Cooperative State Research, Education, and Extension Service

NRI Annual Report

Fiscal Year 2008

Table of Contents

Message from the CSREES Science Advisor 1

National Research Initiative: An Overview 2
- Identification of Program Priorities 2
- Grants Provided 3
- Program Implementation 3
- Program Outreach 4
- Funded Projects in Fiscal Year 2008 4
- Crosscutting Areas 5
- Research Dimensions 5
- Education 5
- Participation 5
- Interagency Research 5
- CSREES NRI Awards and Honors 6

Fiscal Year 2008 National Research Initiative Statistics 8
- Table 1. Characteristics of NRI Peer Review Panels 8
- Table 2. NRI Funding Allocations 9
- Table 3. Agricultural Research Enhancement Awards 10
- Table 4. Crosscutting Program Areas 11
- Table 5. Dimensions of NRI Research 11
- Table 6. Distribution of NRI Awards by Institution Type 11
- Table 7. Student Training Support 12

The National Research Initiative: Supporting the CSREES Mission 13
- Strategic Goal 1 13
- Strategic Goal 2 14
- Strategic Goal 3 15
- Strategic Goal 4 16
- Strategic Goal 5 17
- Strategic Goal 6 18
- NRI Impacts 20

NRI Program Contacts 23

Message from the CSREES Science Advisor

Dear Colleagues,

The National Research Initiative (NRI) completed another successful year advancing the mission of the Cooperative State Research, Education, and Extension Service (CSREES). As many of you are aware this will be the final year in name - but not in spirit - for both the NRI and CSREES. The Food, Conservation and Energy Act of 2008, otherwise known as the Farm Bill, established the National Institute of Food and Agriculture, which will assume all of the authorities of CSREES. The newly established Agriculture Food Research Initiative (AFRI) will subsume the authorities of the NRI. These are both extremely positive developments acknowledging the need for change and the opportunity to build upon the tremendous legacy of CSREES and one of its premiere competitive research programs, the NRI. It is easy to imagine a number of headlines heralding the transformation of the NRI to AFRI, but a pronouncement that might be expected from a university professor is simply “The NRI Goes to College.” FY 2008, the NRI’s senior year, proved to be an outstanding year, which is illustrated by a wide array of projects and activities from which the nation will reap benefits well into the future.

During the development phase of the Request for Applications (RFA), CSREES benefited from the input of individuals, groups, and organizations. As usual we appreciate the hundreds of panelists who participated in the noble tradition of peer review which led to the selection of the “NRI Class of 2008” funded projects. These projects reflect the agency’s expanded efforts to engage 1890 and 1994 Land-Grant institutions in NRI programs and to impact the preparation of tomorrow’s agricultural researchers, educators, and extension specialists. As this report shows, progress has been made but opportunities and challenges still exist. Perhaps the extent of these opportunities and challenges is illustrated best by the fact that in Fiscal Year 2008 over 600 appropriately ranked proposals totaling $225 million were not funded due to insufficient funds appropriated to the NRI.

Each year one of our most pleasant challenges is condensing the number of funded projects to a few examples that illustrate the NRI’s impact for this annual report. Projects were selected that show strong links to one or more of our six strategic goals, but also that creatively address emerging issues in food and agriculture. For example, the impact of changing climate on crops is being investigated by 2008 NRI project directors. Arizona State University’s Dr. Elizabeth Vierling is working to understand fundamental processes associated with increasing temperature on plants while Dr. Patrick Byrne of Colorado State University will use traditional plant breeding to increase plant tolerance to drought and provide new educational modules to prepare graduate students in plant breeding. At the same time, the national pursuit to reduce greenhouse gas emissions has focused on the sustainable production of biofuels. Dr. Burton C. English of the University of Tennessee will examine the implications of biofuel production on water quantity and quality and provide useful policy recommendations. From the project of Dr. Todd Ames of the University of Guam we are reminded that research and education on subsistence agriculture are critical to the livelihood of citizens in our nation’s smallest communities.

From the ecosystem to the genome, past grantees were honored for their contribution to agriculture. Dr. Valerie Eviner of the University of California, Davis, the recipient of the FY 2007 President’s Early Career Award for Scientists and Engineers (PECASE), addressed the emerging issue of “ecosystem services” in her project on rangeland seedling dynamics through a novel blend of research, education, and extension. The spectrum of stakeholders involved in this project is equally impressive. The team of Drs. Pamela Ronald and Julia Bailey-Serres at the University of California, Davis and Dave Mackill at the International Rice Research Institute was awarded the prestigious 2008 NRI Discovery Award for their work which identified a gene that enables rice to survive flooding conditions. This work will result in a new rice variety that will have positive impacts on 70 million people worldwide.

Perhaps the 2008 NRI Discovery Award project is an appropriate candidate for “2008 NRI Class Valedictorian”. After all, this project embodies our founding principle as the “People’s Agency” and allows us to envision a future in which the National Institute for Food and Agriculture and the Agriculture Food

Research Initiative emerge and bring forth a new era in the support of fundamental and applied research and in the unique integration of research, education, and extension to advance agricultural knowledge and enhance the lives of people in this nation and around the world.

Dr. Larry Robinson
CSREES Science Advisor

National Research Initiative: An Overview

CSREES has the unique mission to advance knowledge for agriculture, the environment, human health and well-being, and communities. The mission is achieved by funding projects that support mission-relevant topics benefiting society while advancing agricultural achievements. These projects promote effective communication between scientific disciplines and bring together stakeholders with similar interests. The NRI was established by CSREES to further the agency's mission by increasing the competitiveness of U.S. agriculture; improving human health and well-being through an abundant, safe, and high-quality food supply; and sustaining the quality and productivity of the natural resources upon which agriculture depends. Fiscal Year (FY) 2008 was the last year the NRI received appropriations. This program will be replaced by the new AFRI competitive grant program.

In FY 2003, the NRI expanded its interests beyond those set during the program's inception to fund projects that integrate research, education, and extension. The inclusion of these integrated projects into the traditional research platform allowed the NRI to address agricultural concerns using the traditional research approach while expanding the reach of the program to better address the needs of the end-user.

Congress sets the basic budgetary framework for the NRI and requires that grants be consistent with the development of systems of sustainable agriculture. Members of Congress make recommendations for the scientific and programmatic administration of the NRI through appropriation language and through their questions and comments during Congressional budgetary hearings.

In FY 2008, the NRI provided $173,229,307 to states in the form of research and integrated research, education, and extension grants. The funds were distributed to support programs within four cluster areas: Agricultural Genomics and Biosecurity; Agricultural Production and Value-Added Processing; Nutrition, Food Safety and Quality; and Agroecosystems and Rural Prosperity.

Identification of Program Priorities

The Competitive Program staff assimilates the input of diverse stakeholder groups to develop programs that will solicit the highest-quality proposals to meet the needs of agriculture, food, forestry, environment, and rural communities in the United States. Setting program priorities is an important means of facilitating the scientific and technological advances needed to meet the challenges facing U.S. agriculture. The program priorities encompass one and often several of the six USDA strategic goals for FY 2008:

1. Enhance international competitiveness of American agriculture
2. Enhance the competitiveness and sustainability of rural farm economies
3. Support increased economic opportunities and quality of life for rural America
4. Enhance protection and safety of the nation's agriculture and food supply
5. Improve the nation's nutrition and health
6. Protect and enhance the nation's natural resource base and environment

Input from coalitions and stakeholders provide broad perspectives on current research, extension, and education needs and priorities. Staff also meets with coalition groups and nonprofit societies to determine current trends in each field. In addition, the NRI receives input on its programs from academia, including administrators, staff members, and scientists, as well as research, extension, and academic administrators of the land-grant institutions.

The NRI scientific staff attends scientific and professional meetings to ensure scientific trends are reflected in the RFA. They also coordinate program priorities with other federal agencies. The NRI staff participates in meetings with representatives of key commodity groups and other user groups to discuss stakeholders' current research, education, and extension priorities, to solicit comments and suggestions on NRI program priorities, and to determine how the NRI can best meet stakeholders' needs.

Grants Provided

The NRI provides grants that support research, education, and extension to address mission relevant goals. Fundamental awards are granted to projects that provide basic knowledge, which advances applied research and conceptual breakthroughs in fields relevant to agriculture. Enhancement awards are provided to strengthen the research capacity of individuals and institutions, such as postdoctoral fellowships, new investigator grants, and Strengthening awards. Mission-linked awards fund projects that address specific problems, needs, or opportunities in modern society as well as projects that convey information and technology on specific agricultural issues to end-users. Multi-disciplinary 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. Integrated research, education, and extension awards fund projects that 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 the end users, while providing educational opportunities to assure the development of agricultural expertise in future generations. All funding types are represented in the last type of award called the Coordinated Agricultural Project (CAP). In 2004, the CAP was created to support large-scale, multi-million dollar projects to promote collaboration, open communication, and the exchange of information; reduce duplication of effort; and coordinate activities among individuals, institutions, States, and regions. CAP awards are only solicited in defined programs and may be research or integrated based on the priorities of the program. Project participants serve as a team that conducts targeted project priorities in response to emerging or priority area(s) of national need.

Of the NRI awards funded each fiscal year, Congress designates that funds be allocated in a specific manner. Multi-disciplinary funding should be greater than or equal to 30 percent of funds awarded. Mission-linked funding should be greater than or equal to 40 percent of funds awarded. No less than 10 percent is to be awarded to strengthen research capacity of individuals and institutions. In FY 2008, Congress designated that integrated projects may account for up to 26 percent of funds across the grant spectrum.

Program Implementation

Proposals are solicited through the NRI RFA. The RFA is distributed widely within the scientific community and among other interested groups. The FY 2008 RFA, published on the CSREES Web site and Grants.gov, identified 26 program areas addressing the six strategic goals.

In FY 2008, the NRI provided integrated opportunities in 16 of the 26 programs: Plant Biosecurity; Managed Ecosystems; Air Quality; Bioactive Food Components for Optimal Health; Human Nutrition and Obesity; Arthropod and Nematode Biology and Management; Animal Reproduction; Animal Growth and Nutrient Utilization; Animal Genome; Animal Protection and Biosecurity; Biology of Weedy and Invasive Species in Agroecosystems; Plant Genome; Plant Biology; Rural Development; Agricultural Prosperity for Small and Medium-Sized Farms; and Improving Food Quality and Value.

A total of 2,154 proposals were considered for funding in FY 2008 and reviewed through a competitive review process. Each year, panels of scientific peers meet to evaluate and recommend proposals based on scientific merit, investigator qualifications, and relevance of the proposed work to U.S. agriculture. In FY 2008, 32 peer panels reviewed and ranked the applications. Panel members were selected based on knowledge of the relevant scientific discipline, educational background, experience, and professional stature within the scientific community. The membership of each panel was balanced 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 statistics is shown in Table 1. Additional expertise was brought to proposal evaluation by a number of scientists and other specialists through ad hoc reviews, which covered a wide variety of fields. These reviews provided the additional knowledge needed to select the

highest quality and most meritorious proposals for funding. In total, more than 476 panelists contributed their time and expertise to the NRI proposal evaluation process in FY 2008.

At the conclusion of the review process, a summary of the peer panel's evaluation and the written reviews were forwarded to the submitting investigators, providing them with critical assessments of their proposed project by recognized leaders in the appropriate fields. The reviewers' comments and suggestions also provided another avenue for the applicants to refine proposals for future resubmission.

Since 1993, non-technical summaries of each funded project have been published as Abstracts of Funded Projects and posted on the CSREES Web site on NRI Information Web page (http://www.csrees.usda.gov/funding/nri/nri.html).

Program Outreach

The NRI program staff conducted Grantsmanship Workshops in Washington, D.C. and Salt Lake City, Utah, to increase applicant community and administrator understanding of the philosophy, directives, and procedures of the NRI competitive review process. These workshops focused on CSREES funding opportunities in competitive research and integrated programs, as well as capacity building in the Science and Education Resource Development (SERD) programs, including higher education, international programs, and multi-cultural alliances. Information provided during breakout sessions expanded on guidelines for preparing proposals, individual program descriptions, and recent funding statistics. In addition, a Grantsmanship Workshop for Integrated Research, Education, and Extension Programs was held in Memphis, Tennessee, which focused on how to develop, write, and implement competitive integrated proposals for CSREES integrated programs. In addition to Grantsmanship Workshops, the NRI staff made presentations on opportunities within the NRI program at national meetings of scientific and/or professional societies, for regional research groups, and other audiences from EPSCoR (Experimental Program for Stimulating Competitive Research) institutions and 1890 Land Grant Institutions.

In an effort to provide better guidance to our applicants, additional funding information was provided on the CSREES Web site, which presents a series of links that provide valuable information to the user, including a link the NRI program synopsis page, the current RFA, and abstracts of funded projects. In addition, the topics area and proposal due date link directs the user to a quick reference chart listing codes for the 26 NRI programs and submission deadline dates to assist applicants with the grant process.

Funded Projects in Fiscal Year 2008

A total of 2,154 applications were submitted to the NRI, requesting a total of $902,855,103. Awards totaling $173,229,307 were made to the 480 highest-ranked applications as shown in Table 2. The success rate is calculated in terms of number of proposals funded, excluding conferences, supplements, and continuing increments of the same grant, divided by the number of proposals submitted for review. The NRI funded approximately 22 percent of proposals submitted. Funding for 303 standard research projects averaged approximately $388,932 for 2.8 years, excluding Research Career Enhancement Awards, Equipment Grants, Seed Grants, Conference Grants, continuing increments, and supplements. Seventy-eight standard integrated research, education, and extension projects were funded averaging $626,506 for 3.0 years, excluding Bridge Grants, Conference Grants, continuing increments, and supplements.

The NRI provided funds totaling $328,900 in partial support of 31 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. The NRI provided a total of $29,231,925 in funds to the Agricultural

Research Enhancement Awards. These awards support Postdoctoral Fellowships, New Investigator Awards, and Strengthening Awards. More details on AREA awards are provided in Table 3.

In order to determine how to fund applications, panelists place the applications into one of five categories: outstanding, high-priority, medium-priority, low-priority, and do not fund. In FY 2008, 480 applications from a pool of 2,154 applications were funded, primarily from the outstanding and high-priority categories. Of the remaining 1,674 applications, 78 were placed in high-priority and 600 were placed in medium-priority. These proposals could have been supported provided an additional $225 million had been available.

Crosscutting Areas

A number of topics of major importance to USDA span several program areas. The NRI support for these crosscutting program areas in FY 2008 is shown in Table 4. The data provided identify the total amount of funding from all program areas for a specified topic. For example, the Water Quality area includes projects from the Water and Watersheds Program as well as some projects from other programs relevant to water quality such as Soils Processes.

Research Dimensions

As noted, research projects can be examined by type of investigation (fundamental or mission-linked) and by organization of research approach (single discipline or multi-disciplinary). These collaborations, where appropriate, may combine the biological, physical, chemical, and social sciences. The NRI funding in FY 2008 for these categories is shown in Table 5.

Participation

The range of institutions participating in the NRI is very broad. A breakdown of submitted applications, funded applications, and FY 2008 dollars awarded is provided by institution in Table 6. The institution types include1862, 1890, and 1994 Land-Grant Universities, as well as public non Land-Grant Universities, private universities, private research organizations, and federal laboratories.

Education

The NRI contributed to the preparation of the next generation workforce for agriculture by funding 1999 years of student assistantships in FY 2008. To continue to advance agriculture and remain competitive in the international market, it is imperative that every effort is made today to train tomorrow's workforce including researchers, teachers, and policy makers. This can be achieved and sustained with funding for comprehensive training and education of students. Table 7 provides an overview of student support provided by programs within the NRI. Students funding ranged from undergraduate to the post-doctoral level.

Interagency Research

The NRI National Program Leaders work closely with their research-funding counterparts in other federal agencies to maximize interagency cooperation and avoid research duplication. Each interagency

research program issues a single request for proposals, and representatives of the agencies work together to assemble a panel of scientific peers to identify the most meritorious proposals. From this group, representatives of each agency select proposals that are the most germane to the mission of that agency. Thus, the NRI is able to attract researchers from an even wider applicant pool in order to address areas of importance to agriculture, food, forestry and the environment. An example of cooperation is seen in the research that NRI funds jointly with other federal agencies, including:

The Microbial Genome Sequencing Program has been supported jointly by the USDA/CSREES NRI and the National Science Foundation (NSF) since FY 2001. Over 100 microbial genomes have been sequenced to date. The USDA/CSREES and NSF Microbial Genome Sequencing Program will lead to improved breeding strategies, increased disease resistance, and enhanced yield and nutritive value.

> The FY 2008 Global Climate Change Program is supported with funds from USDA/CSREES NRI, the Environmental Protection Agency (EPA), and the National Aeronautics and Space Administration (NASA). Knowledge gained from this program addresses the impact of global climate change on land-based systems and the global carbon cycle. In addition, this program identifies agricultural and forestry activities that can help reduce greenhouse gas concentrations by using technologies and practices that reduce carbon in the atmosphere and enacting risk management practices that mitigate natural and human impacts on agricultural ecosystem dynamics.
>
> The Maize Genome Project partners USDA/CSREES NRI with the National Science Foundation (NSF) and the Department of Energy (DOE) in supporting a large-scale sequencing of the corn genome. Previous funding from the USDA/CSREES NRI, NSF, and DOE has supported development of maize genome sequence resources, including physical and genetic maps, expressed sequence tags, sequences derived from gene-enriched genomic libraries, and a community genome database. The genetic sequence of maize will open new avenues of research for scientists to increase yields, reduce inputs, and develop more disease-resistant and drought tolerant varieties. This knowledge will also advance our understanding of the biology of important, but poorly understood processes, such as development of biofuels, hybrid vigor, and asexual plant production.

CSREES NRI Awards and Honors

Every year the Competitive Programs unit of CSREES has two opportunities to honor highly successful, motivated, and innovative scientists funded through the NRI. The President's Early Career Award for Scientists and Engineers (PECASE) award is the highest honor bestowed by the U.S. government on outstanding scientists and engineers beginning their independent careers. CSREES selects its awardees from among the most meritorious investigators funded through the NRI Competitive Grants Program New Investigator Awards. The Discovery Award was established by the NRI to recognize outstanding researchers in agriculture who advance knowledge and address issues critical to agriculture, the environment, human health and well-being, and communities. The Discovery award highlights exceptional scientific and economic impacts of NRI-funded projects and recognizes outstanding scientists in agriculture who have supported the CSREES mission.

In December 2008, Dr. Valerie Eviner of the University of California, Davis was the recipient of the FY 2007 PECASE award. Dr. Eviner developed new management grazing practices by focusing on the quality of grazing material and plant services, which has the potential to have broad economic and environmental impacts for industry, especially if adopted throughout the Western rangelands. She received funding for her proposal entitled Understanding Rangeland Seedling Dynamics: a Tool to Increase Forage Quality and Quantity while Providing Multiple Ecosystem Services. Dr. Eviner incorporated students, ranchers, environmental organizations and research and extension centers into her work, which enhances the dissemination of her research results and provides students with real world experiences that require social as well as scientific answers for management problems. She works

directly with stakeholders and ranchers, working their fields on a long-term basis to both understand their needs and to be able to conduct research that is relevant to them.
http://www.csrees.usda.gov/newsroom/news/2008news/12191_pecase.html

In FY 2008, the research team of Drs. Pamela Ronald and Julia Bailey-Serres at the University of California, Davis, and Dave Mackill at the International Rice Research Institute was awarded the NRI Discovery Award for their work which identified a gene that enables rice to survive complete submergence. The discovery allows for development of a new rice variety that can withstand flooding. Approximately one-fourth of the global rice crop is grown in low-lying fields prone to seasonal floods. Rice is the only cereal crop that can withstand submergence; however, most rice varieties will die if fully submerged more than four days, costing producers an estimated $1 billion in annual crop losses. Cultivation of the new variety is expected to increase food security for 70 million of the world's poorest people in developing countries. The researchers are also hoping the new gene will be useful in suppressing weeds and reducing herbicide applications for conventional and organic rice farmers in developed countries.
http://www.csrees.usda.gov/newsroom/news/2008news/120511_discovery_award.html

Fiscal Year 2008 National Research Initiative Statistics

Table 1. Characteristics of NRI Peer Review Panels, FY 2008

Characteristic	Number of Peer Review Panelists	Percent
Geographic Region[1]		
Northeast	100	21.0
North Central	125	26.3
Southern	148	31.1
Western	103	21.6
Type of Institution[2]		
Land Grant University		
1862 Land-Grant University	308	64.7
1890 Land-Grant University	31	6.5
1994 Land-Grant University	2	0.4
Hispanic Serving	11	2.3
Public non Land-Grant	43	9.0
Private College/University	14	2.9
Private Research	8	1.7
Federal	51	10.7
Industry/Other	24	5.0
Type of Position		
Professor	159	33.4
Associate Professor	115	24.2
Assistant Professor	104	21.8
Federal	50	10.5
Industry	18	3.8
Other (Senior Lecturer)	30	6.3
Expertise Representation		
Researcher	290	60.9
Educator	105	22.1
Extension Educator	48	10.2
Other	32	6.8
Gender/Minority Representation[3]		
Non-minority Male	212	44.5
Non-minority Female	130	27.3
Minority Male	95	20.0
Minority Female	39	8.2

[1] Regions include:
Northeast region: CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT, and WV plus DC
North Central region: IA, IN, IL, KS, MI, MO, MN, ND, NE, OH, SD, and WI
South region includes: AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, and VA
West region includes: AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, and WY

[2] Eighty-eight panelists represented USDA EPSCoR states, and 51 panelists represented Small and Mid-sized Institutions.

[3] Minorities include: Asians, African Americans, Hispanics, Pacific Islanders, and Native Americans

Table 2. NRI Funding Allocations, FY 2008[1]

Program Name	Number of Grants Awarded	Total Dollars Awarded
Agricultural Genomics and Biosecurity Program Cluster		
Plant Biosecurity	5	3,840,858
Animal Genome (A): Applied Animal Genomics	10	3,793,696
Animal Genome (B): Tools and Resources	3	2,066,355
Animal Genome (C): Bioinformatics	5	2,237,188
Animal Genome (D): Functional Genomics	4	1,584,958
Animal Genome (E): Whole Genome Enabled Animal Selection	3	1,317,803
Animal Protection and Biosecurity (A): Animal Disease	33	8,507,098
Animal Protection and Biosecurity (B): Animal Well-Being	9	2,703,402
Animal Protection and Biosecurtiy (C): Animal Biosecurity Coordinated Agricultural Projects	3	4,066,667
Microbial Genomics (A): Genome Sequencing	8	5,010,000
Microbial Genomics (B): Functional Genomics of Microorganisms[2]	-	-
Arthropod and Nematode Biology and Management (A): Organismal and Population Biology	19	6,102,250
Arthropod and Nematode Biology and Management (B): Suborganismal Biology	11	3,438,356
Arthropod and Nematode Biology and Management (C): Tools, Resources and Genomics	5	2,969,333
Arthropod and Nematode Biology and Management (D): Protection of Managed Bees Coordinated Agricultural Project	2	1,398,062
Microbial Biology (A): Microbial Observatories	1	500,000
Microbial Biology (B): Biology of Plant-Microbe Associations	16	5,390,000
Plant Genome (A): Tools, Resources, and Bioinformatics	7	2,414,500
Plant Genome (B): Functional Genomics	4	1,578,000
Plant Genome (C): Genome Structure and Organization	1	1,000,000
Plant Genome (D): Applied Plant Genomics Coordinated Agricultural Project	6	5,252,499
Total	***155***	***65,171,025***
Agricultural Production and Value-added Processing Program Cluster		
International Cooperative Biodiversity Groups	3	2,500,000
Agricultural Markets and Trade[2]	-	-
Animal Growth and Nutrient Utilization	16	4,746,000
Animal Reproduction	18	4,501,500
Biobased Products and Bioenergy Production Research	23	8,378,033
Nanoscale Science and Engineering for Agriculture and Food Systems	13	2,500,000
Plant Biology (A): Gene Expression and Genetic Diversity	12	4,200,000
Plant Biology (B): Environmental Stress	15	4,150,652
Plant Biology (C): Biochemistry	16	4,600,000
Plant Biology (D): Growth and Development	17	4,200,000
Plant Biology (E): Plant Breeding and Education	4	1,558,490
Total	***133***	***39,776,185***

Program Name	Number of Grants Awarded	Total Dollars Awarded
Agroecosystems and Rural Prosperity Program Cluster		
Agricultural Prosperity for Small and Medium-Sized Farms	14	5,288,681
Air Quality	13	5,000,000
Biology of Weedy and Invasive Species in Agroecosystems	14	4,595,000
Global and Climate Change	2	1,026,000
Managed Ecosystems	19	4,831,111
Rural Development	11	5,100,000
Soil Processes	21	4,331,500
Water and Watersheds	19	5,300,000
Total	***113***	***35,472,292***
Nutrition, Food Safety and Quality Program Cluster		
Bioactive Food Components for Optimal Health	20	5,856,791
Food Safety and Epidemiology (A): Biological Approaches for Food Safety	20	5,024,524
Food Safety and Epidemiology (B): Epidemiological Approaches for Food Safety	5	4,130,000
Human Nutrition and Obesity	12	10,500,000
Improving Food Quality and Value	18	5,740,000
Total	***75***	***31,251,315***
Grand Total	**480**	**173,229,307**

[1] The content of this table varies from tables provided in documents supporting the President's budget to Congress each year in that these data represent all awards made with FY 2008 appropriated funds regardless of the year awards were made.
[2] Program not offered in FY 2008.

Table 3. Agricultural Research Enhancement Awards, FY 2008[1]

Type of Award	Number of Grants Awarded	Total Dollars Awarded
Post Doctoral Fellowships	16	1,952,394
New Investigator Awards	25	7,436,397
Strengthening Awards		
Research Career Enhancement Awards	8	681,250
Equipment Grants	11	327,430
Seed Grants	33	3,225,436
Strengthening Standard Research Project Awards[2]	46	15,609,018
Total	**139**	**29,231,925**

[1] The content of this table varies from tables provided in documents supporting the President's budget to Congress each year in that these data represent all awards made with FY 2008 appropriated funds regardless of the year awards were made.
[2] Thirty-seven additional grants totaling $10,702,119 were awarded to institutions eligible for Strengthening Standard Research Projects Awards.

Table 4. Crosscutting Program Areas, FY 2008[1]

Area	Number of Grants Awarded	Total Dollars Awarded
Animal Genome	20	16,440,855
Animal Health	62	27,250,513
Food Safety	40	15,335,118
Forest Biology	38	13,416,513
Global Change	34	11,288,499
Integrated Pest Management	54	23,978,270
Plant Genome	27	14,677,371
Sustainable Agriculture	32	11,251,484
Water Quality	35	8,768,110

[1] The content of this table varies from tables provided in documents supporting the President's budget to Congress each year in that these data represent all awards made with FY 2008 appropriated funds regardless of the year awards were made.

Table 5. Dimensions of NRI Research, FY 2008[1]

Dimension	Total Dollars of Support	Percent
Fundamental	100,481,451	58
Mission-linked	72,747,856	42
Multi-disciplinary	129,921,980	75
Single Discipline	43,307,327	25
Integrated Research, Education, and Extension Projects	47,291,601	27
Research Projects	125,937,706	73

[1] The content of this table varies from tables provided in documents supporting the President's budget to Congress each year in that these data represent all awards made with FY 2008 appropriated funds regardless of the year awards were made.

Table 6. Distribution of NRI Awards by Institution Type, FY 2008[1]

Type of Institution	Percent of Submitted Applications	Percent of Grants Awarded	Percent of Total Dollars Awarded
Land Grant University			
1862 Land-Grant University	72.9	76.5	80.1
1890 Land-Grant University	2.0	0.8	0.2
1994 Land-Grant University	0.1	0.4	1.0
Public non Land-Grant University	7.8	9.2	7.6
Private College/University	5.9	4.4	4.2
Private Research	4.9	4.4	2.4
Federal	5.1	4.4	4.5
Industry/Other	1.3	0.0	0.0

[1] The content of this table varies from tables provided in documents supporting the President's budget to Congress each year in that these data represent all awards made with FY 2008 appropriated funds regardless of the year awards were made.

Table 7. Student Training Support, FY 2008

Program Cluster	Number of Students	Months of Support	Years of Support
Agricultural Genomics and Biosecurity			
Undergraduate Students	153	1626	136
Graduate Students	150	3169	264
Postdoctoral Students	165	3578	298
Subtotal	**468**	**8373**	**698**
Agricultural Production and Value-added Processing			
Undergraduate Students	74	1406	117
Graduate Students	100	2529	211
Postdoctoral Students	69	1946	162
Subtotal	**243**	**5881**	**490**
Agroecosystems and Rural Prosperity			
Undergraduate Students	80	616	51
Graduate Students	112	2349	196
Postdoctoral Students	31	597	50
Subtotal	**223**	**3562**	**297**
Nutrition, Food Safety and Quality			
Undergraduate Students	87	1830	153
Graduate Students	162	3861	322
Postdoctoral Students	141	483	40
Subtotal	**390**	**6174**	**515**
All Programs			
Undergraduate Students	394	5478	457
Graduate Students	524	11908	992
Postdoctoral Students	406	6604	550
Total	**1324**	**23990**	**1999**

The National Research Initiative: Supporting the CSREES Mission

In FY 2008, the NRI funded 527 grants. This section provides examples of both research and integrated projects in support of the mission priorities of USDA and CSREES.

Strategic Goal 1

Enhance International Competitiveness of American Agriculture

Expanding global markets for agricultural products is critical for the long-term economic health and prosperity of our food and agricultural sector. U.S. farmers have a wealth of natural resources, cutting-edge technologies and a supporting infrastructure that result in production capacity beyond domestic needs. Expanding global markets will increase demand for agricultural products and contribute directly to economic stability and prosperity for America's farmers.

Plant Biology
Project Director – Elizabeth Vierling
Institution – University of Arizona
Project Title – Function and Regulation of a Key Enzyme in Nitric Oxide Metabolism: S-Nitrosoglutathione Reductase

Impact: Understanding nitric oxide metabolism in plants will improve crop plant heat tolerance and increase seed production and yield.

Nitric oxide (NO) is a gas produced by plants that affects diverse physiological responses in plants, including stomatal movement, flowering, and pathogen responses. Mutants of the enzyme S-nitrosoglutathione (GSNO) reductase (GSNOR) may control the accumulation of NO species in the plant. Manipulation of GSNOR levels has been proposed as a means to modulate plant disease resistance, heat stress tolerance, and several other plant processes. In this project, the research team aims to understand the role of GSNOR activity in the complex metabolism of NO in plants. The results of this project will allow scientists to develop heat-tolerant plants that can better deal with changing climate conditions while achieving optimal seed production and yield.

Plant Biology
Project Director – Patrick Byrne
Institution – Colorado State University
Project Title – Enhancing Education and Research Capacity in Plant Breeding for Drought Tolerance

Impact: Agriculture faces many challenges with changing climate and traditional breeding methods will be used to increase drought tolerance in crop plants and improve plant breeding education.

The number of plant breeders produced annually by U.S. universities has fallen below the level required by public and private sectors. At the same time, the challenges facing plant breeders have never been greater. Global climate change has transformed much of the arable land to marginal land that is too dry for growing crops. Although tremendous progress has been made in the basic biology of plant drought tolerance and in genomic and molecular techniques in recent years, the breeding expertise that is needed to move the new drought-tolerant crop varieties into the field is lacking. This project will enhance the academic institution's capacity to conduct education and research in plant breeding for drought tolerance, focusing on winter wheat. On the educational side, the project will train graduate students, develop and offer a field-oriented short course, and develop and teach an online distance education course on plant breeding for drought tolerance. On the research side, new populations will be created that combine adapted cultivars with materials that include wild wheat germplasm as a source of novel drought tolerant

genes. This project will have impact on both increased drought tolerance, an essential trait for crop production as climate changes, and improved capacities for plant breeding education.

Animal Reproduction
Project Director – Richard Pursley
Institution – Michigan State University
Project Title – Improving Ovsynch to Maximize Fertility and Enhance Profitability of Dairy Farms

Impact: Dairy farmers will benefit from new protocols offered through demonstration and Web-based tools to improve dairy cow reproduction and maximize lactation.

Fertility of dairy cows has declined 1 percent per year over the past 35 years. Improving reproduction is critical for the dairy industry, because having a calf is required to induce the next lactation (milk-producing cycle) and to produce the next generation of milking cows. Understanding the intricate timing of the reproductive cycle in dairy cattle is important not only to induce lactation, thereby maximizing the percentage of cows at the peak of milk production and increasing farm profits. This project aims to improve upon a widely used approach to synchronize estrus followed by timed artificial insemination, called Ovsynch, in dairy cows. The team will educate dairy producers on the use of this new Ovsynch protocol through use of demonstration projects and development of interactive Web-based tools to improve farm profitability.

Strategic Goal 2

Enhance the Competitiveness and Sustainability of Rural Farm Economics
An economically prosperous agricultural production sector contributes to the nation's economic vitality and standard of living. Consumers benefit from efficiently produced and marketed agricultural products that minimize their food costs and maximize their consumption choices. The sector's success depends on the ability to expand into new markets, gain adequate capital, protect itself adequately against financial risk, and adjust to changing market conditions. Farm sector diversity is driven by fluctuations in resource availability, climate, individual preferences, and even lifestyles. The needs, concerns, and opportunities of larger, commercially oriented farms differ from those of smaller, intermediate farms, regardless of location.

Agricultural Prosperity for Small and Medium-Sized Farms
Project Director – Todd Ames
Institution – University of Guam
Project Title – The Application of Innovative Marketing to Traditional Subsistence Agricultural Activities

Impact: Small scale agriculture and agro-forestry provides sustainability and economic viability for the people of the Federated States of Micronesia.

More than 80 percent of the population of the Federated States of Micronesia depends on subsistence and semi-subsistence activities for the livelihoods. In addition, there is a tremendous gap in field research linking small and medium-scale faming to business practices in Micronesia. The need for local market development was highlighted in the 2008 Association of Pacific Islands Legislatures. This project will examine the socioeconomic impact of subsistence farming and its changing role in the Pacific Islands by conducting stakeholder input sessions and field research. The researchers will identify subsistence crops that have a market potential and design small-scale marketing strategies and educational programs that will enhance farm income. This project has a great potential to improve the living conditions of the people in Micronesia as small scale agriculture and agro-forestry provides sustainability and economic viability to the region.

Animal Genome
Project Director – Alison Louise Van Eenennaam
Institution – University of California, Davis
Project Title – Integrating DNA Information into Beef Cattle Production Systems

Impact: The beef cattle industry adoption and understanding of cost-effective DNA-based technologies will improve product quality and production efficiency.

Few of the over 800,000 cattle producers in the United States are familiar with recent developments in DNA-based technologies, or how DNA information could be used to benefit beef cattle production systems. Investment in sequencing of the bovine genome has resulted in the development of DNA-based approaches to select animals that are likely to produce the best offspring. This project aims to provide beef cattle producers with the background information and research-derived data they need to make informed decisions about the use of DNA-technologies in the context of commercial cow-calf operations. Outcomes are expected to include the increased understanding and adoption of cost-effective DNA-based technologies by beef cattle producers resulting in improved product quality and production efficiency.

Managed Ecosystem
Project Director – Maria Fermandez-Gimenez
Institution – Colorado State University
Project Title – Linking ecological and Economic state and Transition Models for Adaptive Management of Rangeland Ecosystems

Impact: A practical tool will assist management of rangelands to help ranchers and communities understand and benefit form the connections between ecological conditions and ranch profitability.

Stewards of Western rangelands must manage rangeland ecosystems with few practical decision-making tools to help them evaluate the ecological and socio-economic costs, benefits, and risks of their management choices. Together, these changes threaten the continued viability of ranches throughout the West, the sustainability of working rangeland landscapes, and the well-being of rural ranching communities. Accompanying these social and ecological changes in rangeland systems are shifts in natural resource management policy towards land stewardship that applies adaptive management and collaborative learning to build ecological and social resilience. Practical tools to assist land managers in the transition towards adaptive management for ecosystem resilience are sorely lacking. This project aims to address these challenges by developing, testing, and disseminating an effective adaptive management decision-making tool for land managers. This tool will be used in an innovative outreach program to help ranchers and communities explore the connections between ecological conditions and ranch profitability, and learn collaboratively about potential future landscape conditions based on different management scenarios.

Strategic Goal 3

Support Increased Economic Opportunities and Improved Quality of Life in Rural America
Rural America, home to one-fifth of the nation's population, is a collage of people and economic activities. Today, seven out of eight rural counties are dominated by varying mixes of manufacturing, services and other non-farming activities. Of the 65 million people who live in rural America, only two million are engaged directly in production agriculture. While farm income is an important source of revenue for some rural families, most rural residents are not dependent on agriculture. Economic opportunities and quality of life for rural residents may be enhanced by helping to provide local demographic information, financial and technical assistance for business and industry, water and waste disposal, community facilities, advanced telecommunications and broadband infrastructure, electric utilities, and housing.

Rural Development
Project Director – Robert LaRose
Institution – Michigan State University
Project Title – Connecting Rural Youth and Rural Enterprise to the Information Economy

Impact: Linking youth programs and rural enterprises will benefit both communities by improving youth ties to the community and proving computer technologies to build small business entrepreneurship.

To thrive in the information economy rural areas must train and retain youth who are fluent with Information and Communications Technologies (ICTs) and nurture rural enterprises that are connected to the global economy. The project will apply online social networking to forge new social ties between youth and entrepreneurs to enhance the social capital of both groups and the communities in which they live. The project will draw on community relationships, courseware, and social networking applications to organize online community development forums in three diverse rural counties that will engage youth and small business proprietors in dialogue about entrepreneurial activities in their communities. Rural high schools students and college students from rural communities are expected to form stronger attachments to their communities by learning about entrepreneurial careers available to them and by expanding their social circles, community activities, and pre-vocational interests in their home communities. Small business owners will benefit from tapping the resources of a youthful workforce fluent with ICTs and from networking with each other to develop and share common resources.

Rural Development
Project Director – Stephen Swallow
Institution – University of Rhode Island
Project Title – Developing Ecosystem Services Businesses as New Revenues for Farms in Communities Facing Exurban Development

Impact: Paying for the benefits of ecosystem services will be examined to sustain small farms and the environment.

Urban sprawl and rising real incomes have generated rural development scenarios that have displaced traditional agriculture and, as a result, deemphasized the ecosystem services agriculture contributes to the quality of rural life. By examining the marketing of ecosystem services, this project will offer an early step to entrepreneurship opportunities and new revenue streams based on ecosystem services that farms may deliver to rural residents. This project will implement experimental markets based on prior experience in a pilot market in Jamestown, Rhode Island where residents buy into contracts that compensate farmers who manage hayfields in consideration of grassland nesting birds or other cultural or aesthetic ecosystem services. The project will disseminate the information to farmers, and policy makers interested in the sustainability of small farms and the environment.

Strategic Goal 4

Enhance Protection and Safety of the Nation's Agriculture and Food Supply
Providing consumers with a healthy food supply and a secure agricultural production system is critical. This is achieved by ensuring that the nation's meat, poultry, egg, and plant products are safe, wholesome and labeled accurately. This also is achieved by protecting the nation's agricultural system from pests and disease outbreaks, minimizing production losses, maintaining market viability and promoting responsible environmental stewardship.

Arthropod and Nematode Biology and Management
Project Director – Kenneth Raffa
Institution – University of Wisconsin

Project Title – How do Interactions among Microbial Symbionts Affect the Host and Range Expansions of an Eruptive Forest Insect?

Impact: Guidelines establish how phytochemicals present in pines can influence the way bacteria and fungi regulate bark beetle reproduction.

The mountain pine beetle is a major pest of North American forests. Intermittent outbreaks have historically occurred, but were quickly quashed by the return to cold conditions. Global warming is causing temperatures in northern and western states to increase, stressing several species of pine trees and allowing bark beetles to survive during milder winter conditions and expand their range. The research team will study how phytochemicals present in pines influence the way bacteria and fungi regulate bark beetle reproduction. This work will help guide management responses to a climate-induced biological invasion, and contribute to our understanding of how symbionts mediate herbivore-host plant interactions.

Arthropod and Nematode Biology and Management
Project Director – Keith Delaplane
Institution – University of Georgia
Project Title – Sustainable Solutions to Problems Affecting Health of Managed Bees

Impact: Best management practices to aid bee keepers dealing with Colony Collapse Disorder will help maintain healthy bee population size and diversity.

During the winter of 2006-2007, U.S. beekeepers reported the rapid loss, an estimated 25 percent, of adult bees from the hive. This issue, labeled Colony Collapse Disorder (CCD), is a major problem for agriculture because bee pollination is responsible for $15 billion in added crop value each year. The problems with managed pollinators cannot be relegated to one or few causative agents. Bee declines are likely a product of negatively interacting factors in pathology, immunology, nutrition, toxicology, genetics, ecosystems management, and bee husbandry. The team will develop best management practice guidelines that provide practical answers for beekeepers and growers of crops in order to restore large and diverse populations and health of managed bees.

Strategic Goal 5

Improve the Nation's Health and Nutrition

America's health is promoted through nutrition education, and guidelines for the general public and targeted groups. These goals inform and motivate Americans to use this information to improve their diets and physical activity patterns. This is also accomplished by expanding research and scientific knowledge about the contribution of food and human nutrition to public health. Promoting better diets, reaching children early and ensuring access to healthy food contributes to the nation's health.

Bioactive Food Components for Optimal Health
Project Director – Adam Lock
Institution – University of Vermont
Project Title – The Impact of Milk Fat-Derived Bioactive Fatty Acids on the Fetal Programming of Atherosclerosis

Impact: The link between trans fats to heart disease later in life provide health advocates greater resources to fight this deadly disease.

Coronary heart disease (atherosclerosis) is the leading cause of death in Western industrialized countries. Research has revealed that trans-fatty acids (TFA) are a particularly significant dietary risk factor for this disease. The risk of heart disease may differ according to the dietary source of TFAs, but it

may also be impacted by nutritional disturbances that occur during fetal and early postnatal life. This study will examine the impact of TFA on the 'fetal programming' of coronary heart disease development later in life. Using an appropriate rodent model and a combination of techniques the project will examine the effect of pre and postnatal exposure to natural (milk fat) and industrial (partially-hydrogenated vegetable oil) sources of TFA to determine the origin of heart disease. Given that a high proportion of the current U.S. population would have been exposed to natural and industrial sources of TFA during their own early development, the findings will provide valuable knowledge for use by government, nutritionists, and health professionals in the development of policies and recommendations regarding the health effects of TFA.

Human Nutrition and Obesity
Project Director – Scott Going
Institution – University of Arizona
Project Title – Stealth Health: Youth Innovation, Mobile Technology, Online Social Networking and Informal Learning to Promote Physical Activity

Impact: Social networking and new technologies may shift the scales to improve physical activity and nutrition for youth at risk of obesity.

Physical inactivity and poor dietary habits are important contributors to the increase in youth obesity. Popular technology, often considered a contributing factor to the rise in obesity, must become part of the solution. The project team proposes using a youth friendly informal approach capitalizing on technologies and social networking sites to increase physical activity and improve nutrition knowledge and behavior. This project aims to capture youth who do not participate in traditional interventions with special customized, miniature software applications (widgets) that motivate physical activity and support informal health and nutrition education. Working with national partners (4H, YMCA and America on the Move), the project team will sponsor a national youth contest to use, adapt, and share the widgets. Novel uses will be rewarded and posted on partners' Web sites, and advertised to other youth. This will insure adoption, diffusion, and positive effects on physical activity and nutrition behavior.

Strategic Goal 6

Protect and Enhance the Nation's Natural Resource Base and Environment
America's soils, water supplies, and range and forest ecosystems produce the raw materials for food, clothing, shelter, and energy. They also provide the settings for recreation and other activities highly valued by Americans. High-quality soils and abundant supplies of clean air and water are the essential to production agriculture and forestry, rural economies, and all life. It is imperative to ensure that the nation's natural resources meet the long-term needs of a dynamic society with an increasing population.

Air Quality
Project Director – Dr. Wayne Robarge
Institution – North Carolina State University
Project Title – Measurement and Modeling of Net Exchange Fluxes and In-Canopy Source/Sink Characteristics of Ammonia in Forest and Agricultural Landscapes

Impact: Reducing ammonia dry deposition in agricultural landscapes will improve air quality and human health.

Modern agriculture production accounts for over 50 percent of all known ammonia emissions to the atmosphere. This ammonia is transferred back to the planet in rain, which can negatively impact nutrient sensitive ecosystems and human health through the formation of fine airborne particulate matter (PM 2.5). Development of economically sound yet environmentally safe control strategies for ammonia

emissions from agriculture require a thorough knowledge of the fate and transport of ammonia in the environment, both on a local and regional (national) scale. This project will improve current estimates of ammonia emission rates for forests and fertilized crops, which currently represent large uncertainties in national ammonia emissions inventories. The measurements will be used to estimate the potential contribution of ammonia dry deposition to total atmospheric nitrogen deposition to forest and agricultural landscapes in the eastern United States to improve current air quality models used in regulatory applications regarding ammonia and atmospheric PM 2.5.

Water and Watersheds

Project Director – Burton C. English
Institution – University of Tennessee
Project Title – Assessing Water Use and Water Quality Change with Respect to Large-scale Expansion of Ethanol Feedstock Production in the United States

Impact: A careful examination of biofuel production, especially ethanol production, on the quality and quantity of freshwater resources around the country.

Sufficient supply of clean water is essential to public health, ecosystem protection, as well as economic development. Water conservation, however, has become challenging with the expansion of biofuel ethanol production. Ethanol refinery plants, which provide approximately 100 jobs, require 3 gallons of water to convert feedstock to 1 gallon of ethanol. A biorefinery that produces 100 million gallons of ethanol per year would use the equivalent of the water supply for a town of about 5,000 people. Intensive feedstock production could increase fertilizer or other chemical runoff. The project team will identify and quantify the gross water use and water quality required to meet the 2022 goal of 36 billion gallons of ethanol production, of which 21 billion gallons of ethanol from feedstock other than corn. In addition, the project team will identify policies that will enhance water quality and water conservation under these ethanol production goals and indicate and estimate the impacts of these potential national water policy tools.

Soil Processes

Project Director – David McNear
Institution – University of Kentucky
Project Title – Response of Soil Processes to an Aboveground Plant-Fungal Symbiosis: From Rhizosphere to Regional Scales

Impact: Endophyte tall fescue impact on the soils may alter management decisions of pasture and forage land across the United States.

Tall fescue, a common forage crop, accounts for 40 million acres of pasture and forage land in the United States. Most of the crop is infected with an internal fungus that allows the fescue plant to be more persistent in a wide range of environments, but the fungus produces compounds that are toxic to animals. These toxins produce a condition called tall fescue toxicosis, which costs the U.S. livestock industry nearly $1 billion annually.
The project team will provide novel data on how the soil chemical environment, soil microbial communities, and soil carbon and nitrogen dynamics are altered by the newly developed tall fescue cultivar whose fungal endophyte symbioses not produce animal toxins. This project is both practical and fundamental in that it will lead to predictions of nutrient availability and productivity of both crops and livestock on the soils currently or recently planted to tall fescue. In addition, it may impact management decisions in this region as well as the spread of the new cultivars of this popular forage crop that will in turn affect sustainability and environmental impact.

Biobased Products and Bioenergy Production Research
Project Director – Charles Wyman
Institution – University of California, Riverside
Project Title – Advanced Continuous Biomass Hydrolysis snd Fermentation

Impact: An analysis of batch and continuous production of cellulosic biomass conversion to reduce the cost of bioethanol production.

Cellulosic ethanol has unique potential to provide a low cost, sustainable, and abundant liquid transportation fuel. Although costs have been reduced significantly, recalcitrance of cellulosic biomass limits biological conversion. Overcoming this obstacle through advances in pretreatment and enzymatic hydrolysis clearly offers the most powerful opportunity for significant additional cost reductions. Continuous processing is generally favored to realize low costs in ethanol production, but the initial results reveal instabilities and other challenges in continuous operations. The target of this project is to develop, understand, and advance multistage continuous fermentations that combine the best features of batch and continuous systems. Baseline data would be developed, methods devised to avoid instabilities, and biological and staging strategies advanced to significantly lower enzyme doses for multistage saccharification and fermentation.

NRI Impacts

The NRI Annual Report provides an opportunity to highlight both research and integrated projects funded in FY 2008 that address critical issues in agriculture, nutrition, rural communities, and the environment. The Annual Report also provides a way to illustrate the success and impact of projects funded in previous fiscal years. The projects highlighted below received funding from the National Research Initiative within the past six years. Research and integrated funds produced monitoring programs to protect agriculturally important crops and animals from disease, unlocked the genome of agriculturally important crops, animals, and insects in order to maintain food security at home and abroad, and developed new methods to keep food safe from pathogens in the domestic market and exports for trade. The impact of NRI funded projects at times expand beyond the realm of the USDA mission leading to the development of unexpected treatments for diseases that threaten human health. Finally, agriculture is intimately linked to the development of the burgeoning biofuel industry. These projects provide a glimpse into the impact CSREES NRI funds have on the agriculture and the nation as a whole.

Project Director – David E. Kerr
Institution – University of Vermont
Project Title – Transgenic Approach to Prevent Bovine Mastitis

Mastitis, which is characterized by inflammation of the cow udder, is the most costly disease of dairy cattle and prevention strategies remain frustratingly ineffective. This project aims to develop transgenic cattle that produce lysostaphim in cow milk. Lysostaphim is an enzyme that kills Staphlyococcus aureus, the primary bacterium responsible for the development of mastitis. The transgenic cows from this study have been shown to be resistant to mastitis caused by S. aureus. The research team has also discovered a new enzyme that can kill S. uberis, the second major mastitis-causing pathogen. Reducing the impact of several Staphylococcus species will ease the burden of the disease from dairy farmers that will ensure the well-being of dairy cows and increase the profitability of dairy farms across the United States.

Project Director – Bruce Hammock
Institution – University of California, Davis
Project Title – Role of A/B-Hydrolase Fold Enzymes In The Regulation Of Juvenile Hormone

Insect juvenile hormone controls the different stages of development. Scientists have developed insect growth regulators that mimic juvenile hormone as a form of biologically based insect control. Bruce

Hammock and colleagues have identified and characterized an important enzyme in the metabolism of the juvenile hormone. The researchers determined that by preventing this hormone from breaking down, they could stop caterpillar metamorphosis into moths or butterflies. This work may lead to a new strategy for insect pest control. This work led to the unexpected discovery of a new approach to treat high blood pressure and other disorders in humans. The oral compound developed in this study is in Phase I human clinical trials and being developed as a pharmaceutical. This work illustrates how fundamental research on agriculturally important insects can lead to a novel and environmentally friendly pest control strategy as well as the first new method to control high blood pressure in humans in over 20 years.

Project Title – Total Assessment Tool for farmland (TVAL-FARM): Geospatially Quantifying Market and Non-market Worth
Project Director – Leah Greden Mathews
Institution – University of North Carolina, Asheville

Past attempts to place value on farmland greatly depended on who was asked. Farmers, developers and residents may have their own view, but no concrete estimates exist. North Carolina leads the nation in the rate of lost farmland. Since 2002, the state has lost more than 6,000 farms and 300,000 acres of farmland. Leah Greden Mathews and colleagues started the Farmland Values Project to assess the full value of farmland in Buncombe, Haywood, Madison and Henderson counties by asking residents and visitors to the area about the various benefits received from farmland, such as scenic beauty, flood control or wildlife habitat. This project is an important first step to assess the value of farm loss in rural North Carolina and could lead to new programs that would allow farmers to directly benefit from the scenic beauty and ecological services provided by their farms.

Project Director – Sherry A. Tanumihardjo
Institution – University of Wisconsin
Project Title – Surrogate Measures of Vitamin A Status Using Validated Methods

Inadequate vitamin A intake during pregnancy may have important implications for the child's health into adulthood, including increases in hypertension and kidney degeneration. This issue has been a major public health problem for women and children of lower socioeconomic status. Sherry Tanumihardjo and colleagues have developed a program to evaluate the vitamin A concentration in lactating sows, which were used as a human surrogate. The research team measured the effect of modified relative dose response (MRDR) test to assess vitamin A status in the sow. The results of this study will guide human supplementation programs. In addition, the investigator is continuing to work with the World Health Organization on appropriate vitamin A supplementation practices for women and children in the United States and developing countries, like Indonesia and Ghana.

Project Director – Steven Tanksley
Institution – Cornell University
Project Title – Investigating the Molecular Basis Of Tomato Size And Shape: A Model for Understanding Quantitative Trait Variation and Evolution of Fruit

Using selective breeding, early agricultural workers domesticated wild tomatoes by growing plants that enhanced specific traits, specifically fruit size. Wild-type tomatoes are often small, round berries, but today's domesticated plants produce the large, round tomatoes commonly found in the grocery produce section. Steven Tanksley and colleagues took on this largely unexplored aspect of plant development to address fruit size and shape–two major factors that control the final yield, quality, and consumer acceptability of many crops. Scientists hope biotechnology will increase their understanding of the genetic blueprint behind natural variation. This knowledge will help breeders improve key traits, such as yield, fruit size, nutritional value, and drought resistance, in agriculturally important crops through natural breeding techniques. This study also demonstrates the feasibility of isolating the key genes involved in the domestication of crop species from their wild plant ancestors. This information is valuable to agriculture

because identification of these genes could lead to advances in plant breeding and the future domestication of new crop plants.

Project Director – Ramon Gonzalez
Institution – Rice University
Project Title – Development of a Novel Fermentation Process for the Anaerobic Conversion of Glycerol and CO2 into Succinic Acid Using Escherichia Coli

Biofuel production is beset by the same problem as traditional petroleum refining – excess waste. As biofuel production increases, the market is being flooded with its waste byproducts, specifically glycerin, also known as glycerol. Glycerin is cheap and abundant in the current marketplace. Although there are many potential uses for the substance, it is difficult to break it down into products with greater economic value. Ramon Gonzalez and William Akers developed a new fermentation process that uses E. coli to convert glycerin into high-value chemicals, like succinate. Succinate and its derivatives have an annual domestic market of more than $1.3 billion. It is used in a variety of products including flavoring agent in food and beverages, an intermediate compound for dyes and perfumes, and medical applications. Another product, formate, is principally used as a preservative and antibacterial agent in livestock feed. Technologies based on Gonzalez's work have been licensed to Glycos Biotechnologies Inc., a Houston-based startup company that plans to open its first demonstration facility within the next 12 months.

NRI Program Contacts

Deputy Administrator	Dr. Deborah Sheely	dsheely@csrees.usda.gov	(202) 401-5024
Research Director	Dr. Mark Poth	mpoth@csrees.usda.gov	(202) 401-5244
Integrated Director	Vacant		
Agribusiness Markets and Trade	Dr. Siva Sureshwaran Dr. Henry Bahn	ssureshwaran@csrees.usda.gov hbahn@csrees.usda.gov	(202) 720-7536 (202) 720-8143
Agricultural Prosperity for Small and Medium-Sized Farms	Dr. Siva Sureshwaran Dr. Diana Jerkins	ssureshwaran@csrees.usda.gov djerkins@csrees.usda.gov	(202) 720-7536 (202) 401-6996
Air Quality	Dr. Ray Knighton	rknighton@csrees.usda.gov	(202) 401-6417
Animal Genome, Genetics, and Breeding	Dr. Peter Burfening Dr. Muquarrab Qureshi	pburfening@csrees.usda.gov mqureshi@csrees.usda.gov	(202) 401-5823 (202) 401-4895
Animal Growth and Nutrient Utilization	Dr. Mark Mirando	mmirando@csrees.usda.gov	(202) 401-4336
Animal Health and Well-being	Dr. Peter Johnson	pjohnson@csrees.usda.gov	(202) 401-1896
Animal Biosecurity CAP	Dr. Peter Johnson	pjohnson@csrees.usda.gov	(202) 401-1896
Animal Reproduction	Dr. Mark Mirando	mmirando@csrees.usda.gov	(202) 401-4336
Applied Plant Genomics CAP	Dr. Ed Kaleikau	ekaleikau@csrees.usda.gov	(202) 401-1931
Arthropod and Nematode Biology and Management	Dr. Mary Purcell-Miramontes	mpurcell@csrees.usda.gov	(202) 205-0440
Bioactive Food Components for Optimal Health	Dr. Etta Saltos	esaltos@csrees.usda.gov	(202) 401-5178
Biobased Products and Bioenergy Production Research	Dr. Chavonda Jacobs-Young	cjacobs@csrees.usda.gov	(202) 401-6188
Biology of Weedy and Invasive Species in Agroecosystems	Dr. Michael Bowers	mbowers@csrees.usda.gov	(202) 401-4510
Food Safety and Epidemiology	Dr. Jeanette Thurston	jthurston@csrees.usda.gov	(202) 720-7166
Global and Climate Change	Dr. Nancy Cavallaro Dr. Louie Tupas	ncavallaro@csrees.usda.gov ltupas@csrees.usda.gov	(202) 401-4082 (202) 401-4926
Human Nutrition and Obesity	Dr. Etta Saltos Dr. Susan Welsh	esaltos@csrees.usda.gov swelsh@csrees.usda.gov	(202) 401-5178 (202) 720-5544
Improving Food Quality and Value	Dr. Ram Rao Dr. Hongda Chen Dr. Dionne Toombs	rrao@csrees.usda.gov hchen@csrees.usda.gov dtoombs@csrees.usda.gov	(202) 401-6010 (202) 401-6497 (202) 401-2138

Managed Ecosystems	Dr. Diana Jerkins	djerkins@csrees.usda.gov	(202) 401-6996
Microbial Biology: Microbial Association with Plants	Dr. Ann Lichens-Park	apark@csrees.usda.gov	(202) 401-6460
Microbial Genomics	Dr. Ann Lichens-Park Dr. Daniel Jones	apark@csrees.usda.gov djones@csrees.usda.gov	(202) 401-6460 (202) 401-6854
Nanoscale Science and Engineering for Agriculture and Food Systems	Dr. Hongda Chen	hchen@csrees.usda.gov	(202) 401-6497
Plant Biology	Dr. Liang-Shiou Lin Dr. Diana Jerkins Dr. Ed Kaleikau	llin@csrees.usda.gov djerkins@csrees.usda.gov ekaleikau@csrees.usda.gov	(202) 401-5042 (202) 401-6996 (202) 401-1931
Plant Breeding and Education	Dr. Liang-Shiou Lin	llin@csrees.usda.gov	(202) 401-5042
Plant Biosecurity	Dr. Liang-Shiou Lin	llin@csrees.usda.gov	(202) 401-5042
Plant Genome, Genetics, and Breeding	Dr. Ed Kaleikau	ekaleikau@csrees.usda.gov	(202) 401-1931
Protection of Managed Bees CAP	Dr. Mary Purcell-Miramontes	mpurcell@csrees.usda.gov	(202) 205-0440
Rural Development	Dr. Siva Sureshwaran	ssureshwaran@csrees.usda.gov	(202) 720-7536
Soil Processes	Dr. Nancy Cavallaro	ncavallaro@csrees.usda.gov	(202) 401-4082
Water and Watersheds	Mary Ann Rozum James P Dobrowolski	mrozum@csrees.usda.gov jdobrowolski@csrees.usda.gov	(202) 401-4533 (202) 401-5016