142,258
Postdoctoral Fellowships	49	\$ 5,408,690
New Investigator Awards	40	\$ 18,893,543
Strengthening Awards		
Sabbatical Grants	2	350,805
Equipment Grants	9	277,936
Seed Grants	41	6,367,341
Standard Strengthening Grants	56	22,177,756
Strengthening Coordinated Agricultural Projects	1	8,625,814
Strengthening Conference Grants	6	186,111
Total		\$ 49,536,711³

² Application numbers indicate applications submitted in Fiscal Year 2017 and funding indicates FY 2017 appropriated funds used (funding from other appropriation years may have been used for FY 2017 submitted applications)

³ Total excludes New Investigator Awards

TABLE 7. NUMBER AND LENGTH OF TIME OF UNDERGRADUATE, GRADUATE, AND POSTDOCTORAL JOBS PROVIDED BY AFRI FY 2017 AWARDS

Program	Undergraduate (Number / Months)	Graduate (Number / Months)	Postdoctoral (Number / Months)	Subtotal (Number / Months)
Foundational and Applied Science RFA Program Areas				
Plant Health and Production and Plant Products	386 / 836	322 / 1,791	338 / 1,319	1,046 / 3,946
Animal Health and Production and Animal Products	39 / 274	83 / 1,368	40 / 933	162 / 2,575
Food Safety, Nutrition, and Health	37 / 498	82 / 1,648	46 / 535	165 / 2,681
Bioenergy, Natural Resources, and Environment	37 / 464	64 / 2,306	19 / 541	120 / 3,311
Agriculture Systems and Technology	49 / 26	108 / 655	16 / 164	173 / 845
Agriculture Economics and Rural Communities	2 / 0	35 / 575	4 / 81	41 / 656
Critical Agricultural Research and Extension	6 / 88	11 / 126	4 / 40	21 / 254
Education and Workforce Development RFA				
All Programs	467 / 1,564	69 / 1,703	44 / 1,058	580 / 4,325
Challenge Area RFAs Program Areas				
Sustainable Bioenergy	17 / 102	38 / 417	11 / 126	66 / 645
Climate Change	18 / 592	33 / 1,086	32 / 720	83 / 2,398
Food Safety	46 / 48	56 / 420	12 / 12	114 / 480
Global Food Security	46 / 243	27 / 1,069	7 / 192	80 / 1,504
Childhood Obesity Prevention	62 / 530	26 / 535	9 / 135	97 / 1,200
Water for Agriculture	46 / 83	62 / 636	15 / 126	123 / 845
Total	1,263 / 5,379	1,021 / 14,413	598 / 6,005	2,882 / 25,797

TABLE 8. AREAS OF SCIENCE IMPORTANT TO AFRI AND USDA

Area of Science	Number	Funding
Animal Genome	19	\$12,844,402
Animal Health	76	\$26,382,296
Forest Biology	20	\$11,502,472
Food Safety	50	\$25,022,891
Climate Change	68	\$56,042,745
Integrated Pest Management	42	\$21,029,156
Plant Genome and Breeding	29	\$13,757,654
Bioenergy	22	\$29,424,478
Sustainable Agriculture	139	\$94,979,070
Social Science	89	\$65,779,099
Water Quality	58	\$57,565,938