



United States
Department of
Agriculture

National Institute
of Food and
Agriculture

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AGRICULTURE AND FOOD RESEARCH INITIATIVE (AFRI) 2012 SYNOPSIS

PROGRAM OVERVIEW

THE AGRICULTURE AND FOOD RESEARCH INITIATIVE (AFRI) is the premier agricultural competitive grants program in the United States, and it is the National Institute of Food and Agriculture's (NIFA) principal tool for funding research, education, and extension projects that bring practical solutions to today's critical societal challenges. The rapidly rising population, which is expected to reach 9 billion people by 2050, requires NIFA to focus its funding around solving the challenges that affect society's ability to feed, clothe, and shelter all people. These challenges include food security and hunger, climate change, diminishing land and water resources, changing incomes and diets, and the expectations of better health outcomes.

To address these societal challenges, AFRI programs impact all components of agriculture, including farm efficiency and profitability, ranching, renewable energy, forestry, aquaculture, rural communities, human nutrition, food safety, biotechnology, and conventional breeding. 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. Additionally, AFRI funding supports education and extension activities that deliver science-based knowledge to the public, allowing them to make informed, practical decisions.

AFRI was established by the 2008 Farm Bill and re-authorized in the 2014 Farm Bill, and it is one of NIFA's major programs through which to address six priority areas (Table 1, page 2). Within the framework of these six priority areas, in fiscal year (FY) 2012 AFRI focused on addressing five critical societal challenge areas: Childhood Obesity Prevention, Climate Variability and Change, Food Security, Sustainable Bioenergy, and Food Safety. AFRI also supported research grants via its Foundational

Program in the six AFRI priority areas to continue building a foundation of knowledge critical for solving current and future societal challenges. In addition, NIFA supported pre- and postdoctoral students via the NIFA Fellowships Grant Program.

In FY 2012, NIFA issued seven AFRI requests for applications (RFAs) for projects related to the challenge areas, foundational program, and the NIFA Fellowships. Those RFAs generated 1,796 applications, 650 of which were recommended for funding. Peer review panels reviewed the recommended proposals and awarded \$189,576,826 in funding to the top 343 projects (Table 2, page 3).

COMPETITIVE PROGRAM SOLICITATION

FY 2012 was the fourth year that AFRI solicited competitive grant applications. Thirty-eight programs solicited applications in FY 2012 addressing the six AFRI priority areas and five challenge areas. A total of 1,796 competitive grant applications, requesting \$1,355,792,059, were received and reviewed through a competitive peer review process (Table 2, page 3).

PEER REVIEW PANEL CHARACTERISTICS

More than 300 experts from across the country participated in peer review panel evaluations to help select the most meritorious projects for funding. AFRI ensures the widest participation of qualified individuals in peer review by balancing the membership of panels carefully to reflect diversity in geographical region, type of institution, type of position, gender, and minority status. A breakdown of panel member characteristics is shown in Table 3, at right. Additional expertise was brought to proposal evaluation by a number of scientists and other specialists through ad hoc reviews.

FUNDING PORTFOLIO

SUCCESS RATE

Awards totaling \$189,576,826 were made to the 343 highest-ranked applications. Table 4 (pages 4-5) shows the number of awards and total dollars awarded for each AFRI program area. An additional 650 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 \$387,799,207 was available to the program (Table 2, at right). The success rate for AFRI applications, 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 approximately 14 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. See Table 5, page 6, for a breakdown of the total dollars and percent of support to each type. The mean award size for research projects was \$707,133 for up to 5 years, excluding Food and Agricultural Science Enhancement (FASE) Grants and Conference Grants. These excluded grant types are often shorter in duration and have lower budget limitations than do standard research awards.

Integrated awards comprised 45 percent of the 2012 funding portfolio (Table 5, page 6). These projects bring together at least two of the three components of the agricultural knowledge system (e.g., research, education, and extension). Integrated projects hold the greatest potential to produce, transfer, and apply knowledge directly to end users, while providing educational opportunities to assure the development of agricultural expertise in future generations. The average award for integrated projects was \$977,759 for up to 5 years,

excluding FASE Grants and Conference Grants. The mean includes Coordinated Agriculture Projects (CAP), which support large-scale, multi-million dollar projects to promote collaboration, open communication, and the exchange of information. CAPs greatly reduce duplication of effort and increase coordinated activities among individuals, institutions, states, and regions. CAP awards often have a longer duration but, as with many AFRI awards, are funded on a continuation basis, with funding coming as yearly increments to assure accountability and monitor ongoing success.

AFRI provided funds totaling \$393,774 in support of 17 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.

FUNDAMENTAL AND MISSION-ORIENTED RESEARCH

Forty-eight percent of AFRI awards support fundamental research to deliver basic knowledge to advance applied research and conceptual breakthroughs in fields relevant to agriculture. Mission-linked awards accounted for the remaining 52 percent to fund applied work to address specific problems, needs, or opportunities (Table 5, page 6).

MULTIDISCIPLINARY AWARDS

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. As shown in Table 5, 84 percent of AFRI awards made in 2012 are conducted by multidisciplinary teams.

BROADENING THE FUNDING PORTFOLIO

AFRI offers FASE grants 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

TABLE 2. THE NUMBER OF AFRI APPLICATIONS AND TOTAL DOLLARS REQUESTED, RECOMMENDED FOR FUNDING, AND AWARDED FOR FY 2012 FUNDS.

APPLICATIONS	NUMBER	FUNDING
Requested	1,796	\$1,355,792,059
Recommended for Funding	650	387,799,207
Awarded	343	189,576,826

TABLE 3. CHARACTERISTICS OF FY 2012 AFRI PEER REVIEW PANELISTS BY NUMBER AND PERCENT

CHARACTERISTIC	NUMBER	PERCENT
GEOGRAPHIC REGION		
Northeast	88	26.7
North Central	83	25.2
Southern	109	33.0
Western	59	17.9
TYPE OF INSTITUTION*		
Land-Grant University		
1862 Land-Grant University	188	57.0
1890 Land-Grant University	35	10.6
1994 Land-Grant University	1	0.3
Hispanic-Serving	9	2.7
Public Non-Land-Grant	14	4.2
Private College/University	21	6.4
Private Research	2	0.6
Federal	42	12.7
Industry/Other	19	5.7
TYPE OF POSITION		
Professor	100	30.3
Associate Professor	72	21.8
Assistant Professor	101	30.6
Federal	46	13.9
Industry	5	1.5
Other (Senior Lecturer)	19	5.8
EXPERTISE REPRESENTATION		
Researcher	217	65.7
Educator	46	13.9
Extension Educator	31	9.4
Other	32	9.9
GENDER/MINORITY REPRESENTATION		
Non-Minority Male	122	37.0
Non-Minority Female	87	26.4
Minority Male	86	26.1
Minority Female	46	13.9

TOTAL PANELISTS
 *54 panelists represented the USDA Experimental Program to Stimulate Competitive Research (EPSCoR) states and 52 panelists represented small and mid-sized institutions.

TABLE 1. SUMMARY OF THE RELATIONSHIP BETWEEN THE LEGISLATIVELY-DEFINED AFRI PRIORITY AREAS AND THE CHALLENGE AREAS. AFRI PROVIDED FUNDING FOR BOTH THE LEGISLATIVELY-DEFINED AREAS INDIVIDUALLY AND IN COMBINATION TO ADDRESS THE CHALLENGE AREAS.

AFRI PRIORITY AREAS ▼	CHILDHOOD OBESITY PREVENTION	CLIMATE CHANGE	FOOD SAFETY	FOUNDATIONAL PROGRAM	GLOBAL FOOD SECURITY	SUSTAINABLE BIOENERGY	NIFA FELLOWSHIPS
Plant Health and Production and Plant Products	–	●	–	●	●	●	●
Animal Health and Production and Animal Products	–	●	●	●	●	–	●
Food Safety, Nutrition, and Health	●	–	●	●	–	–	●
Renewable Energy, Natural Resources, and Environment	–	●	–	●	–	●	●
Agricultural Systems and Technology	–	●	●	●	–	●	●
Agricultural Economics and Rural Communities	●	●	●	●	–	●	●

▲ REQUESTS FOR APPLICATIONS

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TABLE 4. NUMBER OF APPLICATIONS, AWARDS, AND TOTAL DOLLARS AWARDED FOR EACH AFRI PROGRAM, BY AREA, IN FY 2012

PROGRAMS BY REQUEST FOR APPLICATION (RFA)	APPLICATIONS	NUMBER OF AWARDS	FUNDING
FOUNDATIONAL PROGRAMS (COMBINED 2012/2013 RFA)			
PLANT HEALTH AND PRODUCTION AND PLANT PRODUCTS			
Biology of Agricultural Plants	155	27	\$8,596,523
Controlling Weedy and Invasive Plants	7	1	499,679
Insects and Nematodes	96	10	2,905,852
Understanding Plant-Associated Microorganisms	195	21	9,118,420
Plant Breeding for Agricultural Production	24	4	780,584
Applied Plant Genomics	1	0	0
Biology of Weedy and Invasive Species in Agroecosystems	2	0	0
ANIMAL HEALTH AND PRODUCTION AND ANIMAL PRODUCTS			
Animal Breeding, Genetics, and Genomics	45	18	7,850,726
Animal Health and Disease	74	13	6,103,899
Animal Reproduction	87	22	6,804,231
Ecology and Evolution of Infectious Diseases	2	2	2,500,000
Improved Nutritional Performance, Growth, and Lactation of Animals	51	11	3,906,900
Dual Use of Animals for Dual Benefit	4	4	5,000,000
Animal Growth and Nutrient Utilization	1	0	0
Animal Health and Well-Being	2	0	0
FOOD SAFETY, NUTRITION, AND HEALTH			
Physical and Molecular Mechanisms of Food Contamination	38	9	2,897,868
Function and Efficacy of Nutrients	19	0	
RENEWABLE ENERGY, NATURAL RESOURCES, AND ENVIRONMENT			
Microbial Communities in Soil	8	2	455,727
AGRICULTURE SYSTEMS AND TECHNOLOGY			
Nanotechnology for Agricultural and Food Systems	77	10	4,394,909
Engineering Products and Processes	48	4	1,278,727
Metabolic Engineering	2	2	1,495,968
National Robotics Initiative	2	2	1,321,103
AGRICULTURE ECONOMICS AND RURAL COMMUNITIES*			
Rural Development	6	0	0
Small and Medium-Sized Farms	13	0	0
CHALLENGE AREA PROGRAM			
SUSTAINABLE BIOENERGY			
Development and Sustainable Production of Regionally Appropriate Biomass Feedstocks	39	2	218,002
Policy Options for and Impacts on Regional Biofuels Production Systems	21	7	2,273,120
Environmental Implications of Direct and Indirect Land Use Change	44	5	2,489,136
Impacts of Regional Bioenergy Feedstock Production Systems on Wildlife and Pollinators	23	4	1,991,472
Socioeconomic Impacts of Biofuels on Rural Communities	16	7	2,444,258
Stimulating a New Era of Students and Faculty in Bioenergy	2	2	1,948,733
National Loblolly Pine Genome Sequencing	1	1	2,925,000
Plant Feedstock Genomics for Bioenergy	2	2	2,000,000
Sustainable Agroecosystems Science LTAP	1	0	0
Sustainable Bioenergy Research	2	0	0

*No awards obligated as of 12/31/2013

TABLE 4. NUMBER OF APPLICATIONS, AWARDS, AND TOTAL DOLLARS AWARDED FOR EACH AFRI PROGRAM, BY AREA, IN FY 2012

PROGRAMS BY REQUEST FOR APPLICATION (RFA)	APPLICATIONS	NUMBER OF AWARDS	FUNDING
CHALLENGE AREA PROGRAM (CONTINUED)			
CLIMATE CHANGE			
Regional Approaches to Climate Change	30	5	\$15,998,499
National Cereal Germplasm Phenotyping	1	1	5,000,000
Climate Change Mitigation and Adaptation in Agriculture	12	12	10,957,435
Impacts of Climate Change on Animal Health and Production	1	1	500,000
Climate Adaptation and Mitigation in Agroecosystems	104	16	8,466,349
Interagency Climate Change	10	8	10,000,000
FOOD SAFETY			
Addressing Critical and Emerging Food Safety Issues	85	14	5,381,045
Food Processing Technologies to Destroy Food-Borne Pathogens	3	3	2,998,163
Prevention and Control of Salmonella and Campylobacter in Poultry Flocks and Poultry Products, Including Eggs	6	6	2,244,452
Effective Mitigation Strategies for Antimicrobial Resistance	34	3	1,649,830
Improving the Safety of Fresh and Fresh-Cut Produce	64	4	1,364,073
Prevention, Detection, and Control of Shiga Toxin-Producing <i>Escherichia Coli</i>	1	0	0
Epidemiological Approaches	1	0	0
Improving Food Quality	1	0	0
GLOBAL FOOD SECURITY			
Improved Sustainable Food Systems to Reduce Hunger and Food Insecurity, Domestically and Globally	62	13	11,208,333
Improving Sustainability by Improving Feed Efficiency of Animals	3	3	2,925,000
Oomycete Pathosystems in Crop Plants to Minimize Disease	2	2	3,705,000
Minimizing Losses from Dairy Diseases with Major Impact on Production, Marketing, and/or Trade	1	1	1,950,000
Translational Genomics for Improved Fertility of Animals	17	4	3,119,900
Translational Genomics for Disease Resistance in Animals	12	3	1,964,686
Extension-Driven Disease Prevention and Control in Animals	7	3	1,261,748
Minimizing Diseases Due to Fungal Pathosystems	8	3	3,241,666
Management of Arthropod- or Nematode-Vectored Plant Pathogens	12	2	1,425,000
Program Delivery and Implementation of Wide-Area Pest Monitoring	2	1	1,170,000
Enhanced Implementation of Integrated Pest Management for Vectored Pathogens	7	4	1,666,667
CHILDHOOD OBESITY PREVENTION			
Integrated Research, Education, and Extension to Prevent Childhood Obesity	34	4	4,995,670
Community-Based Childhood Obesity Prevention	1	0	0
Transdisciplinary Graduate Education and Training	4	0	0
NIFA FELLOWSHIPS			
NIFA Postdoctoral Fellowships	79	32	3,967,417
NIFA Pre-Doctoral Fellowships	82	3	215,056
GRAND TOTAL	1,796	343	\$189,576,826

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successful in receiving AFRI funding (these states are identified by NIFA as Experimental Program to Stimulate Competitive Research states). In FY 2012, approximately 15 percent of AFRI funds supported FASE grants. A breakdown of FASE awards is available in Table 6, right.

TRANSCENDING TOPIC AREAS

AFRI makes awards that span several topics of major importance to USDA. Table 7, right, lists these crosscutting areas and identifies the number of awards and total amount of funding for each area.

INSTITUTION TYPES

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 2012 dollars awarded is available by institution type in Table 8 (page 7).

TRAINING

Competitive grants administered by AFRI provide jobs to train the next generation of agricultural professionals. In 2012, AFRI provided funding for more than 2,162 students and post-doctorates for more than 1,928 years, cumulatively. Table 9 (page 7) provides an overview of student and postdoctoral support provided by program areas within AFRI.

TABLE 5. TOTAL DOLLARS AND PERCENT OF FUNDING FOR DIMENSIONS OF FY 2012 AFRI AWARDS

AWARD DIMENSION	FUNDING	%
Fundamental Research Mission-Linked	\$106,261,529	48
Applied Research	115,231,293	52
Multi-Disciplinary	184,659,610	84
Single Discipline	35,518,168	16
Integrated Research, Education, and Extension	74,984,409	45
Single Function Research	85,204,748	51
Single Function Education	3,415,425	2
Single Function Extension	2,836,667	2

TABLE 6. NUMBER AND TOTAL DOLLARS OF FY 2012 AWARDS PROVIDED FOR EACH CATEGORY FASE GRANTS

AWARD TYPE	NUMBER	FUNDING
Postdoctoral Fellowships	32	\$3,967,417
Pre-Doctoral Fellowships	3	215,056
New Investigator Awards	8	3,328,105
STRENGTHENING AWARDS		
Research Career Enhancement Awards	0	0
Equipment Grants	6	107,552
Seed Grants	19	2,404,612
Standard Strengthening Research Project Awards	31	19,358,814
TOTAL	99	\$29,381,556

TABLE 7. NUMBER OF AWARDS AND AMOUNT OF FUNDING FOR CROSSCUTTING AREAS OF MAJOR IMPORTANCE TO AFRI AND USDA IN FY 2012. SOME AWARDS ARE LISTED IN MORE THAN ONE AREA.

AREA	NUMBER	FUNDING
Animal Genome	25	\$16,669,642
Animal Health	38	22,139,191
Food Safety	39	18,285,570
Forest Biology	11	15,803,648
Global Change	54	55,593,971
Integrated Pest Management	26	18,607,452
Plant Genome	13	14,701,298
Sustainable Agriculture	43	39,527,108
Water Quality	20	13,111,631

TABLE 8. PERCENT OF APPLICATIONS SUBMITTED, APPLICATIONS AWARDED, AND TOTAL FUNDS AWARDED BY INSTITUTION TYPE FOR AFRI IN FY 2012

TYPE OF INSTITUTION	% OF APPLICATIONS SUBMITTED	% OF APPLICATIONS AWARDED	% OF TOTAL DOLLARS AWARDED
Land-Grant University			
1862 Land-Grant University	74.05	75.72	82.88
1890 Land-Grant University	2.62	1.73	0.61
1994 Land-Grant University	0.17	0.29	0.08
Public Non-Land-Grant	7.14	8.67	7.61
Private College/University	5.92	5.78	4.69
Federal	3.24	2.89	2.21
Industry/Other*	5.92	4.92	1.92

*Includes Non-Federal Government, Private For-Profit, and Other Entities

TABLE 9. NUMBER AND LENGTH OF TIME OF UNDERGRADUATE, GRADUATE, AND POSTDOCTORAL JOBS PROVIDED BY AFRI FY 2012 AWARDS

PROGRAM	SUPPORTED	GRADUATE STUDENTS	POSTDOCTORAL STUDENTS	UNDERGRADUATE STUDENTS	SUBTOTAL
FOUNDATIONAL PROGRAMS					
Plant Health and Production and Plant Products	NUMBER MONTHS	63 1,202	33 1,408	31 595	127 3,205
Animal Health and Production and Animal Products	NUMBER MONTHS	39 833	72 887	104 162	215 1,882
Food Safety, Nutrition, and Health	NUMBER MONTHS	55 706	9 126	246 439	310 1,271
Renewable Energy, Natural Resources, and Environment	NUMBER MONTHS	8 94	3 25	5 68	16 187
Agriculture Systems and Technology	NUMBER MONTHS	40 818	14 173	8 99	62 1,090
Agriculture Economics and Rural Communities	NUMBER MONTHS	0 0	0 0	0 0	0 0
CHALLENGE AREAS					
Sustainable Bioenergy	NUMBER MONTHS	70 1,502	20 415	121 1,074	211 2,991
Climate Change	NUMBER MONTHS	341 3,677	102 1,196	181 1,101	624 5,974
Food Safety	NUMBER MONTHS	48 758	23 361	30 204	101 1,323
Global Food Security	NUMBER MONTHS	111 1,764	38 702	180 1,311	329 3,777
Childhood Obesity Prevention	NUMBER MONTHS	88 523	9 132	33 265	130 920
NIFA Fellowships	NUMBER MONTHS	3 72	32 768	0 0	35 840
TOTAL ALL PROGRAMS	NUMBER MONTHS	866 11,949	355 5,833	939 5,354	

AFRI INVESTMENTS: MAKING AN IMPACT

GLOBAL FOOD SECURITY

The multi-billion dollar citrus industry in the United States is at grave risk of irreparable damage from citrus greening disease, also call Huanglong-bing (HLB), for which there is no cure. **University of California-Riverside** researchers are using a \$500,000 AFRI grant to develop sensors that can detect *Candidatus liberacter*, the bacterial pathogen that causes HLB. These sensors, which could be used in the field, would detect specific proteins that *Ca. liberacter* secretes.

FOOD SAFETY

Harvard University researchers are using a \$490,000 AFRI grant to investigate the effectiveness of a novel, chemical free, nanotechnology-based method of inactivating pathogenic and spoilage microorganisms on the surface of fruits and vegetables. The technique uses engineered water nanostructures (EWNS), which are synthesized by the electro spraying of atmospheric water vapor. EWNS can interact with inactive microorganisms or inanimate surfaces (stainless steel) and in the air. If successful, this technology—which does not use chemicals or electromagnetic radiation and leaves no residues or dangerous byproducts in the final product—could help ensure safety and prolong the shelf life of products consumed raw.

SUSTAINABLE BIOENERGY

Pennsylvania State University is using a \$10 million AFRI grant to lead the **Northeast Woody/Warm-season Biomass Consortium (NEWBio)**, a group of researchers from **Cornell University**, the **State University of New York**, **West Virginia University**, **Delaware State University**, **Ohio State University**, **Rutgers University**, **USDA's Eastern Regional Research Center**, and the **U.S. Department of Energy's Oak Ridge National Laboratory** and **Idaho National Laboratory**. NewBio aims to build a robust, scalable, and sustainable value chain for biomass energy by using under-utilized agricultural land in the region to grow short-rotation woody crops and perennial grasses.

CHILDHOOD OBESITY PREVENTION

Many factors influence diet and physical activity behaviors in adolescents, including parents, but not much is known about how a family's daily activities may influence a child's food choice and diet behavior. Researchers from the **University of Kentucky** are using a \$150,000 NIFA-administered AFRI grant to examine families' food shopping patterns, behaviors, and food purchasing choices. Their goal is to identify gaps in how families interact in the food environment and develop interventions to improve diets during the critical childhood development stage.

CLIMATE CHANGE

A \$9.9 million NIFA grant is helping soil scientists at the **University of Wisconsin** measure greenhouse gas (GHG) fluxes across the dairy production system—at the cow, manure, and soil levels. Researchers will use this information to develop a decision support tool that producers can use to learn about inefficiencies in their system as well as how management changes will improve GHG reductions and soil resiliency. The project's long-term goals are to develop sustainable, environmentally-sound milk production systems across North Central and Northeastern United States; enhance resilience and capacity for climate change adaptation in U.S. dairy production systems; and increase public awareness about the environmental sustainability of dairy products.

FOUNDATIONAL PROGRAM

Nutrition researchers at **Cornell University** are examining how a dietary supplement could reduce inflammation and improve placental function in pregnant women. The study, funded by a \$470,000 AFRI grant, suggests that having healthy third-trimester women supplement their diets with choline—an essential micronutrient—would prevent placental dysfunction and support fetal well-being.