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National Institute
of Food
and Agriculture

AFRI

Agriculture and Food Research Initiative

2010 Annual Synopsis

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Program Overview

The Food, Conservation and Energy Act of 2008, otherwise known as the 2008 Farm Bill, established the Agriculture and Food Research Initiative (AFRI), which assumed all of the authorities of its predecessor program, the National Research Initiative. AFRI is the premier agricultural competitive grants program in the United States. The program is authorized through fiscal year (FY) 2012 to fund high priority research, education, and extension competitive grants that address food and agricultural sciences. The purpose of AFRI is to support research, education, and extension as well as integrated programs by awarding grants that address key problems of national, regional, and multi-state importance in sustaining all components of agriculture, including farm efficiency and profitability, ranching, renewable energy, forestry (both urban and agroforestry), aquaculture, rural communities and entrepreneurship, human nutrition, food safety, biotechnology, and conventional breeding. Providing this support requires that AFRI advance fundamental sciences as well as translational research and development in support of agriculture and coordinate opportunities to build on these discoveries. This will also require that AFRI support education and extension that delivers science-based knowledge to people, allowing them to make informed practical decisions. The science programs supporting agriculture were developed within the context of the authorized purposes of USDA research, extension, and education. In addition, AFRI obtains additional input from Congress, the National Agricultural Research, Education, Extension, and Economics Advisory Board (NAREEEAB), as well as many university, scientific, and agricultural committees and organizations. NIFA developed a stakeholder's Web page (www.nifa.usda.gov/business/reporting/stakeholder.html) to document stakeholder input that is considered when developing and updating Program Area Descriptions and Priorities each year.

Background

In July, 2008, the National Institutes of Health (NIH), National Science Foundation (NSF), and Department of Energy (DOE) asked the National Research Council's Board on Life Sciences to convene a committee to *examine the current state of biological research in the United States and recommend how best to capitalize on recent technological and scientific advances that have allowed biologists to integrate biological research findings, collect and interpret vastly increased amounts of data, and predict the behavior of complex biological systems.* The committee produced a report entitled "New Biology for the 21st Century: Ensuring the United States Leads the Coming Revolution," and a set of recommendations that recognize that the most effective leveraging of investments would come from a coordinated, interagency effort to encourage the emergence of a New Biology that would enunciate and address broad and challenging societal problems.

The New Biology is already emerging, but it is as yet poorly recognized, inadequately supported, and delivering only a fraction of its potential. The committee concludes that the most effective way to speed the emergence of the New Biology is to challenge the scientific community to discover solutions to major societal problems and outlined four broad challenges in food, environment, energy, and health that could be tackled by the New Biology.

The four challenges are:

1. *Generate food plants to adapt and grow sustainably in changing environments*
2. *Understand and sustain ecosystem function and biodiversity in the face of rapid change*
3. *Expand sustainable alternatives to fossil fuels*
4. *Understand individual health*

Background (continued)

The committee chose to focus on these four areas of societal need because the benefits of achieving these goals would be large, progress would be assessable, and both the scientific community and the public would find such goals inspirational. Each challenge will require technological and conceptual advances that are not now at hand, across a disciplinary spectrum that is not now encompassed by the field. In the committee's view, one of the most exciting aspects of the New Biology initiative is that success in achieving the four goals chosen here as examples will propel advances in fundamental understanding throughout the life sciences. Because biological systems have so many fundamental similarities, the same technologies and sciences developed to address these four challenges will expand the capabilities of all biologists.

USDA – NIFA Approach

The report “New Biology for the 21st Century” bolsters the case for increasing the level and effectiveness of USDA’s agricultural research, education, and extension programs. These efforts have included creating NIFA and significantly increasing funding over previous levels for its research, education, and extension programs.

AFRI is one of NIFA’s major programs through which to address critical societal issues such as those laid out in the “New Biology for the 21st Century” report. USDA leadership has integrated the six AFRI priority areas with the four challenges and the approach laid out in the “New Biology for the 21st Century” report to identify five primary challenge areas around which to structure the AFRI program and begin to focus the Department’s investment in enabling an integrated approach to biological research, education, and extension. USDA science will support the following challenges:

1. Keep American agriculture competitive while ending world hunger
2. Improve nutrition and end child obesity
3. Improve food safety for all Americans
4. Secure America’s energy future
5. Mitigate and adapt to climate change

To address these challenges at a meaningful scale and to achieve outcomes of relevance to the societal challenges, NIFA supported specific competitive programs on these issues. They address each of the five challenges, enable transition and refocusing of grants made previously under AFRI, and provide pre- and postdoctoral fellowship opportunities. AFRI solicited applications for larger awards for longer periods of time to enable greater collaboration among institutions and organizations and integration of basic and applied research with deliberate education and extension programs.

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	FY 2010 AFRI Funding Support
Plant Health and Production and Plant Products	Climate Change Foundational Program Global Food Security Sustainable Bioenergy
Animal Health and Production and Animal Products	Climate Change Food Safety Foundational Program Global Food Security
Food Safety, Nutrition, and Health	Childhood Obesity Prevention Food Safety Foundational Program
Renewable Energy, Natural Resources, and Environment	Climate Change Foundational Program Sustainable Bioenergy
Agriculture Systems and Technology	Climate Change Food Safety Foundational Program Sustainable Bioenergy
Agriculture Economics and Rural Communities	Childhood Obesity Prevention Climate Change Food Safety Foundational Program Sustainable Bioenergy

USDA – NIFA Approach (Continued)

In FY 2010, AFRI solicited projects addressing the above challenges through five separate challenge area RFAs, each addressing one of the challenges. AFRI also supported research grants in the six AFRI priority areas to continue building a foundation of knowledge critical for solving current and future societal challenges (See Table 1).

Competitive Program Solicitation

Fiscal year (FY) 2010 was the second year that AFRI solicited competitive grant applications. Fifty-one programs solicited applications in FY 2010 addressing the areas of: 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; Agriculture Systems and Technology; Agriculture Economics and Rural Communities; Sustainable Bioenergy; Climate Change; Food Safety; Global Food Security; and Childhood Obesity Prevention. A total of 1,571 competitive grant applications, requesting \$3,984,288,212, were received and reviewed through a competitive peer review process (Table 2).

Peer Review Panel Characteristics

Over 500 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, as well as gender and minority status. A breakdown of panel member characteristics is shown in Table 3. Additional expertise was brought to proposal evaluation by a number of scientists and other specialists through *ad hoc* reviews.

Table 2. The number of FY 2010 AFRI applications and total dollars requested, recommended for funding, and awarded.

Applications	Number	Dollars
Requested	1571	3,984,288,212
Recommended for Funding	1012	2,879,693,931
Awarded	403	232,649,478

Table 3. Characteristics of FY 2010 AFRI peer review panelists by number and percent.

Characteristic	Number	Percent
Geographic Region		
Northeast	132	24.0%
North Central	145	26.3%
Southern	167	30.3%
Western	107	19.4%
Type of Institution*		
Land Grant University		
1862 Land Grant University	312	56.6%
1890 Land Grant University	42	7.6%
1994 Land Grant University	0	0.0%
Hispanic Serving	12	2.2%
Public non-Land Grant	46	8.3%
Private College/University	22	4.0%
Private Research	12	2.2%
Federal	71	12.9%
Industry/Other	46	8.3%
Type of Position		
Professor	188	34.1%
Associate Professor	96	17.4%
Assistant Professor	113	20.5%
Federal	71	12.9%
Industry	27	4.9%
Other (Senior Lecturer)	56	10.2%
Expertise Representation		
Researcher	275	49.9%
Educator	131	23.8%
Extension Educator	78	14.2%
Other	67	12.2%
Gender/Minority Representation		
Non-minority Male	242	43.9%
Non-minority Female	145	26.3%
Minority Male	108	19.6%
Minority Female	56	10.2%
Total Panelists	551	

*80 panelists represented USDA EPSCoR states and 53 panelists represented Small and Mid-sized Institutions.

Funding Portfolio

Success Rate - Awards totaling \$232,649,478 were made to the 403 highest-ranked applications. Table 4 (pages 6-7) shows the number of awards and total dollars awarded for each AFRI program area. An additional 609 proposals were recommended for funding by review panels and could have been supported provided an additional \$2.65 Billion was available to the program (Table 2). 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 23 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 for a breakdown of the total dollars and percent of support to each type. The mean award size for research projects was \$511,454 for up to 5 years, excluding Food and Agricultural Science Enhancement Grants and Conference Grants. These excluded grant types are often shorter in duration and have lower budget limitations than do standard research awards.

Table 5. The total dollars and percent of funding for dimensions of FY 2010 AFRI awards.

Award Dimension	Dollars	Percent
Fundamental Research	103,536,691	54
Mission-linked Applied Research	88,479,234	46
Multi-disciplinary	205,546,775	88
Single Discipline	27,102,703	12
Integrated Research, Education, and Extension	108,345,548	47
Single Function Research	112,696,584	48
Single Function Education	5,910,532	3
Single Function Extension	5,696,814	2

Integrated awards comprised 47% percent of the 2010 funding portfolio (Table 5). 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 \$1,415,365 for up to 5 years, excluding Food and Agricultural Science Enhancement 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. These CAP awards often have a longer overall duration but, as with many AFRI awards, are funded on a continuation basis. Awards coming as yearly increments assure accountability and allow the agency to monitor ongoing success.

AFRI provided funds totaling \$707,833 in support of 28 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 - Fifty-four 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 46 percent to fund applied work to address specific problems, needs, or opportunities in modern society (Table 5).

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, 88 percent of AFRI awards made in 2010 are conducted by multidisciplinary teams.

Table 4. The number of applications, awards, and total dollars awarded for each AFRI program by area in FY 2010.

Programs by Request for Application (RFA)	Applications	Number	Dollars
FOUNDATIONAL PROGRAMS RFA			
Plant Health and Production and Plant Products			
Plant Sciences	72	21	7,980,017
Pest and Beneficial Insects in Plant Systems	116	19	6,357,624
Plant Genome, Genetics and Breeding*	3	3	1,497,000
Applied Plant Genomics Coordinated Agricultural Project (CAP)*	3	3	3,500,000
Biobased Products and Bioenergy Production Research*	1	1	250,000
Arthropod and Nematode Biology and Management: Suborganismal Biology*	1	1	160,000
Arthropod and Nematode Biology and Management: Protection of Managed Bees*	2	1	1,000,000
Arthropod and Nematode Biology and Management: Organismal and Population Biology*	4	4	711,481
Animal Health and Production and Animal Products			
Animal Health and Production: Animal Bioinformatics and Development of Tools for Livestock, Poultry, and Aquaculture	34	11	4,875,000
Animal Health and Production and Animal Products: Animal Reproduction	63	14	5,068,109
Animal Health and Production: Animal Health	73	18	5,585,862
Animal Health and Well-Being: Tools and Resources*	1	1	1,711,594
Animal Genome, Genetics and Breeding*	3	3	1,625,000
Food Safety, Nutrition, and Health			
Food-borne Pathogen-Plant Interactions	25	12	4,855,924
Practical Approaches to Food Safety	6	0	0
Reducing Food Allergies by Improving Food Quality	21	4	1,998,963
Bioactive Food Components for Optimal Health*	1	1	179,842
Renewable Energy, Natural Resources, and Environment			
Microbial Communities in Soil	50	12	4,840,660
Agricultural Water Science	36	10	4,551,847
Agriculture Systems and Technology			
Engineering Approaches for Improved or Alternative Management Systems to Safeguard Animal Welfare	14	5	2,639,513
Nanoscale Science and Nanotechnology to Ensure Safe Food	36	7	3,200,500
Agriculture Economics and Rural Communities			
Prosperity of Small and Medium-Sized Farms and Rural Communities	72	19	6,961,740
Economics of Markets and Development	35	10	2,835,108
Disaster Resilience for Rural Communities	4	3	953,152
SUSTAINABLE BIOENERGY RFA			
Regional Approaches to Sustainable Bioenergy	36	9	27,736,528
Regional Approaches to Sustainable Bioenergy: Planning	3	3	132,892
Sustainable Bioenergy Research	170	42	7,755,453
Investing in America's Scientific Corps: Stimulating a New Era of Students and Faculty in Bioenergy	17	2	1,832,911
National Loblolly Pine Genome Sequencing	4	1	2,925,000
DOE Sustainable Bioenergy: Plant Feedstock Genomics for Bioenergy	2	2	2,000,000

*Programs that funded only continuing increments of awards from previous years.

Table 4. Continued

Programs by Request for Application (RFA)	Applications	Number	Dollars
CLIMATE CHANGE RFA			
Regional Approaches to Climate Change	15	3	20,000,000
Regional Approaches to Climate Change: Planning	26	10	500,000
National Cereal Germplasm Phenotyping	4	1	5,000,000
Impacts of Climate Change on Animal Health and Production	21	1	1,000,000
Climate Change Mitigation and Adaptation in Agriculture	114	13	16,927,216
NASA Climate Change: Carbon Cycle Science	5	5	3,336,595
NSF and DOE Climate Change: Earth System Climate Modeling Program	9	9	11,061,189
FOOD SAFETY RFA			
Prevention, Detection, and Control of Shiga toxin-producing Escherichia coli (STEC) from Pre-Harvest through Consumption of Beef Products	11	2	299,571
Microbial Ecology and Shiga toxin-producing Escherichia coli (STEC) Shedding in Cattle	15	3	2,999,793
Prevention, Detection and Control of Food-borne Viruses in Food: A Focus on Noroviruses	2	1	4,989,945
Food Processing Technologies to Destroy Food-borne Pathogens with an Emphasis on Viruses and Shiga toxin-producing Escherichia coli (STEC)	12	3	2,953,523
Addressing Critical and Emerging Food Safety Issues	38	8	2,006,023
National Education Programs for Food Safety	12	3	687,758
GLOBAL FOOD SECURITY RFA			
Improving Sustainability by Improving Feed Efficiency of Animals	30	4	2,925,000
Minimizing Losses from Diseases with Major Impact on Production, Marketing, and/or Trade	8	1	1,950,000
Oomycete Pathosystems in Crop Plants to Minimize Disease	9	2	3,656,250
Program Delivery and Implementation of Wide-area Pest Monitoring	8	2	1,170,000
Improved Sustainable Food Systems to Reduce Hunger and Food Insecurity Domestically and Globally	31	8	4,875,000
CHILDHOOD OBESITY PREVENTION RFA			
Integrated Research, Education, and Extension to Prevent Childhood Obesity	84	17	11,902,877
Extension Interventions to Prevent Childhood Obesity	20	2	1,897,093
Transdisciplinary Graduate Education and Training in Nutrition and Family Sciences or Child Development or Related Fields to Prevent Childhood Obesity	9	4	3,375,033
Methodological Research to Assess the Effectiveness of Obesity Prevention Strategies	10	3	2,199,997
Community-based Childhood Obesity Prevention	6	1	4,869,895
NIFA FELLOWSHIPS RFA			
NIFA Postdoctoral Fellowships	123	41	5,330,000
NIFA Predoctoral Fellowships	41	14	1,015,000
Grand Total	1571	403	232,649,478

Broadening the Funding Portfolio - AFRI offers Food and Agricultural Science Enhancement (FASE) Grants designed 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

Table 6. The number and total dollars of FY 2010 awards awarded for each category of Food and Agricultural Science Enhancement (FASE) Grants.

Type of Award	Number	Dollars
Post Doctoral Fellowships	41	5,330,000
Predocctoral Fellowships	14	1,015,000
New Investigator Awards	10	5,559,620
Strengthening Awards		
Research Career Enhancement Awards	2	116,655
Equipment Grants	3	105,208
Seed Grants	13	1,855,700
Standard Strengthening Research Project Awards*	54	28,507,577
Total**	134	40,765,515

*26 additional grants totaling \$20,868,437 were awarded to institutions eligible for, but not funded as, Standard Strengthening Projects Awards.

**Three awards worth \$1,724,245 are represented in both the New Investigator and Standard Strengthening Research Project Awards categories but were counted only once for the total.

Transcending Topic Areas - AFRI makes awards that span several topics of major importance to USDA. Table 7 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 2010 dollars awarded is provided by institution type in Table 8.

Training - Competitive grants administered by AFRI provide jobs to train the next generation workforce for agriculture. In 2010, AFRI provided funding for over 1,700 students and post-doctorates for over 2,100 years, cumulatively. Table 9 (pages 9-10) provides an overview of student and postdoctoral support provided by programs areas within AFRI.

states in which institutions have been less successful in receiving AFRI funding (these states are identified by NIFA as Experimental Program for Stimulating Competitive Research, EPSCoR, states). In FY 2010, approximately 18% of AFRI funds supported FASE grants. A breakdown of FASE awards is found in Table 6.

Table 7. The number of awards and total amount of funding for crosscutting areas of major importance to AFRI and USDA in FY 2010. Some awards are listed in more than one area.

Area	Number	Dollars
Animal Genome	21	16,078,760
Animal Health	36	16,264,887
Food Safety	51	33,338,763
Forest Biology	22	49,713,946
Global Change	65	79,553,178
Integrated Pest Management	25	26,886,424
Plant Genome	23	35,843,674
Sustainable Agriculture	65	58,443,803
Water Quality	14	14,967,550

Table 8. The percent of applications submitted, applications awarded, and total funds awarded by institution type for AFRI in FY 2010.

Type of Institution	Percent of Applications Submitted	Percent of Applications Awarded	Percent of Total Dollars Awarded
Land Grant University			
1862 Land Grant University	78.29	73.95	83.3
1890 Land Grant University	1.65	1.24	0.7
1994 Land Grant University	0.32	0.25	0.4
Public non-Land Grant	5.35	5.71	3.2
Individual	0.45	0.74	0.5
Private College/University	4.96	7.69	5.0
Private Research	3.82	4.47	2.5
Federal	4.07	3.97	2.6
Industry/Other	1.08	1.99	1.7

Table 9. The number and length of time of undergraduate, graduate, and postdoctoral jobs provided by AFRI FY 2010 awards.

Program	Number Supported	Months Supported
Foundational Programs		
Plant Health and Production and Plant Products		
Graduate Students	41	794
Post Doctoral Students	34	1109
Undergraduate Students	111	974
<i>subtotal</i>	186	2877
Animal Health and Production and Animal Products		
Graduate Students	35	874
Post Doctoral Students	27	683
Undergraduate Students	19	251
<i>subtotal</i>	81	1808
Food Safety, Nutrition, and Health		
Graduate Students	13	396
Post Doctoral Students	10	372
Undergraduate Students	3	108
<i>subtotal</i>	26	876
Renewable Energy, Natural Resources, and Environment		
Graduate Students	28	714
Post Doctoral Students	13	411
Undergraduate Students	14	237
<i>subtotal</i>	55	1362
Agriculture Systems and Technology		
Graduate Students	11	270
Post Doctoral Students	3	96
Undergraduate Students	5	35
<i>subtotal</i>	19	401
Agriculture Economics and Rural Communities		
Graduate Students	35	653
Post Doctoral Students	13	123
Undergraduate Students	12	103
<i>subtotal</i>	60	879
Challenge Areas		
Sustainable Bioenergy		
Graduate Students	132	1881
Post Doctoral Students	54	1027
Undergraduate Students	110	1166
<i>subtotal</i>	296	4074

Table 9. Continued

Program	Number Supported	Months Supported
Challenge Areas		
Climate Change		
Graduate Students	273	4028
Post Doctoral Students	96	2138
Undergraduate Students	139	1361
<i>subtotal</i>	508	7527
Food Safety		
Graduate Students	67	1466
Post Doctoral Students	37	790
Undergraduate Students	78	479
<i>subtotal</i>	182	2735
Global Food Security		
Graduate Students	62	635
Post Doctoral Students	18	324
Undergraduate Students	67	386
<i>subtotal</i>	147	1345
Childhood Obesity Prevention		
Graduate Students	99	635
Post Doctoral Students	6	162
Undergraduate Students	37	270
<i>subtotal</i>	142	1067
NIFA Fellowships		
Graduate Students	15	348
Post Doctoral Students	40	936
Undergraduate Students	1	7
<i>subtotal</i>	56	1291
Total	1758	26242
All Programs		
Graduate Students	811	12,694
Postdoctoral Students	351	8171
Undergraduate Students	596	5377