

Agriculture and Food Research Initiative (AFRI) FY 2019 Annual Review

ESTABLISHED BY THE 2008 FARM BILL and most recently re-authorized in the 2018 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, 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 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 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, nutrition security, sustainable value-added bioproducts, and climate change.

FUNDING PORTFOLIO

AFRI's funding portfolio supports research, education, and extension work that address key problems of national and regional importance in sustaining all components of food and agriculture. Since 2009 (Figure 1), AFRI has received \$3,449,899,000 to advance research, education, and extension activities in the United States. The level of investment shows a gradual upward trend in funding, representing more than twofold in funding from \$201,500,000 in 2009 to \$415,000,000 in 2019.

AFRI is authorized under the 2018 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) agricultural systems and technology; and F) agriculture economics and rural communities (Figure 2).

In FY 2019, AFRI received \$415,000,000 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, which aligns with AFRI's scientific approach of expending funds when they are best able to support work that addresses food and agricultural challenges.

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 relationships within the Sustainable Agricultural Systems and the Education and Workforce Development programs are not as obvious. Therefore, a breakout of the expended 2019 funds (Figure 2) shows the multidisciplinary work of the entire AFRI program.

AWARDS OVERVIEW

OVERVIEW OF THE APPLICATION PROCESS

In FY 2019, 45 programs solicited applications. A total of 2,144 competitive grant applications, requesting \$1,531,687,709, were received, and reviewed through a competitive peer review process (Table 2). Awards totaling \$375,537,610 were made to 618 highly-ranked applications distributed across the program (Table 3). An additional 706 proposals were recommended for funding—rated as Outstanding, High Priority, or Medium Priority—by review panels and could have been supported, provided an additional \$601,777,515 was available to the program (Table 2). The success rate for AFRI applications in FY 2019, 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 18 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-five 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 45 percent to fund work to address specific near-term problems, needs, or opportunities in the food and agricultural sciences. Multidisciplinary teams conducted 78 percent of the AFRI awards made in 2019. 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 2019, 1862 land-grant universities were the main recipients of AFRI funding, accounting for 75% of applications submitted and 75% of grants awarded (Table 5).

In 2019, three program area priorities (Plant Breeding for Agricultural Production, Welfare and Well-being of Agricultural Animals, and Diseases of Agricultural Animals) piloted a partnership opportunity to request an additional \$150,000 for applications that included significant collaboration with one or more minority-serving institutions, small- to mid-sized institutions, institutions in Established Program to Stimulate Competitive Research (EPSCoR) states, and/or international partners. The additional \$150,000 above the listed budget maximum was required to be sub-awarded to the partnering institution(s). Among these three program area priorities, there were 29 number of partnership applications submitted (Plant Breeding for Agricultural Production = 15, Welfare and Well-being of Agricultural Animals = 3, Diseases of Agricultural Animals = 11) and 8 awards (Plant Breeding for Agricultural Production = 4, Welfare and Well-being of Agricultural Animals = 1, Diseases of Agricultural Animals = 4) for an overall success rate of 27.6%. Partner institutions included those in EPSCoR states (1 award) and international partners (7 awards).

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 EPSCoR funding. NIFA determines the states that are eligible for USDA EPSCoR each year based on a three-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 2019, approximately 21 percent of AFRI program funds were set-aside to support FASE 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 2019, AFRI funding supported 1,647 undergraduate students, 706 graduate students, and 303 postdoctoral scholars for an average of three, 16, and 16 months, respectively (Table 7).

SUSTAINABLE AGRICULTURAL SYSTEMS

In 2019 the AFRI Sustainable Agricultural Systems RFA solicited projects addressing the following long-term goals: 1) increase profitability in agriculture by reducing input use; expand existing and create new markets; increase productivity and curb production losses due to environmental and biological stresses, including pests and diseases; 2) foster economic development and prosperity in rural America by catalyzing the bioeconomy through production of high-value bio-based chemicals and other products using agricultural feedstocks; 3) enhance the contribution of food and agriculture to the health of the nation through development, adoption, and application of new or existing technologies, tools, education, and other resources to ensure access to sufficient quantities of safe, nutritious, and affordable food. Out of 60 applications, nine projects were funded (15%) for a total of \$89,800,000 (Table 3).

AREAS OF SCIENCE

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

AFRI 2019 ANNUAL REVIEW DATA

FIGURE 1. AFRI HISTORICAL FUNDING

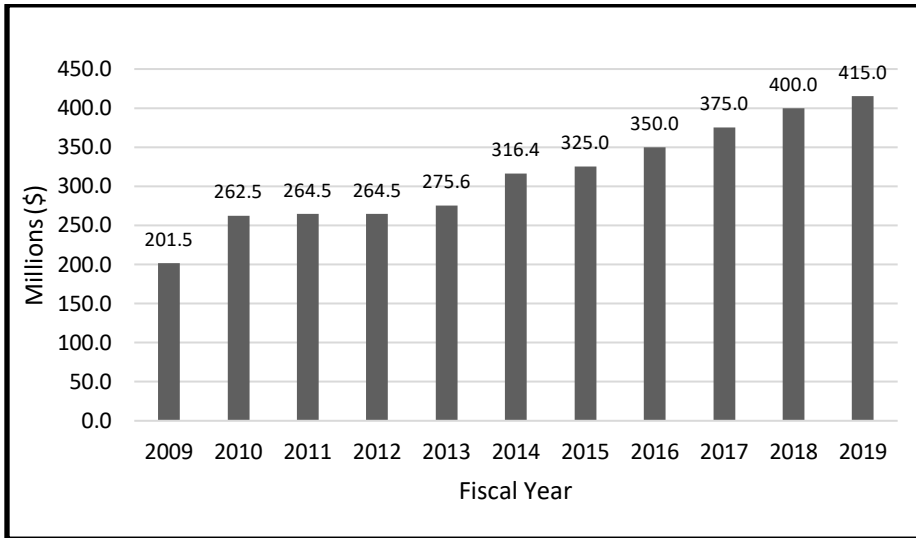
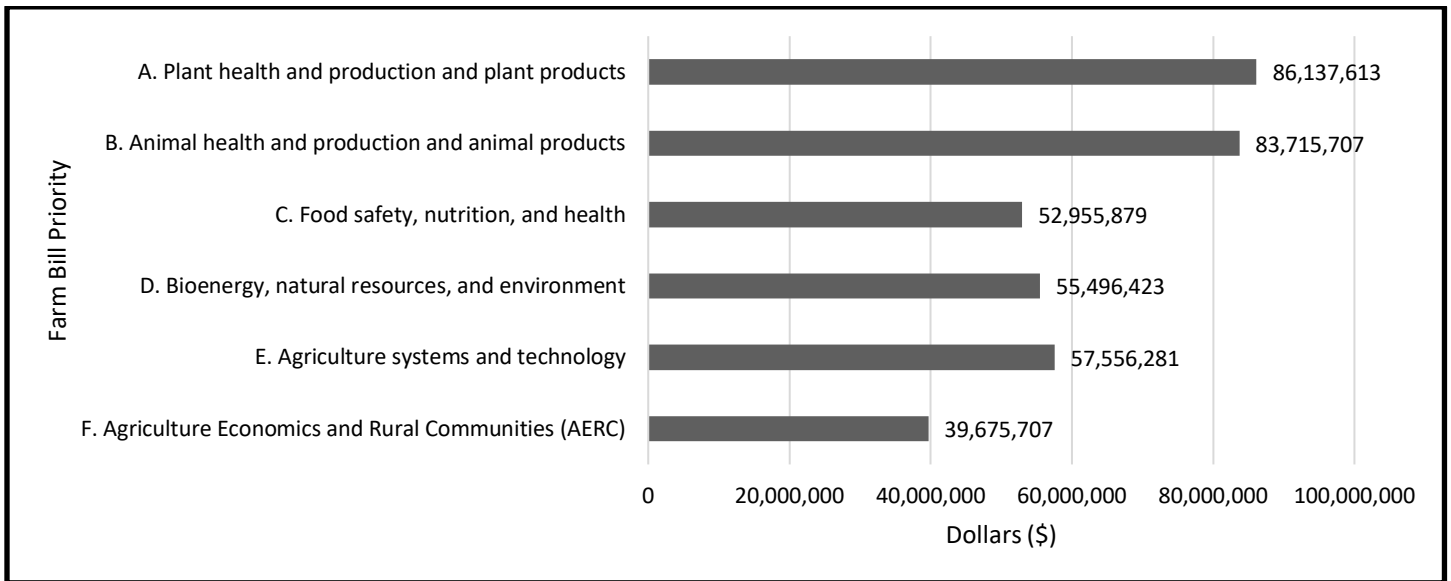


FIGURE 2. AFRI FUNDING BY FARM BILL PRIORITY



Total for awards = \$375,537,610. In any given fiscal year, funding available for awards is approximately 91% of that appropriated after accounting for NIFA administrative costs of 5%, salaries for Panel Managers, honoraria and travel for panel reviewers, and Congressionally-mandated set-asides to support USDA’s Small Business Innovation Research and Biotechnology Risk Assessment Grants programs.

TABLE 1. FUNDING ALLOCATIONS BY AFRI PROGRAM AREA

AFRI Programs	Rounded to Nearest Million
Education and Workforce Development	40
Foundational Programs	220
Interagency Agreements	29
Sustainable Agricultural Systems	90
Program Administration	36
TOTAL	415

TABLE 2. NUMBER OF AFRI APPLICATIONS AND TOTAL DOLLARS REQUESTED, RECOMMENDED FOR FUNDING, AND AWARDED FOR FY 2019 FUNDS

Applications	Number	Funding
Requested	2,144	\$ 1,531,687,709
Recommended for Funding	1,324	\$ 977,315,125
Awarded	618	\$ 375,537,610

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

AFRI Program	Number of Applications	Number of Awards	Fiscal Year 2019 Funding
Plant Health and Production and Plant Products			
Foundational Knowledge of Agricultural Production Systems	66	11	\$ 5,162,374
Foundational Knowledge of Plant Products	28	8	\$ 3,751,819
Pests and Beneficial Species in Agricultural Production Systems	85	15	\$ 6,459,898
Pollinator Health: Research and Application	37	11	\$ 3,556,661
Plant Breeding for Agricultural Production	90	20	\$ 11,882,229
Physiology of Agricultural Plants	83	13	\$ 5,429,819
Tactical Sciences for Agricultural Biosecurity	29	7	\$ 4,753,116
Agricultural Innovation through Gene Editing	29	12	\$ 3,420,470
Plant Biotic Interactions ^{1, 2}	11	11	\$ 5,127,652
International Wheat Yield Partnership ^{1, 2}	0	0	\$ 2,500,000
Animal Health and Production and Animal Products			
Animal Breeding and Functional Annotation of Genomes	24	9	\$ 4,722,200
Animal Reproduction	60	15	\$ 7,374,260
Diseases of Agricultural Animals	118	33	\$ 14,716,000
Animal Nutrition, Growth and Lactation	72	23	\$ 9,664,453
Welfare and Well-being of Agricultural Animals	29	8	\$ 3,309,000
Inter-Disciplinary Engagement in Animal Systems (IDEAS)	19	5	\$ 4,049,250
Annotation of Agricultural Animal Genomes ²	0	0	\$ 1,500,000
Ecology and Evolution of Infectious Diseases ^{1, 2}	3	3	\$ 2,742,837
Dual Use of Animals for Dual Benefit ^{1, 2}	4	4	\$ 4,950,000
Food Safety, Nutrition, and Health			
Food Safety and Defense	92	19	\$ 8,091,574
Food and Human Health	85	21	\$ 8,510,499
Diet, Nutrition and the Prevention of Chronic Diseases	15	3	\$ 3,020,111
Novel Foods and Innovative Manufacturing Technologies	80	17	\$ 7,771,629
Mitigating Antimicrobial Resistance Across the Food Chain	22	3	\$ 2,999,790
Food Specific Molecular Profiles and Biomarkers of Food and Nutrient Intake, and Dietary Exposure ^{1, 3}	2	2	\$ -
Bioenergy, Natural Resources, and Environment			
Soil Health	42	15	\$ 9,503,771
Agricultural Microbiomes	60	12	\$ 8,942,376
Water Quantity and Quality	45	12	\$ 5,535,133
Sustainable Biomass Feedstock Systems	5	1	\$ 1,000,000
Sustainable Agroecosystems: Health, Functions, Processes and Management	56	13	\$ 6,665,727
Interagency Climate Change ¹	3	3	\$ 10,473,590
Agriculture Systems and Technology			
Nanotechnology for Agricultural and Food Systems	80	13	\$ 5,391,456
Engineering for Agricultural Production Systems	64	12	\$ 4,995,248

¹ Indicates interagency programs.

² Indicates grants submitted in other fiscal years that were funded with FY 2019 appropriations.

³ Indicates Grants Submitted in FY 2019 that were funded from other fiscal year appropriations.

AFRI Program	Number of Applications	Number of Awards	Fiscal Year 2019 Funding
Bioprocessing and Bioengineering	83	12	\$ 4,673,945
Food and Agriculture Cyberinformatics Tools (FACT)	44	11	\$ 9,179,714
National Robotics Initiative ^{1,2}	12	12	\$ 4,344,022
Cyber-Physical Systems ^{1,2}	0	0	\$ 8,264,538
Agriculture Economics and Rural Communities			
Small and Medium-Sized Farms	22	9	\$ 9,066,341
Economics, Markets and Trade	28	11	\$ 4,699,164
Social Implications of Food and Agricultural Technologies	9	3	\$ 1,520,000
Environmental and Natural Resource Economics	25	10	\$ 3,873,604
Rural Economic Development	30	10	\$ 5,808,407
Crosscutting Programs			
Critical Agricultural Research and Extension (CARE)	32	16	\$ 6,950,821
Education and Workforce Development			
Pre-doctoral Fellowships	127	57	\$ 7,888,734
Postdoctoral Fellowships	116	51	\$ 6,091,379
Research and Extension Experiences for Undergraduates (REEU)	63	26	\$ 12,455,920
Professional Development for Agricultural Literacy (PDAL)	28	15	\$ 4,544,231
Agricultural Workforce Training Grants	27	12	\$ 8,403,849
Sustainable Agricultural Systems			
Sustainable Agricultural Systems	60	9	\$ 89,800,000
Total	2,144	618	\$ 375,537,610

TABLE 4. TOTAL DOLLARS AND PERCENT OF TOTAL FUNDING FOR DIMENSIONS OF FY 2019 AFRI AWARDS

Award Dimension	Funding	Percent
Fundamental Research Mission-Linked	\$149,252,407	54.5%
Applied Research	\$124,407,411	45.5%
Multi-Disciplinary	\$293,733,497	78.2%
Single Discipline	\$81,804,113	21.8%
Integrated Research		
Education and Extension	\$3,417,109	0.9%
Research and Education	\$16,057,647	4.3%
Research and Extension	\$27,044,762	7.2%
Research, Education, and Extension	\$116,129,405	30.9%
Single Function Projects		
Research	\$201,567,692	53.7%
Education	\$9,349,051	2.5%
Extension	\$1,971,945	0.5%

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	75.2%	75.2%	80.7%
1890 Land-Grant University (including Tuskegee)	3.0%	2.1%	1.1%
1994 Land-Grant University	0.1%	0.3%	0.1%
Public Non-Land-Grant University or College	5.3%	5.0%	4.6%
Private University or College	6.7%	7.0%	5.4%
Federal Agency/Department	1.5%	1.9%	2.1%
Other ⁴	8.2%	8.4%	6.1%

TABLE 6. NUMBER AND TOTAL DOLLARS OF FY 2019 AWARDS PROVIDED FOR EACH CATEGORY FASE GRANT

Award Type	Number ²	FY 2019 Funding ⁵
Predocctoral Fellowships	57	\$ 7,888,734
Postdoctoral Fellowships	51	\$ 6,091,379
New Investigator Awards	50	\$ 24,028,986
Strengthening Awards		
Sabbatical Grants	2	\$ 106,777
Equipment Grants	6	\$ 190,221
Seed Grants	42	\$ 7,649,385
Standard Strengthening Grants	57	\$ 27,099,061
Strengthening Coordinated Agricultural Projects	4	\$ 30,000,000
Strengthening Conference Grants	4	\$ 64,247
Total		\$ 79,089,803

⁴ Includes Non-Federal Government, Private For-Profit, Non-Profit, and other entities

⁵ Application numbers indicate applications submitted in Fiscal Year 2019 and funding indicates FY 2019 appropriated funds used (funding from other appropriation years may have been used for FY 2019 submitted applications)

TABLE 7. NUMBER AND LENGTH OF TIME OF UNDERGRADUATE, GRADUATE, AND POSTDOCTORAL JOBS PROVIDED BY AFRI FY 2019 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	95 / 881	95 / 843	46 / 853	236 / 2,577
Animal Health and Production and Animal Products	59 / 299	94 / 94	72 / 661	225 / 3,466
Food Safety, Nutrition, and Health	37 / 319	72 / 1,606	26 / 586	135 / 2,511
Bioenergy, Natural Resources, and Environment	44 / 492	94 / 2,010	24 / 685	162 / 3,187
Agriculture Systems and Technology	30 / 192	73 / 684	15 / 198	118 / 1,074
Agriculture Economics and Rural Communities	4 / 36	8 / 237	3 / 26	15 / 299
Critical Agricultural Research and Extension	13 / 238	54 / 139	1 / 18	68 / 395
Education and Workforce Development RFA				
All Programs	1,216 / 2,735	59 / 1,668	42 / 1,008	1,317 / 5,411
Sustainable Agricultural Systems RFA				
Sustainable Agricultural Systems	148 / 279	155 / 1,655	74 / 727	377 / 2,661
Total	1,647 / 5,471	706 / 11,348	303 / 4,762	2,656 / 21,581

TABLE 8. AREAS OF SCIENCE IMPORTANT TO AFRI AND USDA

Area of Science	Number	FY 2019 Funding
Animal Genome	22	\$8,058,050
Animal Health	67	\$36,661,097
Forest Biology	11	\$4,487,438
Food Safety	46	\$47,676,731
Climate Science	39	\$34,599,856
Integrated Pest Management	42	\$37,875,230
Plant Genome and Breeding	15	\$14,319,681
Bioenergy	9	\$33,036,901
Sustainable Agriculture	159	\$145,818,190
Social Science	52	\$37,082,941
Water Quality	33	\$44,168,060