United States Department of Agriculture
Cooperative State Research, Education, and Extension Service,
Office of the Administrator

Self-Review for 2004
Portfolio Review Expert Panel

Portfolio 1.1: Agricultural Markets & Trade

Portfolio 1.2: International Economic Development

Portfolio 1.4: Structure of the Agricultural Sector & Farm Management

Supporting Objectives 1.1, 1.2, and 1.4

CSREES *Goal 1: Enhance Agricultural Opportunities for Agricultural Producers*

For the period 1998-2002

INTRODUCTION

The Cooperative State Research, Education and Extension Service (CSREES) staff has prepared this report for the Portfolio Review Panel convened by the CSREES Administrator to assess the relevance, quality, and performance of the above three portfolios in the context of the Agency's Strategic Plan.

The first half of the report contains a general description of CSREES, its vision, mission, strategic goals/objectives, and functions, as well as funding authorities for its programs. [***Deleted for publication on the web, as repetitive across portfolios.]*** The second half of the report provides a description and analysis of each of the three portfolios. References to "Evidentiary Materials" refer to supporting information that will be available to the Review Panel when it arrives in Washington, D.C. Additional information is available on the CSREES website (http://www.csrees.usda.gov); click on Economics & Commerce, and Technology & Engineering.

The following is a brief taxonomy of what you will see in the second half of the report. The three portfolios address three of the five objectives in Strategic Goal 1 (Enhance Economic Opportunities for Agricultural Producers) of the CSREES Strategic Plan. Each portfolio contains a group of two to four Problem Areas. Each Problem Area is composed of research, education, and extension activities across all of the program units within CSREES. A specific program, often conducted by a single program unit or even a single NPL, may address several Problem Areas and several objectives of the Strategic Plan. Hence, the discussion of a portfolio may not include a complete research, education and extension program. For example, the Farm Management program is primarily covered by Problem Area 601 (Economics of Agricultural Production and Farm management), Problem Area 602 (Business Management, Finance, and Taxation), and PA 801 (Individual and Family Resource Management). Our discussion for this review will be limited primarily to PA 601, as part of Portfolio 1.4. PA 602 and PA 801 will be reviewed later in Portfolios 2.1 and 2.2, respectively.

During your Review Panel meeting, National Program Leaders (NPLs), with responsibility for programs that contribute to each Problem Area within the three portfolios of this review, will make brief presentations; and Review Panel members will have opportunities to ask questions and dialogue with them.

It is CSREES's expectation that Review Panel members will: (1) study this report before meeting in Washington, DC; (2) ask the NPLs questions for clarifications during or after their presentations; (3) deliberate an assessment of the three portfolios and score the portfolios on the basis of criteria developed by the Office of Management and Budget (OMB) for Relevance, Quality and Performance, using a scoring tool that will be provided; and (4) make recommendations to the CSREES Administrator and NPLs for improving the portfolios' performance.

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GOAL 1: ENHANCE ECONOMIC OPPORTUNITIES FOR AGRICULTURAL PRODUCERS

Sustaining and expanding new markets for U.S. agricultural products is critical for the long-term economic health and prosperity of the food and agricultural sector. American farmers and ranchers have superior natural resources, cutting-edge technology, a high level of education and management skill, and a supporting infrastructure that results in production capacity that exceeds domestic needs. U.S. agricultural productivity expands global markets, and results in a consistently positive balance of agricultural trade. Our productive capability is the basis for new uses for agricultural and forestry resources in industrial and pharmaceutical markets, as well as the world's lowest percentage of disposable income spent for food. CSREES provides the education, research, and extension base on which contemporary agriculture depends for future growth and development.

CSREES in partnership with the land grant university system support the USDA mission and its five strategic goals: (1) Enhance Economic Opportunities for Agricultural Producers, (2) Support Increased Economic Opportunities and Improved Quality of Life in Rural America, (3) Enhance Protection and Safety of the Nation's Agriculture and Food Supply, (4) Improve the nation's Nutrition and Health, and (5) Protect and Enhance the Nation's Natural Resource Base and Environment. CSREES also seeks to improve federal management services via the Presidents' Management Initiatives.

The three portfolios under review all contribute to Goal 1 of the USDA and CSREES strategic plan: Enhance Economic Opportunities for Agricultural Producers. This goal has five objectives:

1. Provide information, knowledge, and learning to help expand markets and reduce trade barriers.

The economic viability of U.S. agriculture depends on its performance in the global market. To enhance the competitiveness of U.S. agricultural commodities, products, and processes in the global economy, the production, processing and distribution system must provide reliable supplies of desired products to buyers at competitive prices. Timely, reliable, and valid research, along with education and extension leading to adoption of new technologies and their resulting economic advantage, help the U.S. maintain its net positive agricultural balance of trade by expanding international markets.

CSREES provides and distributes knowledge and technologies to sustain agricultural productivity, and data, analyses, and management capabilities to operate the system efficiently and effectively. CSREES Sponsors the development, teaching, and dissemination of science-based information to promote market efficiency, overcome barriers to trade that arise from scientific and technical problems, enhance sales of food and agricultural products to buyers worldwide, and adjust quickly to emerging trade opportunities and challenges.

2. Support international economic development and trade capacity.

Developing and transitioning countries are a major source of new demand for agricultural products. Access to these markets is important to U.S. producers. These countries represent the largest population growth and market potential for U.S. agricultural exports, but their purchasing power is limited as their economies and markets struggle. Limited technology and weak or obsolete infrastructure hinder developing and transitioning countries' capacity to participate effectively in global markets. Trade increases economic growth opportunities by expanding markets, and promoting economic development. Education and technology transfer help expand international trade in food and agriculture.

CSREES funds the production and dissemination of science-based information, education and technical assistance that lead to capacity building in developing countries, promoting economic, political, and social stability. Research discovers more productive and environmentally benign ways to produce food and fiber, not only in the U.S., but worldwide.

3. Provide the science-based knowledge and technologies to generate new or improved high quality products and processes to expand markets for agricultural sector.

New products, new uses, and value-added processes must be acceptable to consumers to be commercially successful. Bio-based technologies promise opportunities for energy, industrial, pharmacological, and other non-food markets for U.S. producers. New markets are emerging for environmental activities and products that mitigate environmental threats. The foundation for economic, technological, and market advancement is timely, valid, and reliable research, education, and extension that leads to inventions and practices that help establish new products in the marketplace.

CSREES Sponsors vital research and development contributions for new products, quality improvements, new uses, and value-added processes that enhance market opportunities for agricultural and forest products. Through education and extension, CSREES and its partners effectively demonstrate and transfer this knowledge to users.

4. Provide science-based information knowledge, and education to facilitate risk management by farmers and ranchers.

The U.S. agricultural sector must be dynamic to quickly respond to changing political, economic, technological, environmental, and consumer-driven market forces. Agricultural production and marketing is constantly affected by external factors such as weather and growing conditions, disease and pests, financial conditions, cultural practices, and consumer demand. New and emerging risks associated with domestic and international policy, genetic technology, exotic invasive species, and complex

agricultural diseases that can affect humans defy conventional means of identification, quantification, and management.

CSREES contributes to the improvement and strengthening of this dynamic agricultural system through sponsored research into alternative methods to identify, assess, and manage risk, providing relevant education, and extending information and practices to improve production and market decision making through enhanced risk management.

5. Contribute science-based information, analysis and education to promote the efficiency of agricultural production systems.

Fundamental to the stability and adequacy of our nation's food and fiber supply is the ability of a farmer or rancher to manage an efficient operation that realizes a profit. While factors like market conditions, weather, and diseases play an important role, production and market efficiency are critical components of economic viability. Government programs help manage some of the risk that producers inevitably face. Program eligibility and participation parameters must be understood and properly managed to optimize the protections that these programs offer. The long-range goal of research, education, and extension is to help producers operate efficient, economically sustainable farms and ranches yielding high quality products that are profitable at market prices, minimizing the need to use the safety net. We use the best science, education, and extension to design new management procedures and improve existing ones.

CSREES funds higher education, research, and extension programs to develop and transfer technology, practices, and skills to support economically viable farms and ranches of various size and scale. This work reduces production costs, increases production efficiency, improves yields, reduces environmental impact, improves marketing and management decisions, develops new products and uses for by-products, and finds new ways of adding value to traditional crops and products. Research ranges from using genomics to develop hybrids requiring fewer chemical inputs, to systems for more informed decision making, to new precision technology and nanotechnology to improve management of crops and animals.

AGRICULTURAL MARKETS AND TRADE – PORTFOLIO 1.1

General Overview

The Agricultural Markets and Trade (AMT) portfolio focuses on the marketing system that assembles agricultural commodities, converts them into food products, and distributes those products to consumers around the world. CSREES provides program leadership and funding to a combination of research-education-extension programs that enhance the performance of the food marketing system by helping producers, food companies, consumers, and society make better marketing and public policy decisions. The public policy portion of this portfolio also includes a broad range of domestic policy issues (not limited to marketing).

CSREES' leadership is primarily the responsibility of National Program Leaders (NPLs) working in consultation with the Agency's partners (institutions of higher education and federal agencies) to meet the needs of stakeholders (Congress, commodity organizations, interest groups, and others). CSREES does not conduct research, education, and extension activities; instead it seeks partners, such as land-grant universities, to carry out these functions at the local, state, national, and international level.

CSREES utilizes a diversity of authorizations and funding mechanisms to accomplish the goals of the AMT portfolio. Such a diversity of funding promotes a variety of approaches that often meet the unique requirements of the Agency's diverse population of stakeholders. Competitive grants are made through the National Research Initiative, Higher Education, 1994 Institutional Research and Extension, and Integrated Programs. Formula-funded grants to land-grant universities, authorized by the Hatch Act, Smith-Lever Act, Evans-Allen Act (1890), and Cooperative Forestry Research Act (McIntire-Stennis Act), provide land-grant institutions a high degree of flexibility and autonomy. Special Research Grants are appropriated by Congress to accomplish site-specific projects. "Pass-through" funds from other government agencies are awarded on a competitive basis for specific purposes, such as Risk Management Education funds provided by USDA's Risk Management Agency, or used for procurement of professional services, such as the international development assistance funds from USAID.

Furthermore, NPLs encourage interaction across program lines within a type of funding as well as across different types of funding. For example, The Sustainable Agriculture Research and Education (SARE) program is very interested in marketing so that producers are able to capture the additional value they create with environmentally friendly products.

The AMT portfolio includes three CSREES Problem Areas (PAs): Market Economics (PA 603), Marketing and Distribution Practices (PA 604), and Domestic Policy Analysis (PA 610).

Market Economics (PA 603) focuses on the understanding of markets, productivity, and interregional trade, and gives insight to the role and function of markets and their regulation, primarily from the macroeconomic (industry) perspective. Topics include: market performance; economics of processing, storage, and transportation; regulation and protection of markets;

marketing and pricing systems; institutions; local, regional, and national trade patterns; supply and demand; price analysis; and grades and standards.

Marketing and Distribution Practices (PA 604) concerns the distribution of products, goods, and services, the practices of buying and selling, and the development and improvement of markets primarily from the microeconomic (firm) perspective. Topics include: improvements in the marketing and distribution of products, goods, and services; development of domestic markets; direct marketing, alternative markets, and niche marketing; electronic commerce options for producers; group action, bargaining, and cooperatives; marketing orders; futures and options markets, cash and forward contracts, and other marketing and pricing arrangements; and effectiveness of alternative marketing structures. [Exclusions: (1) While most of the above could be applied to domestic and international markets, international market development, *per se*, is included in PA 606, Portfolio 1.2; (2) The focus is on marketing and not the broader business management function which is in PA 602, Portfolio 2.1.]

Domestic Policy Analysis (PA 610) provides an understanding of the effectiveness and the economic and social impacts of domestic programs and policies. Emphasis is on the long-term effects of government actions that influence the development and implementation of policies. Topics include: impacts and implications of macroeconomic policies; agricultural production, price, and income policy, including commodity programs; antitrust and market policy; consumer policy; natural resource policy; rural development policy; science, research, and education policy; and public policy education. [Exclusions: Foreign policy programs and analysis are included in PA 611, Portfolio 1.2.]

NPLs involved with the AMT portfolio often take a pragmatic, problem-solving approach to stakeholders' concerns and integrate across research, education and extension functions. Nevertheless, most of the CSREES funding lines and accountability systems segregate the three functions; hence, the following discussion of inputs is also segregated.

Much of the detailed data concerning funding and personnel committed to this portfolio are derived from the Current Research Information System (CRIS), which captures all research and most integrated (research-extension-teaching) projects/programs funded by CSREES. For the 5-year period 1998-2002, $76,005,000 (or $15,201,000 a year) was allocated to the three PAs in AMT.

Detailed data pertaining to extension and higher education cannot be easily apportioned to selected PAs and portfolios because they are not included in CRIS. Extension funding for this portfolio is estimated to be $22 to $31 million a year, depending on assumptions about the number of FTEs per state and cost per FTE. Higher Education funding is estimated to be about $1.5 million a year in agribusiness management and marketing. (Funding for public policy is not tracked for policy issues.)

An overview of CSREES funding lines for research, higher education, extension, and integrated activities is available at http://www.csrees.usda.gov/about/offices/budget.html, and will be included in the Evidentiary Materials.

Markets and Marketing (PA 603 and PA 604)

Overview

Markets and marketing refer to the macroeconomic and microeconomic aspects, respectively, of research, education, and extension activities related to the marketing systems for agricultural commodities and food and fiber products. The goal of CSREES programs in this area is to improve the performance of the marketing systems themselves and the success of individuals and firms who participate in the systems to deliver goods and services to consumers. Hence the emphasis is on: (1) increasing understanding and improving the decision making of individuals, firms, and policy makers and (2) training the next generation of decision makers.

CSREES NPLs collaborate with land-grant faculty and administrators to identify the needs of stakeholders and design appropriate research, education, and extension activities. Each state describes its process for acquiring stakeholder input in its Plans of Work. (An example of a Plan of Work is included in the Evidentiary Materials.) NPLs with responsibility for AMT have several venues for joint collaboration with land-grant partners and others, including seven multistate research committees (Table 1.1.1), two multistate extension marketing committees, and several professional organizations, such as the American Agricultural Economics Association.

Table 1.1.1 Multistate Projects with PA603 and PA604

PROJECT TITLE	PROJECT NUMBER	NUMBER OF PARTICIPANTS	
		SAES	OTHERS
Marketing and Delivery of Quality Cereals and Oilseeds	NC-213	14	ARS, ERS
Competitiveness and Value-Added in the U.S. Grain and Oilseed Industry	NC-224	14	ACS, ERS
Private Strategies, Public Policies and Food System Performance	NE-165	28	AMS, ERS, GIPSA, RBS, CDCP, GAO, FDA
Commodities, Consumers, and Communities: Local Food Systems in a Globalizing Environment	NE-185	16	Wallace Inst.
Technical and Economical Efficiencies of Producing, Marketing, and Managing Environmental Plants	S-290 (formerly S-103)	20	0
Fruit and Vegetable Supply-Chain Management, Innovations, and Competitiveness	S-222	17	ERS, NFAPP
Enhancing the Global Competitiveness of U.S. Red Meats	W-177	16	ARS, ERS

CSREES NPLs help to link other USDA agencies into these activities, thereby making their data, staff, and funds more available to land-grant universities. For example, (1) the Economic Research Service and the Grain Inspection Packers and Stockyards Administration participate in market structure and performance issues; (2) the Agricultural Marketing Service and the Rural Development – Business and Cooperatives Program participate in topics related to development of new marketing institutions and direct marketing; (3) the Foreign Agricultural Service participates in programs that enhance global marketing capability.

NPLs have the potential to work together within CSREES to make linkages among the Agency's programs so that the marketing work funded by competitive grants in the Markets and Trade sections of the NRI and SBIR, formula-funded grants to the states, several special grants, and other programs, such as Sustainable Agriculture Research and Education (SARE), support one another to accomplish Goal 1.

A search of the SARE database shows about 120-200 projects (10-15%) related to marketing in 1998-2002, depending on how broadly marketing is defined. Included in the marketing projects are a large number of small ($5,000-$10,000) producer grants, 30-40 research and education grants, and 15-25 professional development grants.

The CRIS system revealed an annual average of 384 Market Economics projects and 351 Marketing Practice projects during the period 1998-2002 (Table 1.1.2). Most of the projects were broader in scope than just marketing and supported other PAs in addition to 603 and 604.

Table 1.1.2 Number of CRIS Projects, PA 603 & 604, 1998-2002

PROBLEM AREA	1998	1999	2000	2001	2002	AVERAGE
603 Market Economics	399	411	395	375	338	384
604 Marketing Practices	296	331	365	378	386	351

Situation

"The food marketing system is an important part of the U.S. economy. In 2000, the food and fiber marketing system accounted for 7.7 percent of U.S. GDP and employed over 12 percent of the U.S. labor force. An increasing share of what consumers spend on food goes to marketing services added after the product leaves the farm. In 2000, over 80 percent of the U.S. food dollar went toward value-added services and materials — transportation, processing, distribution, labor, packaging, and energy." The system connects about 2 million farms, 22,000 food processing firms, 42,000 wholesale firms, 111,000 food retail firms, and 366,000 food service firms, with 250 million U.S. consumers. The system is partly responsible for the fact that US consumers spend only 10% of their disposable income on food (http://www.ers.usda.gov/publications/aer811/).

Inputs

CSREES funding for markets and marketing research and integrated programs was $57.6 million during the 1998-2002 period (Table 1.1.3), an average of $11.5 million a year. Hatch Act funds provided almost half of the funding for PA 603 Market Economics. PA 604 Marketing Practices received its funding through Hatch Act, special grants, and other grants.

Table 1.1.3 CSREES Funding by Category, PA 603 & 604, 1998-2002

PROGRAM AREA & SOURCE						
603 Market Economics	1998	1999	2000	2001	2002	TOTAL
Hatch	$2,168	$2,345	$2,308	$2,432	$2,067	$11,320
McIntire-Stennis	$150	$200	$148	$167	$154	$819
Evans Allen	$60	$113	$131	$134	$153	$591
Special Grants	$1,191	$714	$1,363	$1,746	$1,538	$6,552
NRI Grants	$478	$237	$220	$257	$33	$1,225
SBIR Grants	$0	$12	$0	$131	$99	$242
Other CSREES	$442	$123	$1,356	$540	$548	$3,009
SUBTOTAL	$4,489	$3,744	$5,526	$5,407	$4,592	$23,758
604 Marketing Practices	1998	1999	2000	2001	2002	TOTAL
Hatch	$1,398	$1,642	$1,657	$1,665	$1,675	$8,037
McIntire-Stennis	$85	$29	$43	$150	$132	$439
Evans Allen	$424	$508	$320	$365	$349	$1,966
Animal Health	$12	$0	$0	$0	$0	$12
Special Grants	$414	$2,022	$2,156	$2,682	$2,003	$9,277
NRI Grants	$314	$213	$577	$400	$191	$1,695
SBIR Grants	$404	$399	$314	$413	$537	$2,067
Other CSREES	$517	$1,926	$4,838	$2,552	$540	$10,373
SUBTOTAL	$3,568	$6,739	$9,905	$8,227	$5,427	$33,866
GRAND TOTALS	$8,057	$10,483	$15,431	$13,634	$10,019	$57,624

CSREES provided only 27 percent of the funding for these two PAs. State appropriations provided 46 percent. Other sources provided the remaining 27 percent. There were few noticeable trends in funding streams over the five-year period Table 1.1.4)

Table 1.1.4 CSREES and Other Funding, PA 603 & 604, 1998-2002

PROGRAM AREA & SOURCE						
603 Market Economics	1998	1999	2000	2001	2002	TOTAL
CSREES Funds	$4,518	$3,746	$5,526	$5,407	$4,594	$23,791
Other USDA	$1,282	$1,341	$1,588	$1,486	$1,230	$6,927
Other Federal	$1,148	$1,404	$849	$2,814	$3,401	$9,616
State Appropriations	$12,932	$13,359	$11,829	$10,444	$11,073	$59,637
Self-Generated	$362	$392	$373	$408	$352	$1,887
Ind/Gr Agreements	$1,507	$1,353	$1,725	$1,669	$1,558	$7,812
Other Non-Federal	$1,022	$1,269	$1,188	$1,171	$1,427	$6,077
SUBTOTAL	$22,771	$22,864	$23,078	$23,399	$23,635	$115,747
604 Marketing Practices	1998	1999	2000	2001	2002	TOTAL
CSREES Funds	$3,568	$6,739	$9,901	$8,227	$5,431	$33,866
Other USDA	$631	$976	$1,499	$1,483	$1,672	$6,261
Other Federal	$1,156	$1,340	$1,794	$776	$1,047	$6,113
State Appropriations	$7,192	$7,223	$8,447	$8,366	$8,271	$39,499
Self-Generated	$317	$174	$272	$302	$369	$1,434
Ind/Gr Agreements	$1,602	$1,286	$1,870	$1,884	$1,679	$8,321
Other Non-Federal	$1,026	$718	$617	$1,109	$1,030	$4,500
SUBTOTAL	$15,492	$18,456	$24,400	$22,147	$19,499	$99,994
GRAND TOTALS	$38,263	$41,320	$47,478	$45,546	$43,134	$215,741

The input of "Other Professional Years" for Marketing Practices (PA 604) increased over the period, while input of "Scientist Years" and "Other Professional Years" declined for Market Economics (PA 603) (Table 1.1.5).

Table 1.1.5 Scientist Years and Other Professional Years, PA 603 & 604, 1998-2002

PROBLEM AREA	PERSONNEL	1998	1999	2000	2001	2002	TOTAL
603 Market Economics	Scientist Years	100.4	102.2	87.2	88.8	82.1	460.7
	Other Prof Years	184.3	195.1	173.7	173.5	156.6	883.2
604 Marketing Practices	Scientist Years	61.4	59.9	59.8	67.1	66	314.2
	Other Prof Years	128.3	129.5	140.3	146.7	157.2	702.0
TOTALS	Scientist Years	161.8	162.1	147	155.9	148.1	774.9
	Other Prof Years	312.6	324.6	314	320.2	313.8	1585.2

The number of extension FTEs working in this area is estimated to be 200-300 (assuming an average of 4-6 campus, district and county faculty FTEs per state); the budget would likely be in the neighborhood of $15 to $23 million (based on average salary of $50,700 in 2000 http://www.csrees.usda.gov/about/human_res/report.html plus 50 percent for benefits and expenses). CSREES provides about 27 percent of the funding for Cooperative Extension, which is $4 million to $6 million a year.

Many of the projects in the marketing area have well-integrated research and outreach components because outreach is expected by Congress when it appropriates CSREES special research grants, which make up 27 percent of the funding for research in this area. Outreach is also encouraged in other research programs. Hence, Cooperative Extension funds are only a part of the broader outreach effort.

CSREES also operates a number of grant programs to improve resident instruction at land-grant and other universities. These grants were not included in CRIS in 1998-2002. From a total annual grant pool of about $22 million in CSREES' Higher Education Program, an estimated $1.5 million a year is in the area of economics, specifically in agribusiness management and marketing. The allocation of funds for each grant program is shown in Table 1.1.6. Challenge Grants, 1890 Capacity Building Grants, Hispanic Serving Institution Grants and Tribal College Grants are for proposals to enhance the curriculum content and means of delivery. The Challenge Grants program is open to all land grant institutions and other agricultural colleges, while the other three programs are directed toward the newer land-grant institutions. The

Multicultural Scholars and Graduate Fellowship Grants are for proposals designed to increase enrollment through undergraduate and graduate scholarships and fellowships, respectively.

Table 1.1.6 CSREES Higher Education Grants for Agribusiness Management & Marketing and All Grants, 1999-2002

AGRIBUSINESS & MARKETING GRANTS	1999	2000	2001	2002	TOTAL
1890 Capacity Building Grants Program	$629,736	$180,000	$815,844		$1,625,580
Challenge Grants Program	$455,785	$184,140	$182,754	$478,240	$1,300,919
Hispanic Serving Institutions	$298,690	$300,000	$413,252		$1,011,942
Tribal Colleges Research Grants Program				$112,014	$112,014
Multicultural Scholars Program			$125,000		$125,000
Graduate Fellowship Grant Program	$5,000	$966,000		$966,000	$1,937,000
SUBTOTAL	$1,389,211	$1,630,140	$1,536,850	$1,556,254	$6,112,455
ALL GRANTS	1999	2000	2001	2002	TOTAL
1890 Capacity Building Grants Program	$9,200,000	$9,200,000	$9,479,000	$9,479,000	$37,358,000
Challenge Grants Program	$4,350,000	$4,350,000	$4,340,000	$4,340,000	$17,380,000
Hispanic Serving Institutions	$2,850,000	$2,850,000	$3,492,000	$3,492,000	$12,684,000
Tribal Colleges Research Grants Program	$1,552,000	$1,552,000	$1,549,000	$1,549,000	$6,202,000
Multicultural Scholars Program	$1,000,000	$1,000,000	$998,000	$998,000	$3,996,000
Graduate Fellowship Grant Program	$3,000,000	$3,000,000	$2,993,000	$2,993,000	$11,986,000
CSREES TOTAL	$21,952,000	$21,952,000	$22,851,000	$22,851,000	$89,606,000

Outputs

A content analysis of a random sample of projects containing PA 603 and PA 604 (from 417 CRIS reports for 1998) showed work in the eight major areas (Table 1.1.7).

Table 1.1.7 Areas of Work in Markets and Marketing, PA 603 & 604, 1998

AREA OF WORK	NO. OF PROJECTS	PERCENT
Global competitiveness	9	21
Market performance	8	19
Policy analysis	7	17
Marketing strategies/marketing; alternatives/merchandising/value chain management	5	12
Feasibility of production-marketing alternatives	4	10
Consumer preferences/behavior	4	10
Financial performance of marketing firms	2	5
Other	3	7
TOTAL	42	100

While we did not run a comparable analysis of projects 10 and 20 years ago, we expect there has been a significant increase in the percentage of projects dealing with global competitiveness, market performance, and policy analysis.

Most projects in the sample have been completed; a few represent renewable, long-term research efforts. The outputs include a large number of professional and popular publications and presentations. Some projects reported M.S. theses and Ph.D. dissertations. Some reported a variety of workshops and consulting activities.

The work in markets and marketing expanded our knowledge in the above areas and gave public and private decision makers better information upon which to make decisions. All projects documented new knowledge gained from research. Some reports provided useful "Impact" statements; however, they did not report actual benefits to clientele. A few results are highlighted below.

Global Competitiveness

Imports of Mexican vegetables had mixed impacts on Texas market prices, but no consistent long-term negative impacts detected (Rosson, TX).

Through the use of advanced technology and business alliances, integration through information achieves benefits similar to those expected through financial ownership integration (Sonka, IL).

Market Performance

Price spreads are primarily influenced by changes in demand and supply, hence much of the concern about market power is misplaced (Wohlgenant, NC).

Research developed new techniques to estimate game theoretic and dynamic models of oligopoly (Perloff, CA).

Policy Analysis

The impact of preferential property taxes on land use in Georgia has helped clarify the choices on how property should be taxed (Newman, GA).

The theoretical derivation of the comparative statics properties of economic models was greatly simplified to improve policy analyses by other researchers (Caputo, CA).

Marketing Strategies

Elevators could benefit from closer grading and segregating practices and passing on to producers 70% of price differentials (Adam, OK).

Modeling of complete supply chains for pork and soybeans have enabled simulations and visualization techniques for complex data which enhances our outreach with industry groups (Westgren, IL).

Feasibility

Results help cow-calf operators assess the profitability of retaining ownership of their calves and purchasing calves for backgrounding and subsequent feeding (McLemore, TN).

Outcomes

Information about how clientele benefit from our programs is more difficult to ascertain because CSREES seldom requires the recipients of funding to determine and report outcomes in the CRIS database. Also, benefits often lag research reports by months and years. The following are some examples of outcomes (clientele acquisition of new knowledge, behavior changes, and receipt of economic and other benefits) from other sources of information.

Impacts are required for projects funded through the Initiative for Future Agriculture and Food Systems (IFAFS). The following are some marketing examples:

Enhancement and Implementation of a Master Marketer Educational System (Amosson, TX). Eighteen Master Marketer trainings have been held with 621 producers graduating, 144 marketing clubs have been assisted with an estimated membership of 2,281, and 53 ATS courses have been conducted with total attendance of 1,452. These numbers are within or exceed original project estimates. Producers reported in a 2-year post-Master Marketer training survey that they increased their returns $21,337 per year based on what they had learned. This results in an annual increase in returns of more than $21 million for all 621 graduates. In a similar survey, marketing club members reported an average increase of $13,731 per year or a total of $31 million per year.

Understanding, Evaluating and Improving Direct Marketing Systems of Small Farms (Carkner, WA). The Rapid Market Assessment technique pioneered by the IFAFS project has been adopted and adapted throughout the country as a tool for enhancing vendor sales and community economic benefits through improvements in the management of farmers markets. Through 20 participatory assessments at markets and 12 manager and board training sessions, this project has trained more than 150 people with the following results:

Quantified consumer willingness to pay for local agricultural products.
Demonstrated the financial impact of customers' weekly purchases at downtown retailers, improving market relationships with business associations.
Learned customer preferences, resulting in more diversified vendor bases (meat, poultry, value-added, etc.), higher customer sales and healthier competition.
Caused markets to switch from traditional advertising to word-of-mouth focus, including special events, children's programs and email database development.
One Seattle-area promotional budget of $45,000 was redirected to reflect the broad trade area while building a local "feel" through participation of community groups.
Markets are replicating the research to continue learning about their customer base, make physical and operational changes, shift budget priorities, etc.
One association has conducted 31 similar studies on its own in three years.

Economic Performance of Market Advisory Services (Irwin, IL). The AgMAS Project has had a positive impact on the way grain is marketed in the United States through the stimulation of new and innovative marketing contracts. Specifically, the findings have been used as the empirical foundation for a new generation of pricing contracts offered to producers by the grain industry. Firms such as Diversified Services, Cargill and e-markets have developed new contracts that simply assure that producers receive the average price for grain over some pre-specified time period. The use of these new-generation marketing contracts appears to be growing rapidly.

The CSREES/Land-Grant Science and Education Impact database http://www.csrees.usda.gov/newsroom/impacts/impacts.html contains reports from across the Nation. Here are a few marketing examples:

- **Kentucky** Extension helped Mennonite and Amish farmers establish the Fairview Produce Auction in 1997, which reaped more than $100,000 in sales its first year and had sales totaling more than $650,000 in 2001.
- **Florida A&M** connected small fruit and vegetable growers to new markets. As a result, Florida's small farmers now provide more than 60,000 pounds of fresh produce to 20 school districts in Florida, Georgia, Alabama, Mississippi and Arkansas.
- **Arkansas** helped create an international trade assistance program for small businesses. Since 1993, more than 90 Arkansas firms received assistance from the program to market everything from gourmet foods to agricultural equipment to skin care products.
- **North Carolina A&T** helped one North Carolina grain processor connect with international trading companies, which resulted in an initial order for 43,200 pounds of corn meal and 43,200 pounds of flour.

- **Purdue's** marketing club network enabled 72 Indiana farmers to improve their combined income by $500,000 annually. A participating farmer said he used new marketing tools to increase his sales by $150,000 in two years.

Domestic Policy Analysis (PA 610)

Overview

Domestic policy analysis refers to a number of research, education and extension programs that help people understand the public policy process and evaluate the impact of current and alternative public policies. The full range of domestic policy issues are covered, including general economic policy, agricultural policy, natural resource and environmental policy, and rural development policy.

The goal of CSREES programs in this area is to improve the policy decision making capacity of individual citizens, organizations, legislators, and others; and to train the next generation of decision makers.

CSREES NPLs collaborate with land-grant faculty and administrators to identify the needs of stakeholders and design appropriate research, education, and extension activities. Each state describes its process for acquiring stakeholder input in its Plans of Work. (An example of a Plan of Work is included in the Evidentiary Materials.) NPLs with responsibility for AMT have several venues for joint collaboration with land-grant partners, including four multistate research committees (Table 1.1.8), four multistate extension marketing committees, the annual National Public Policy Education Conference, and several professional organizations, such as the American Agricultural Economics Association, and the Joint Council of Extension Professionals (e.g. annual Public Issues Leadership Development Conference).

Table 1.1.8 Multistate Projects with PA 610, 2002

PROJECT TITLE	PROJECT NUMBER	NUMBER OF PARTICIPANTS	
		SAES	OTHERS
Financing Agriculture & Rural America: Issues of Policy, Structure & Technical Change	NC-221	15 15	ERS Federal Reserve Bank
Rural Restructuring: Causes and Consequences of Globalized Agricultural and Natural Resource Systems	S-276	13	
Impacts of Trade Agreements and Economic Policies on Southern Agriculture	S-287 (formerly S-256)	13	
Benefits and Costs of Resource Policies Affecting Public and Private Land	W-133	24	

CSREES NPLs help to link other USDA agencies into these activities, thereby making their data, staff, and funds more available to land-grant universities. For example, the Economic Research Service and the Grain Inspection Packers and Stockyards Administration participate in market structure and performance policy issues; the Farm Service Agency participates in agricultural policy issues.

NPLs have the potential to work together within CSREES to make linkages among the Agency's programs so that policy work funded by block grants to the states, competitive grants in the Markets and Trade sections of the NRI, several special grants (including the Food and Agricultural Policy Research Institute and the Rural Policy Research Institute), and other programs support one another.

From 1998 to 2002, there was a major increase in the number of projects involving Domestic Policy Analysis (Table 1.1.9). Most of the projects were broader in scope than just policy analysis and supported other PAs in addition to 610.

Table 1.1.9 Number of CRIS Projects, PA 610, 1998-2002

PROBLEM AREA	1998	1999	2000	2001	2002	AVERAGE
610 Domestic Policy Analysis	148	176	198	201	227	190

Local, state, and national legislators make important policy decisions every day that have an impact on almost every aspect of human life. Various laws, regulations, and other policy instruments affecting natural resources and the environment, agriculture, rural development, the economy, health and education affect the decisions of everyone in society. Tax policies at the local, state, and federal levels, for example, have an impact on individual, family, business, and community economic decisions. A vibrant democratic society depends upon an informed citizenry to be involved in the policy development process. Therefore, it is important that the impact of current policies and alternative policies be understood. Such understanding requires a combination of research, education and extension activities.

Inputs

CSREES funding for Domestic Policy Analysis (PA 610) research and integrated programs was $18.4 million during the 1998-2002 period (Table 1.1.10), an average of $3.7 million a year. Special Grants provided a little over 40 percent of the funding; Hatch Act funds provided almost 30 percent. A variety of other funding streams made up the balance.

Table 1.1.10 CSREES Funding by Category, PA610, 1998-2002

610 DOMESTIC POLICY ANALYSIS	1998	1999	2000	2001	2002	TOTAL
Hatch	$903	$828	$1,016	$1,131	$1,561	$5,439
Mc-Stennis	$58	$73	$104	$132	$198	$565
Evans Allen	$80	$119	$121	$131	$47	$498
Special Grants	$2,017	$1,761	$1,766	$848	$1,214	$7,606
NRI Grants	$349	$338	$427	$211	$217	$1,542
Other CSREES	$715	$358	$198	$571	$862	$2,704
TOTAL	$4,122	$3,477	$3,632	$3,024	$4,099	$18,354

For all of the projects recorded in CRIS, CSREES provided only 27 percent of the funding for PA 610. State appropriations provided 41 percent. Other sources provided the remaining 32 percent (Table 1.1.11).

Table 1.1.11 CSREES and Other Funding, PA 610, 1998-2002

610 DOMESTIC POLICY ANALYSIS	1998	1999	2000	2001	2002	TOTAL
CSREES Funds	$4,122	$3,477	$3,632	$3,024	$4,099	$18,354
Other USDA	$458	$528	$1,157	$767	$1,501	$4,411
Other Federal	$1,315	$1,287	$1,329	$881	$1,345	$6,157
State Appropriations	$3,911	$4,639	$6,114	$6,159	$7,424	$28,247
Self-Generated	$140	$328	$312	$415	$306	$1,501
Ind/Gr Agreements	$372	$447	$1,589	$1,038	$787	$4,233
Other Non-Federal	$703	$1,352	$1,129	$1,098	$971	$5,253
TOTAL	$11,021	$12,058	$15,262	$13,382	$16,433	$68,156

Along with the increase in the number of projects that included policy analysis, there was a major increase in the number of person-years allocated to this kind of work. Both Scientist Years and Other Professional Years almost tripled from 1998 to 2002 (Table 1.1.12).

Table 1.1.12 Scientist Years and Other Professional Years, PA 610, 1998-2002

PROBLEM AREA	PERSONNEL	1998	1999	2000	2001	2002	TOTAL
610 Domestic Policy Analysis	Scientist Years	34.3	39.8	45.6	45.6	53.0	218.3
	Other Prof Years	108.9	123.3	130.2	124.0	169.3	655.7

The number of Extension FTEs in public policy is estimated to be 50-100 (assuming1-2 campus, district, and county faculty FTEs per state); the annual budget would be in the neighborhood of $4 to $8 million (based on average salary of $50,700 in 2000 http://www.csrees.usda.gov/about/human_res/report.html plus 50 percent for benefits and expenses). Typically, CSREES provides 27 percent of the funding, which would be $1 to $2 million.

Many of the projects in the policy analysis area have well-integrated research and outreach components because outreach is expected by Congress when it appropriates CSREES special research grants, which make up 40 percent of the funding for research in

this area. Cooperative Extension funds are only a small part of the broader outreach effort.

CSREES also operates a number of grant programs to improve resident instruction at land-grant universities. These grants were not included in CRIS in 1998-2002. From a total annual grant pool of about $22 million, an estimated $1.5 million a year is in the area of economics, specifically in agribusiness management and marketing; however, few of these grants are believed to have targeted policy analysis, per se.

Outputs

A content analysis of a random sample of projects containing PA 610 (from 148 CRIS reports for 1998) showed work in the five major areas (Table 1.1.13).

Table 1.1.13 Areas of Work in Domestic Policy Analysis (PA 610), 1998

AREA OF WORK	NO. OF PROJECTS	PERCENT
Environmental Policy	6	29
Rural Development Policy	5	24
Farming-Related Agricultural Policy	5	24
Food Policy	3	14
Trade Policy	1	5
Other	1	5
TOTAL	21	100

While we did not run a comparable analysis of projects 10 and 20 years ago, we expect there has been a significant increase in the percentage of projects dealing with environmental policy and rural development policy.

Most projects in the sample have been completed on time; a few represent ongoing long-term research efforts. The outputs include a large number of professional and popular publications and presentations. Many include presentations are to state and federal legislators, and to farm and other interest groups. Some projects reported M.S. theses and Ph.D. dissertations. Included in the sample was the work of three participants (University of Arkansas, Texas A & M University and Cornell University) in the Food and Agriculture Policy Research Institute (FAPRI), which does complex economic modeling of the domestic and global agricultural economy.

The research work in domestic policy analysis expanded our knowledge in the above areas and gave public and private decision makers better information upon which to make decisions. Only some of the reports provided useful "Impact" statements; however, they all referred to new knowledge gained from research. Some speculated on benefits to clientele. The following are a few highlights:

Environmental Policy

This study will help policymakers compare the efficiency of chemical fertilizer-use taxes and three commonly suggested conservation programs for reducing nitrate pollution in the Upper Mississippi River Basin and the Gulf of Mexico (Wu, OR).

The biotechnology analysis will help analyze federal regulatory policy for its ability to manage potential environmental risks from such technologies. This information has been requested and used in several national policy discussions on how to best manage and regulate biotechnology (Batie, MI)

This study is being used by TVA for evaluating reservoir water management and is expected to be cited in the documentation for the final decision (Jakus, UT).

Rural Development Policy

This study enables state level policy makers to evaluate the economic impact of a change in tax rates in terms of changes in the level of economic welfare and the distribution of household income. The study is being used by a state committee considering proposed changes in the Oregon Tax Code (Holland, OR).

The results point to ways that federal agencies can encourage the incorporation of expertise to achieve better public policy outcomes relevant to economic development programs (Foster, RI).

Farming-Related Agricultural Policy

Research derived from the dairy subsector model was the basis for some of USDA's federal milk marketing order reform package and an important vehicle for explaining provisions and impacts to the dairy industry (Novakovic, NY).

This research identifies to whom the economic benefits associated with federal farm income transfer accrue, considering both farm and non-farm sectors, urban and rural places, and household income classes (Leatherman, KS).

More restrictive payment limitations and counting marketing loan gains against the loan deficiency payment limitations would affect cotton and rice farmers more adversely than feedgrain, oilseed, and wheat producers (Richardson, TX)

Food Policy

A number of studies on segments of the food industry show the impact of market share and market power on prices (Cotterill, CT).

Outcomes

Information about how clientele benefit from our programs is more difficult to ascertain because CSREES seldom requires the recipients of funding to determine and report outcomes in the CRIS database. The following are some examples of outcomes (clientele acquisition of new knowledge, behavior changes, and receipt of economic and other benefits) from other sources of information.

The Food and Agricultural Policy Research Institute (FAPRI) involves six universities in complex modeling of the global agricultural economy. FAPRI is funded by CSREES by special research grants appropriated by Congress and is often called upon by Congressional committees as they formulate changes in agricultural and trade policy. The research is also made available to producers and others, many of whom are active in the policymaking process.

Cotterill's work at the University of Connecticut has had a major impact on policy decisions concerning agricultural commodity markets, proposed supermarket acquisitions, and other market structure and performance issues.

Analysis

A discussion of the relevance, quality, and performance of all the three problem areas (PA 603, 604, & 610) of Portfolio 1.1 is combined with the two problem areas (PA 606 & 611) of Portfolio 1.2 in a separate section called Analysis of Portfolios 1.1 & 1.2.

INTERNATIONAL ECONOMIC DEVELOPMENT – PORTFOLIO 1.2

General Overview

In an era of expanding global trade, increased interest in international relationships, and increased concern about terrorism, there are many challenges and opportunities for research, education and extension by CSREES and its partners. The International Economic Development (IED) portfolio focuses on the economies of other nations (both developed and developing) and the interaction between those economies and the U.S. economy. International trade is a major area of interest, as is economic development and development assistance programs.

In today's increasingly global society, CSREES and its cooperating colleges and universities play a major role in preparing U.S. citizens to work and succeed in a rapidly changing world. We produce graduates and citizens with knowledge of foreign languages and cultures and the ability to comprehend complex global issues. University scientists conduct research on international problems and bring beneficial information and technologies back home. Extension personnel with international competencies help our local communities work more effectively with new immigrant populations, as well as identify opportunities for clientele in a global economy. CSREES' International Programs (IP) office is working with universities to find ways of engaging students, faculty, and staff in the world outside our borders.

CSREES' leadership is primarily the responsibility of National Program Leaders (NPLs) working in consultation with the Agency's partners (institutions of higher education and federal agencies) to meet the needs of stakeholders (Congress, commodity organizations, interest groups, and others). CSREES does not conduct research, education, and extension activities; instead it seeks partners, such as land-grant universities, to carry out these functions at the local, state, national, and international level.

CSREES utilizes a diversity of authorizations and funding mechanisms to accomplish the goals of the IED portfolio. Such a diversity of funding promotes a variety of approaches that often meet the unique requirements of the Agency's diverse population of stakeholders. Competitive Grants are made through the National Research Initiative, Higher Education, 1994 Institutional Research and Extension, and Integrated Programs. Formula fund grants to land-grant universities, authorized by the Hatch Act, Smith-Lever Act, Evans-Allen Act (1890), and Cooperative Forestry Research Act (McIntire-Stennis Act), provide land-grant institutions an ongoing annual stream of funding and a high degree of flexibility and autonomy. Special Research Grants are appropriated by Congress to accomplish site-specific projects. "Pass-through" funds from other government agencies, such as the international development assistance funds from USAID, are awarded on a competitive basis for specific purposes. Where appropriate,

NPLs encourage integration across program lines within a given type of funding, as well as across types of funding.

The IED portfolio includes two CSREES Problem Areas (PAs): International Trade and Development Economics (PA 606) and Foreign Policy and Programs (PA 611).

International Trade and Development Economics (PA 606) focuses on the economics of international trade and development, trade performance in sectors of the U.S. and other economies, globalization, barriers to trade, and trade and development impacts. There is a strong focus on the global market economy, specifically the interaction between domestic and international markets. Topics include: balance of trade/payments; comparative/absolute advantage; international economic growth; global and international commodity analysis and projections; country, regional, and sector analysis; and international market development for U.S. products.

Foreign Policy and Programs (PA 611) focuses on U.S foreign policy goals; U.S. and foreign trade policy; the effectiveness and impacts of implemented policies; the interactions between foreign and domestic policies; global implications of policies; effects of policy on foreign market development; foreign assistance policy, projects, and impacts.

NPLs involved with the IED portfolio often take a pragmatic, problem-solving approach to stakeholders' concerns and integrate across research, education and extension functions. Nevertheless, most of the CSREES funding lines and its accountability systems segregate the three functions; hence, the following discussion of inputs is also segregated.

Much of the detailed data concerning funding and personnel committed to this portfolio are derived from the Current Research Information System (CRIS), which captures all research and most integrated (research-extension-teaching) projects/programs funded by CSREES. For the 5-year period 1998-2002, $19.5 million (or $3.9 million a year) was allocated to the two PAs in IED, placing them among the smallest problems areas in CSREES.

Detailed data pertaining to extension and higher education cannot be easily apportioned to selected PAs and portfolios because they are not included in CRIS. The total CSREES budget for research, higher education, extension, and integrated activities is available at http://www.csrees.usda.gov/about/offices/budget.html, and will be included in the Evidentiary Materials.

International Trade and Development Economics (PA 606)

Overview

The goals of CSREES programs in international trade and development are to increase the general welfare of people in the United States and other countries through improvements in trade and increased economic development. Such goals are achieved by: (1) increasing understanding and improving the decision making ability of individuals, firms, and policy makers and (2) training the next generation of decision makers.

CSREES NPLs collaborate with land-grant faculty and administrators to identify the needs of domestic and international stakeholders and design appropriate research, education, and extension activities. Each state describes its process for acquiring stakeholder input in its Plans of Work. (An example of a Plan of Work is included in the Evidentiary Materials.) CSREES NPLs help to link other USDA agencies into these activities, thereby making their data, staff, and funds more available to land-grant universities.

CRIS system data show an annual average of 240 projects involving international trade and development economics during the period 1998-2002 (Table 1.2.1). Most of the projects were included other PAs in addition to 606, demonstrating a broader scope of activity.

Table 1.2.1 Number of CRIS Projects, PA 606, 1998-2002

PROBLEM AREA	1998	1999	2000	2001	2002	AVERAGE
606 International Trade and Development Economic	252	253	249	237	207	240

Situation

The U.S. economy is becoming increasingly dependent on trade as exports and imports become an increasingly larger portion of the Nations' GDP. Agriculture is particularly dependent upon trade. In the case of grains, such as wheat, about half of the crop is exported. American consumers also enjoy a year-around supply of fresh fruits and vegetables from around the globe. In fact the United States is the world's largest food exporter and importer. Increased knowledge and understanding of trade is vital to our economic prosperity and well being. Economic development in other nations is closely related to international trade, because as other countries develop their economies, they become better customers for our good and services.

Inputs

CSREES funding for research and integrated programs in international trade and development economics was $15.4 million during the 1998-2002 period (Table 1.2.2), an average of $3.1 million a year. Hatch Act funds provided about 40 percent of the funding

and special grants, 28 percent. The remaining 32 percent came from several other sources.

Table 1.2.2 CSREES Funding by Category, PA 606, 1998-2002

PROGRAM AREA & SOURCE						
606 International Trade and Development Economics	1998	1999	2000	2001	2002	TOTAL
Hatch	$1,418	$1,011	$1,213	$1,261	$1,148	$6,051
Mc-Stennis	$30	$28	$37	$63	$77	$235
Evans Allen	$57	$90	$108	$186	$201	$642
Animal Health	$0	$8	$0	$0	$0	$8
Special Grants	$422	$977	$1,452	$1,037	$440	$4,328
NRI Grants	$439	$334	$465	$453	$233	$1,924
SBIR Grants	$0	$0	$240	$28	$0	$268
Other CSREES	$0	$404	$353	$1,131	$48	$1,936
TOTAL	$2,366	$2,852	$3,868	$4,159	$2,147	$15,392

For all of the projects recorded in CRIS, CSREES provided only 19 percent of the funding (Table 3); state appropriations provided 46 percent (Table 1.2.3).

Table 1.2.3 CSREES and Other Funding, PA 606, 1998-2002

PROGRAM AREA & SOURCE						
606 International Trade and Development Economics	1998	1999	2000	2001	2002	TOTAL
CSREES Funds	$2,371	$2,850	$3,865	$4,156	$2,151	$15,393
Other USDA	$1,136	$1,197	$758	$1,890	$1,330	$6,311
Other Federal	$3,164	$3,696	$3,229	$1,705	$1,488	$13,282
State Appropriations	$7,933	$7,670	$7,481	$7,058	$6,471	$36,613
Self-Generated	$219	$114	$166	$286	$146	$931
Ind/Grant Agreements	$723	$578	$1,301	$1,249	$960	$4,811
Other Non-Federal	$484	$534	$803	$460	$679	$2,960
TOTAL	$16,030	$16,639	$17,603	$16,804	$13,225	$80,301

Over the five-year period, there was a major increase in Other Professional Years and a slight increase in Scientist Years (Table 1.2.4).

Table 1.2.4 Scientist Years and Other Professional Years, PA 606, 1998-2002

PROBLEM AREA	PERSONNEL	1998	1999	2000	2001	2002	TOTAL
606 International Trade & Development	Scientist Years	58.6	48.6	28.5	40.7	71.5	247.9
	Other Prof Years	134.4	110.9	67.6	85.2	184.2	582.3

Outputs

A content analysis of a random sample of 21 projects containing PA 606 (from 147 CRIS reports for 1999) showed work in the four major areas (Table1.2. 5).

Table 1.2.5 Areas of International Trade and Development Economics, PA 606, 1999

AREA OF WORK	NO. OF PROJECTS	PERCENT
Global competitiveness, of which:	8	43
Among multiple countries	2	
U.S. vs. other countries	6	
Global supply & demand models	2	10
Policy & trade agreement/block analyses	3	10
Improved U.S. production technologies	6	29
Other	2	10
TOTAL	21	100

Changing global competitiveness among countries accounted for almost half of the projects. Most were concerned with changes in U.S. competitiveness for agricultural and forest products and in ways to improve it. Others were interested in changing patterns of competitiveness among countries. The supply and demand models examined several factors affecting the supply and demand for forest products. The policy projects examined the economic impact of environmental regulations, multilateral trade agreements, trading blocks, and domestic policy on trade. Almost 30 percent of the projects involved production scientists seeking new production technologies that would make U.S. producers more efficient and hence more competitive in world markets; they contained no economic content, per se. The two other projects were nonperforming Hatch-funded research that did not deliver any research.

The 147 projects addressing PA 606 also included other PAs, especially Marketing and Distribution Practices (PA 604), Domestic Policy Analysis (PA 610), Foreign Policy and Programs (PA611). Most of this integration is due to the close relationships among these PAs, but some seems to be caused by confusion over the definitions. The six projects involving improved production technologies, for example, should not have included PA 606 as one of the codes because they did not include any economics.

Except for the two "Other" projects, projects in the sample have been successfully completed; a few represent ongoing long-term research efforts. The outputs include a large number of professional and popular publications and presentations. Some projects reported M.S. theses and Ph.D. dissertations. Some reported a variety of workshops and consulting activities.

The work in international trade and development economics expanded our knowledge in the above areas and gave public and private decision makers better information upon which to make decisions. While some of the reports provided useful "Impact" statements, they did not go so far as to report benefits to clientele. The following are a few highlights from the Impact statements.

Global Competitiveness

Using data from several countries, this research has expanded our knowledge of linkages between production agriculture and food processing segments of the agricultural sector, particularly how each segment benefits from productivity changes in the other. The results are important to policy makers as they consider protection versus productivity investments (Gopinath, OR).

International competitiveness was assessed in major competing countries, and Canada has become the most likely competitor to increase world pork market share, followed by the United States (Hayenga, IA).

This research advances the competitiveness of agricultural and forest exports from Washington State by defining target markets more precisely, solving technical impediments to exports, and developing new products and processes (Wahl, WA).

Global Supply and Demand

The methods developed in this study have been used by the U.S. Government to predict the impact of eliminating tariffs for forest product imports; the model has come to the attention of the UN-ECE timber commission which has expressed interest in using it in the next European Timber Trends study (Buongiorno, WI).

Policy Analyses

Through this research the impacts on competitiveness, trade flows, producer incomes, and consumer welfare stemming from changes in domestic, regional, and multilateral agricultural policies were identified (Kennedy, LA).

The removal of Canadian tariffs on sheep and lambs was shown to result in small increases in U.S. exports of sheep to Mexico and lambs to Canada; different assumptions regarding environmental policies in the three countries had little effect on trade or price outcomes (Lindsey, OR).

Outcomes

CSREES does not have much outcome information about PA 606. Information about how clientele benefit from our programs is more difficult to ascertain because CSREES seldom requires the recipients of funding to determine and report outcomes in the CRIS database.

Foreign Policy and Programs (PA 611)

Foreign Policy and Programs (PA 611) has two distinct parts: (1) policy analysis and (2) development assistance programs. CSREES' work in these two areas will be discussed separately in the following two subsections.

Policy Analysis

Overview

Foreign or international policy analysis refers to a number of research, education and extension programs that help people understand the impact of a variety of policy options. The full range of policy issues are covered, including foreign policy, trade policy, inter-country comparisons of many kinds of domestic and foreign polices.

The goal of CSREES programs in this area is to improve the policy decision making capacity of individual citizens, organizations, legislators, and nations; and to train the next generation of decision makers.

CSREES NPLs collaborate with land-grant faculty and administrators to identify the needs of stakeholders and design appropriate research, education, and extension activities. Each state describes its process for acquiring stakeholder input in its Plans of Work. (An example of a Plan of Work is included in the Evidentiary Materials.) NPLs with responsibility for IED have several venues for joint collaboration with land-grant partners, including the annual National Public Policy Education Conference, several domestic and international professional organizations, such as the American Agricultural Economics Association and the International Agricultural Economics Association, and international bodies, such as the Organization for Economic Cooperation and Development (OECD).

CSREES NPLs help to link USDA and other federal agencies into these activities, thereby making their data, staff, and funds more available to land-grant universities. Examples include the Economic Research Service (ERS) and the Foreign Agricultural Service (FAS), and US Agency for International Development (USAID).

NPLs have the potential to work together within CSREES to make linkages among the Agency's programs so that policy work funded by formula funds to the states, competitive grants in the Markets and Trade sections of the NRI, special grants, and other programs support one another.

From 1998 to 2002, there was a major increase in the number of projects involving Domestic Policy Analysis (Table 1.2.6). Most of the projects were broader in scope than just policy analysis and supported other PAs in addition to 610.

Table 1.2.6 Number of CRIS Projects, PA 611, 1998-2002

PROBLEM AREA	1998	1999	2000	2001	2002	AVERAGE
611 FOREIGN POLICY AND PROGRAMS	53	67	72	64	74	66

Situation

Continual changes in trade relationships governed by multilateral trade agreements, bi-lateral agreements, and regional trading block agreements, as well as changes in domestic policies of the United States and other countries, have a significant impact the well-being of U.S. citizens. Research, education and extension programs are needed to help private and public decision makers and the general public understand these changes, understand the impact of current policies and alternative policies, and to make appropriate decisions for themselves and the Nation. A vibrant democratic society depends upon an informed citizenry to be involved in the policy development process.

Inputs

CSREES funding for Foreign Policy (PA 611) research and integrated programs was $4.2 million during the 1998-2002 period (Table 1.2.7), an average of $0.8 million a year. Special grants were the dominant funding category, providing almost half of the money. Hatch Act funds provided 20 percent. A variety of other funding streams made up the balance.

Table 1.2.7 CSREES Funding by Category, PA 611, 1998-2002

PROGRAM AREA & SOURCE						
611 FOREIGN POLICY & PROGRAMS	1998	1999	2000	2001	2002	TOTAL
Hatch	$153	$171	$172	$206	$139	$841
Mc-Stennis	$0	$0	$3	$3	$4	$10
Special Grants	$264	$437	$486	$229	$490	$1,906
NRI Grants	$79	$165	$300	$181	$48	$773
Other CSREES	$136	$132	$132	$0	$224	$624
TOTAL	$632	$905	$1,093	$619	$905	$4,154

For all of the PA 611 projects recorded in CRIS, CSREES provided only nine percent of the funding, and state appropriations provided only 15 percent. Other federal agencies (non-USDA) provided 55 percent (Table 1.2.8).

Table 1.2.8 CSREES and Other Funding, PA611, 1998-2002

PROGRAM AREA & SOURCE						
611 FOREIGN POLICY & PROGRAMS	1998	1999	2000	2001	2002	TOTAL
CSREES Funds	$632	$909	$1,094	$617	$905	$4,157
Other USDA	$911	$1,269	$318	$133	$242	$2,873
Other Federal	$5,006	$5,077	$6,446	$4,511	$3,679	$24,719
State Appropriations	$1,708	$1,226	$1,133	$1,218	$1,317	$6,602
Self-Generated	$188	$101	$127	$86	$33	$535
Ind/Gr Agreements	$673	$620	$884	$845	$454	$3,476
Other Non-Federal	$1,061	$579	$269	$167	$538	$2,614
TOTAL	$10,179	$9,781	$10,271	$7,577	$7,168	$44,976

Since 1999, there has been little change in funding levels or in Scientist Years and Other Professional Years associated with PA 611, except for a major increase in Other Professional Years in 2002 (Table 1.2. 9).

Table 1.2.9 Scientist Years and Other Professional Years, PA 611, 1998-2002

PROBLEM AREA	PERSONNEL	1998	1999	2000	2001	2002	TOTAL
611 FOREIGN POLICY & PROGRAMS	Scientist Years	1.0	14.1	13.6	11.6	19	59.3
	Other Prof Years	8.7	63.7	61.5	63.4	100.8	298.1

Outputs

There was a relatively small number of projects with PA 611 in the 1998-2002 period; 14 of them (33 percent) also included PA 610 (Domestic Policy Analysis), demonstrating the close relationship between domestic and international policy. Although a strict random sampling process was used to choose the sample of ten projects, there could be some bias in the sample. Forty percent of the selected sample involved complex modeling efforts: two by the Food and Agricultural Policy Research Institute (FAPRI), and two by the Center for Agricultural and Rural Development (CARD). These projects focused on a wide range of domestic policy options and trade agreement options to make production and price forecasts. Other projects were one of a kind that examined the effect of policy on international competitiveness, and on the development of financial markets in developing countries; investments in productivity as an alternative to

protection policies; the impact of campaign contributions in gaining nontariff trade barriers; the benefits of faculty overseas assignments.

Outcomes

The economic analyses by FAPRI and CARD have considerable influence on the public policy making process. Their thorough and objective analyses are relied upon by legislators and private interests in the United States and abroad.

Development Assistance Programs

Overview and Situation

America's commitment to economic development and humanitarian assistance overseas was brought into sharp focus by the tragedy of September 11, 2001. While international diplomacy and foreign assistance have always been tools for engaging other countries, suddenly they have become critically important. Finding areas of mutual interest, understanding other cultures, and helping where we can – these have all taken on new meaning and significance.

In many developing countries around the world, socio-economic trends are largely pegged to the performance of the country's agricultural sector. Hence, it is not surprising that USDA is increasingly called upon to be involved in efforts to help stabilize at risk situations overseas and build alliances. The USDA is taking a greater interest in strengthening the production, processing and marketing skills in the developing world as a way to raise incomes, promote trade, and reduce instabilities. Such efforts help to move developing countries from recipients of foreign aid to potential customers for U.S. exports and active trading partners.

CSREES is participating in the USDA effort by tapping the tremendous human resources of its university partners to make a positive difference abroad and at home. During 1998-2002, projects were conducted in the Newly Independent States, Central America, the Caribbean, West Africa and South Africa.

Inputs

For the period 1998-2002, USAID and the State Department provided $38,104,960 for CSREES programs in the following countries. See Table 1.2.10 for a summary of programs and funding by country.

Table 1.2.10. Inputs: An overview of CSREES programs with funding from USAID and the State Department, FY1998-2002

COUNTRY	OBJECTIVES	ACTIVITIES	FUNDING
Honduras, El Salvador	Rehabilitate rural watersheds	Provided training to shrimp farmers	$500,000
Nicaragua, Guatemala	Reduce agricultural health risks:	Participatory assessments and training	$525,000
	(animal and plant health, food safety)	Sanitation improvement training	$543,000
Dominican Republic	Cocoa Production	Field-based technical assistance	75,000
	Coffee forests		
	Livestock Rehabilitation		
	Support for small sugarcane growers		
	Rural agribusiness center improvements		
	Agroforestry rehabilitation		
Nigeria	Capacity building	Multiple training workshops	$176,073
	Technical training	Development of reference materials	
	Post-harvest handling	Procurement of training aids & materials	
	Agribusiness development	Surveys and training evaluations	
	Cooperative planning & development		
Ghana	Post-harvest handling	Multiple training workshops	$200,000
	Value-added processing	Development of reference materials	
	Export marketing	Surveys and training evaluations	
	Agribusiness development		
South Africa	Engage underserved populations	Extension system reform	$590,155
	Institutional change	Agribusiness development	
	Capacity building	Policy advising	
	Strengthen university extension system		

Ukraine	Develop private sector agriculture	Farmer cooperative development	$1,891,732
		Farm management training	
		Business planning	
		Facilitated access to inputs, equipment and credit	
		Technical training	
Armenia	Technical & financial assistance	Appropriate technical assistance	$33,554,000
	Marketing assistance to agribusinesses	Identification of new markets	
	Educational development	Marketing assistance	
	Agricultural extension services	Improved agro-processing methods	
	Applied research	Organizing farmer associations	
		Ag. education development (ATC)	
Republic of Georgia	Meat & dairy improvement	Open USDA office in Tbilisi	$50,000
	Regional economic development	In-country meetings with USG	
	Agricultural education	Hire and recruit staff	
	Youth development		
	Agro-forestry improvements		
TOTAL			$38,104,960

In Central America, USAID provided funds to CSREES for Hurricane Mitch reconstruction efforts to assist Honduras, El Salvador, Nicaragua, and Guatemala. Under agreements with CSREES, Cornell University, Purdue University, North Carolina A & T University, University of Hawaii, Auburn University, University of Arizona and Texas A & M University collaborated together in reconstruction efforts. North Carolina State University directed an effort to enhance agricultural extension programs in the region. In addition, CSREES met ongoing requests from USAID missions in the region for technical assistance.

In the Dominican Republic, CSREES used proceeds form USDA monetized wheat donations to enable technical assistance providers from U.S. universities to work with Dominican counterparts on the following efforts: Cocoa production, coffee forests, livestock rehabilitation, and support for small sugarcane farmers, rehabilitating centers for integrated rural agribusiness service, agro-forestry rehabilitation.

In West Africa, CSREES' International Programs office has been collaborating with the Ghanaian Ministry of Food and Agriculture to support agribusiness entrepreneurial development and extension development since 2002. The goal of the project is to build capacity within the Ghanaian Extension System to enable agricultural agents—both public and private—to guide farmers in improving production for domestic markets and to increase their capacity to participate in world trade. Since 2001, CSREES has been

assisting the government of Nigeria in achieving agricultural sustainability through capacity building and technical assistance training.

In South Africa, the CSREES agribusiness/extension development project focused on providing education and training to a significant portion of the rural South Africa population that had been largely ignored by the previous government and educational institutions—the small subsistence black farmer. The project focused on institutional change and capacity building to create an extension program to meet the unique needs of this critical target group. This project, undertaken as a part of the United States-South Africa Binational Commission and funded by USAID, assisted in developing institutional and human resources to support the successful and widespread emergence of small-scale farmers (primarily women) and stimulated economic growth and development in rural areas.

In the Ukraine, the Commercial Agriculture Development Program (CADP) provided direct, practical assistance to underserved Ukrainian private farmers. The 3-year program, funded by the USAID, ended in September of 1999. Its purpose was to assist in the development of private agriculture in Ukraine. CADP, in collaboration with USAID-funded contractors, successfully developed farmer cooperatives that facilitated the availability of needed inputs and services and enhanced the financial success of private sector agriculture. CADP used the technical resources of USDA-CSREES to help increase both the number and economic viability of private farms in selected areas.

In Armenia, CSREES has been working in partnership with the Armenian agricultural sector for more than a decade. In the early years, the project focused on the development of an applied research and extension capacity, helping to ease the transition to a free market economy. The Marketing Assistance Project (MAP) (http://www.usda.am) provides technical, financial, and marketing assistance to agribusinesses, farmer marketing associations, and cooperatives. MAP has attempted to provide a "package" of technical, financial, and marketing assistance to agribusinesses, farmer marketing associations, and cooperatives. Fortunately, all the U.S. Ambassadors to Armenia have been patient and allowed the project to evolve while developing long-run relationships with Armenian clients in the agro-processing sector. These long-term relationships in the context of a "package" of assistance are what distinguish MAP from other technical assistance efforts in the region.

In 2000, International Programs facilitated the establishment of the Agribusiness Teaching Center through a cooperative agreement with Texas A&M University and the Armenia Agricultural Academy in Yerevan. The agribusiness degree program provides Armenia's future agricultural producers and entrepreneurs with competitive skills in international marketing, finance, management, computers, and language.

In the Republic of Georgia, CSREES started a rural development project in 2000**.** The project strives to facilitate the economic development of the Republic's rural sector by enhancing the quality of agricultural goods and services produced. This development occurs in the agricultural and agribusiness sectors from the identification of constraints in

the production-processing-marketing supply cycle, and in the application of technical, educational, and financial solutions to these challenges. Emphasis is being given to: Meat and dairy quality improvement, regional economic development, agrarian education, sustainable agriculture production and agro-forestry improvements.

Outputs

The above projects have created educational institutions, organized economic organizations, and trained hundreds of nationals to become participants in newly emerging market economies. A summary of outputs from the above projects is provided in Table 1.2.11

Table 1.2.11. Results from international development research, education and extension activities

OUTPUTS		
REGION		RESULTS
Africa	▪	More than 120 Ghanaians trained in areas from production through post-harvest handling, value-added processing. export marketing and agribusiness development
	▪	4 "train the trainer" workshops on marketing & post-harvest handling of chili peppers, okra, pineapples & sweet potatoes
	▪	More than 400 Nigerians participated in workshops on marketing and agribusiness development
	▪	Preliminary surveys from first workshop indicate 153 individuals were trained in post-harvest handling & 170 in marketing
	▪	A commodity reference manual developed by two Land Grant Specialists
	▪	Procurement of needed educational materials and presentations aids
Former Soviet Union	▪	American food scientists collaborated in development of new food products
	▪	USDA-CSREES works directly with 51 agribusiness clients and 12 farmer marketing associations
	▪	The first 2 stages of the Village well project produced 48 new wells making water available to 38,000 villagers
	▪	Strengthened and expanded Potato Credit Clubs to 30 with 473 members
	▪	Strengthened and expanded Youth Clubs modeled after the U.S. 4-H model to 127 and 2500 members
	▪	Organized farmers into marketing groups/associations
	▪	Developed capacity in basic marketing principles
	▪	Initiated advances in goat milk production and goat cheese production/ marketing
	▪	1,000 goats bred by newly trained staff at the ARID Goat Center
	▪	Established local extension and applied research group
	▪	Created 12 dairy associations collecting and marketing higher quality milk

		to cheese and dairy producers
	▪	MAP facilitated client participation in 12 trade shows and exhibitions in 6 countries
	▪	Designed quality initiatives to assist clients in meeting minimum sanitation standards for exporting products
	▪	Conducted administrative management training for leaders at agricultural universities in Armenia & Georgia
Latin America	▪	Direct training provided to 263 shrimp farmers
	▪	A series of train-the-trainer short courses for 48 institutional representatives
	▪	Best management practices were introduced through a series of workshops, extension bulletins and a manual published in English and Spanish
	▪	Training was conducted in IPM, soil and water conservation, crop diversification, water monitoring, and municipal development
	▪	More than 1,000 milk producers received field-based technical assistance
	▪	450 cheese facility employees received formal training
	▪	Extension capabilities were enhanced through improved organizational networks

Outcomes

The projects have resulted in a number of tangible benefits to farmers, processors, students, and others. Best management practices have been successfully adopted, productivity and incomes increased, students trained and employed, conservation practices adopted, new products and new markets developed. A summary of outcomes is provided in Table 1.2.12.

Table 1.2.12. International impacts through research, education and extension activities

OUTCOMES		
REGION		IMPACTS
Africa	▪	Taught farmers how to meet international standards through Good Agricultural Practices
	▪	Farmers are able to identify pests and diseases and control them
	▪	Productivity and income increased while reducing post harvest loss
	▪	Created market linkages for some cooperatives and farmers
	▪	Improved record keeping and accounting practices used to improve cooperative and farmer profitability
Former Soviet Union	▪	Encouraged transparency in business practices and accounting
	▪	Grass-roots programs to develop cooperatives
	▪	Leadership training and capacity building for cooperative board members
	▪	Created 4 private, registered farmer cooperatives in Ukraine
	▪	CADP advisors helped organize 10 groups of private farmers in 7 regions
	▪	Facilitated improved services to nearly 100 cooperative members, private farmers, and family household plot owners
	▪	Developed English based agribusiness curriculum with current textbooks & language lab
	▪	57 students graduated from the Agribusiness Teaching Center in Armenia; several employed in agriculture
	▪	61 students currently enrolled
	▪	2 summer internship programs have been created.
	▪	Developed internship program to complement applied research and studies in the ATC
	▪	Expanded awareness with local agribusinesses to increase potential for employment opportunities
	▪	Continued financial and advisory support for the Foundation for Applied Research and Agribusiness
Latin America	▪	Surveys indicated an average of 9 new best management practices were adopted by participating shrimp producers
	▪	Productivity was significantly increased and food safety practices

		improved
	▪	Organizational structures in place to better handle future environmental problems
	▪	Producers in the watershed planted on hillsides to decrease soil erosion, composted coffee waste, developed reforestation plans, constructed more than 1,000 fuel efficient stoves to reduce need for firewood, and reduced water contamination as a result of water quality monitoring.
	▪	Raised cheese sanitation standards enabling producers to safely supply domestic markets.
	▪	Exported improved cheese to neighboring countries and the U.S.
	▪	Sanitation procedures in dairy processing plants were improved.
	▪	Pine bark beetle outbreaks were controlled, forests were protected and future watershed damage was mitigated.

Analysis

A discussion of the relevance, quality, and performance of the two problem areas (PA 606 & 611) of Portfolio 1.2 is combined with the three problem areas (PA 603, 604, & 610) of Portfolio 1.1 in a separate section called: "Analysis of Portfolios 1.1 & 1.2."

Analysis of Portfolios 1.1 & 1.2

The relevance, quality, and performance of Portfolio 1.1 and Portfolio 1.2 are discussed jointly in this section.

Relevance

1.1 Scope. The samples of CRIS reports demonstrate that the portfolio is addressing a wide range of issues of concern to stakeholders, and that the work is changing with the changing needs. Requests for Agreements (RFAs) have changed over time in response to changing needs for research, education and extension. CSREES International Programs cover several continents to provide a range of technical assistance. CSREES International Programs (IP) responds with flexibly by accessing the land-grant's extension, research and teaching communities and others.

1.2 Focus. The work is focused on the priorities of Congress as expressed in the 2002 Farm Bill and in annual appropriation bills, the priorities of the State Department and USAID, the priorities of local and state stakeholders as expressed to state land-grant institutions and reported in their Plans of Work, the priorities of the Experiment Station Committee of Policy's (ESCOP's) Research Roadmap, and other sources. It is also fits the USDA, REE, and CSREES strategic plans. Emerging domestic and international needs can often be addressed quickly.

1.3 Identification of Emerging Issues. CSREES and the land-grant university community are fairly well attuned to the emerging needs of their clientele at the local, state, and federal levels. In recent years, CSREES has been less well attuned because of the dwindling number of people working in the economics area. In the IP area, however, the Agency has provided timely assistance as challenges and opportunities emerged. For example, as the Iron Curtain fell, CSREES offered to help countries in the Former Soviet Union as they struggled to transition away from command driven to market driven economies.

1.4 Integration. National program leadership across research and extension in marketing has been well integrated since shortly after the creation of CSREES when the primary NPL for research retired and the former extension staff (4 NPLs) assimilated responsibility for state and multi-state Hatch projects, Evans-Allen projects, and special research grants. The merger allowed a very pragmatic approach that focused on the problems of clientele with a combination of research and outreach activities. Integration of the above programs with SBIR and NRI has been less successful. While SBIR itself is an integrated effort to encourage technology adoption, NRI is a more basic research instrument. At the university level, there has been increased integration with greater emphasis on joint appointments and increased use of special grants (many of which require integration) and less reliance on formula funds for research and extension. Needs overseas are often large and complex. So, an integrated approach that brings extension, teaching and research to bear not only makes sense but is a necessity. All three functions have been well integrated in the long-term Armenia project, for example.

1.5 Multidisciplinary Balance. Most of the CRIS projects in the five PAs only involve the discipline of economics (when adjusted to include econometrics and management). In 1998, only 10-13 percent of the projects were interdisciplinary; in 2002, it was 11-16 percent, except for Marketing Practices (PA604) in which there 25 percent were interdisciplinary (Table 1). In IP a wide variety of production, marketing, organizational, and other needs overseas were met with a broad, interdisciplinary collection of U.S. expertise.

Table 14 Interdisciplinary Projects, PA 601, 603, 604, 610, 611, 1998 & 2002

PROBLEM AREA		1998		2002	
603 Market Economics		Number	Percent	Number	Percent
	100%	236	88	214	89
	76-99%	4	1	2	1
	51-75%	8	3	4	1
	26-50%	15	6	15	6
	25% or less	4	1	6	2
	Total	267	100	241	100
604 Marketing Practices					
	100%	163	87	171	75
	76-99%	2	1	6	3
	51-75%	2	1	8	3
	26-50%	17	9	32	14
	25% or less	3	2	12	5
	Total	187	100	229	100
610 Policy Analysis					
	100%	112	89	148	84
	76-99%	3	2	4	2
	51-75%	3	2	5	3
	26-50%	4	3	14	8
	25% or less	4	3	6	3
	Total	126	100	177	100
606 International Trade & Developmental Economics					
	100%	121	90	117	89
	76-99%	5	4	4	3
	51-75%	2	2	4	3
	26-50%	3	2	4	3
	25% or less	3	2	3	2
	Total	134	100	132	100
611 Foreign Policy & Programs					
	100%	21	88	29	85
	76-99%	1	4	1	3
	51-75%	1	4	2	6
	26-50%	0	0	0	0
	25% or less	1	4	2	6
	Total	24	100	34	100

Quality

2.1 Significance of Outputs and Findings. CSREES makes continual changes in Requests for Agreements (RFAs) for its competitive grants programs to keep the research focused on current issues. (See examples from NRI in Evidentiary Materials.) Special grants usually change focus over time to meet the needs of Congress and other stakeholders, and the percentage of CSREES funding from special grants is increasing for these PAs. The lists of publications for many projects include refereed journals and popular publications as well as presentations at meetings with stakeholders. IP responds to the needs of its stakeholders, including USAID, ambassadors, and in-country citizens and leaders, and offers the best, most appropriate and most useful advice, approach or assistance. For example, by evaluating early train-the-trainer programs in Africa, we were able to shape subsequent sessions so as to respond to stakeholder feedback.

2.2 Stakeholder Assessment. CSREES is attuned to the general assessments of the Office of Management and Budget (OMB); Congress; the National Agricultural Research, Extension, Education, and Economics Advisory Board (NAREEEAB) (http://www.nareeeab.com/) to the Research, Education and Economics Under Secretary; the Council for Agricultural Research, Extension, and Teaching (CARET) of the National Association of State Universities and Land-Grant Colleges (NASULGC), and others. Agency leadership and NPLs keep abreast of the changes requested and supported by these groups. IP established successful in-country stakeholder feedback techniques similar to those used at home.

2.3 Alignment with Current Science. CSREES maintains a number of mechanisms to assure that our portfolio is well-aligned with current science. At the same time, we use our leadership to push the science in new directions. We do both through input meetings with partners and stakeholders, portfolio analysis and planning, data gathering at funding opportunities workshops, liaisons with multistate research committees, communication with other federal science funding agencies (NSF, NIH, DOE, NASA, etc.), as well as our sister USDA agencies (ERS, AMS, RD, and FAS), and membership (and sometimes leadership) of CSREES staff in science and professional societies. Resource constraints in formula and competitive funds challenge the Agency, partners, and individual programs to direct their efforts to highest priority and/or cutting edge initiatives, and to places where limited resources can make the most meaningful impact and net the most productive results. And by working overseas, our land-grant partners are able to expand their awareness of different and often innovative ideas and methods that are relevant to situations here in the U.S.

2.4 Methodological Rigor. Competitive programs demand that researchers adhere to the highest standards in research conduct, integrity, and methodological rigor. Because a premium is placed on innovative methodological approaches to research, education, outreach, and extension, there is obviously a risk that initial application will challenge these high standards, but mechanisms of review and accountability push programs to ever higher standards of rigor and excellence. The participants of multi-state projects represent a richness and fullness of scientific expertise to assure that programs and projects

maintain high standards while pushing the envelop of creatively and risk required for breakthrough insights and advances in the science. Because the policy realm is often under threat of politicization, methodological rigor is essential to retain the credibility of CSREES, and the scientists and scientific disciplines that conduct research, extension and education efforts. CSREES prides itself on a portfolio of international work that is growing in popularity and influence largely because we ensure that our programs rely on practical, culturally sensitive, committed experts who work side by side with farmers, teachers, and community and national leaders overseas on problems that need to be addressed.

Performance

3.1 Portfolio Productivity. Evidence in CRIS and elsewhere shows that the above CSREES portfolios of research, education, and extension create and disseminate new knowledge through publications, presentations, workshops, and other methods. Less complete information sources show that the new knowledge results in changes in attitudes and behavior, and ultimately to economic and other benefits. In a general sense, CSREES programs enable domestic producers to adapt more successfully to global markets, and help producers in developing countries achieve a faster, more successful move to a market economy.

3.2 Portfolio Completeness. A review of CRIS reports shows that almost all projects are completed and that expected outputs are achieved. The outcomes generally lag beyond the completion of the projects, hence they are more difficult to capture. But evidence outside of CRIS shows that expected outcomes do occur. Much of the IP work has numerous built-in deadlines which must be respected, and our longer term projects are under the gun to continuously demonstrate results so as to ensure another year of support.

3.3 Portfolio Timeliness. CSREES' experience is that most projects are completed on time. Principal investigators are allowed to take a one-year, no-cost extension on most grants if needed to complete their project. Hatch projects allow a one-year extension with funding. Most Hatch recipients update their project and apply for an additional one to five years in order to continue their line of research.

3.4 Agency Guidance. CSREES' capability to lead Portfolios 1.1 and 1.2 has been significantly eroded by the continual reduction in economist NPLs over the last 10 years. In the early 1990s there were five economists in research, education and extension, whereas today there are only two, and they are largely committed to a small number of grant programs. Internally, the agency lacks a comprehensive approach to economic issues across functions and programs. Externally, it has ceased to have much interaction with the land-grant system, multistate committees, other federal agencies, stakeholders, professional societies, and other groups. IP, on the other hand, provides considerable guidance to its international field operations on a weekly or daily basis. Also, on some of our larger, more management-intensive projects, we are currently working to arrange collaboration with a university or a consortium of universities that will ensure ongoing

and appropriate coverage and oversight. CSREES will continue to provide overall guidance on these projects.

3.5 Portfolio Accountability. CSREES' evaluation system is slowly but continually being improved. The former Research Problem Areas (RPAs) used by CRIS for research purposes have been revised and renamed as Problem Areas (PAs) to include extension and education activities. CSREES will soon begin to create a parallel track for an extension reporting system. Both systems will capture inputs and outputs, but have only limited outcome information. CSREES' international economic development projects include annual reporting and/or feedback evaluation from stakeholders, but we have not conducted an across the board evaluation of all of our international economic development projects. Such an evaluation would be useful to identify lessons learned and to guide current and future projects.

STRUCTURE OF THE AGRICULTURAL SECTOR AND FARM MANAGEMENT – PORTFOLIO 1.4

Portfolio 1.4 Structure of the Agricultural Sector and Farm Management is a bit of a misnomer. It is a collection of Problem Areas (PAs) covering farm management and risk management (PA 601) and several bioengineering subjects closely related to agricultural production (PA 401, 402, 404). Each of the problem areas will be discussed separately in the sections that follow.

Structures, Facilities, and General Purpose Farm Supplies (PA 401)

Overview

This PA is focused on extension and research for the design, construction, and cost of facilities for animals, agricultural products, agricultural inputs, equipment, and other materials. The properties and behavior of the animals, products, equipment, and materials while in various facilities and during transport or processing is a part of this PA.
Areas of extension and research include but are not limited to:
- Engineering aspects of design and construction of structures and facilities.
- Physical, chemical, and biological aspects of the production of fertilizers, pesticides, feeds, and hormones.
- Engineering aspects of materials handling, transport, land use, and storage of crop, forest, and range products.
- Studies on biological, chemical, and physical properties of materials.
- Behavior of chemical and biological materials in storage systems.
- Determining costs and benefits of construction or engineered systems.
- Determining maintenance needs and costs of agricultural systems.
- Facilities for handling, processing, and storing new food and fiber products, animal feeds, forage, and bedding.
- Structures and facilities for housing and handling animals.
- Facilities for handling and storing fuel, fertilizers, pesticides, and other farm supplies.
- Environmental control of structures for animals, plants, or agricultural products.

Exclude research on:
- Safe handling and use of materials and equipment. (Use PA 723)
- Facilities that reduce environmental stress in animals. (Use PA 306)

Situation

The on-the-farm facilities/buildings have always been a major component of agricultural production of plant materials and animals. This will continue into the future whether production agriculture continues to consolidate resulting in fewer small farms and more large farms. The large farms, whether they are large greenhouse operations or large livestock and poultry operations will require specialized structures that provide consistent high quality products that are efficiently produced.

The overall effort for extension and research towards these structural related activities has declined over the past decades. At one time there was a major focus within agricultural engineering departments on farm structures, but that has declined significantly. There are few remaining extension, teaching and research faculty at LG universities working solely on agricultural structure issues. The design and construction of new facilities such as: confinement livestock and poultry structures, greenhouses, milking parlors, grain storage, and machinery storage are carried out by commercial engineering design companies with little input from the Land Grant system.

The current extension, education and research effort related to structures of livestock, poultry and aquaculture is focused on environmental issues as a result of the facilities and the management of the wastes/manure. This may include water quality for aquaculture and odors, particulates and gases from livestock confinement structures. There are other PAs (133, Pollution Prevention and Mitigation; 403, Waste Disposal, Recycling and Reuse; 141, Air Quality) that address environmental issues which are not covered in this portfolio review. There are also PAs like 503, Quality Maintenance in Storing and Marketing Food Products 512, Quality Maintenance in Storing and Marketing Non-Food Products; 205, Plant Management Systems; 306, Environmental Stress in Animals; and 315, Animal Welfare, Well Being, and Protection which may have some overlap with PA 401.

There were over 70 projects identified through a CRIS search of PA 401. They can be categorized by subject under: wood structures, air quality of animal confinement structures, greenhouses, aquaculture, storage or livestock buildings, and other. There were 27 projects focused on the design and components of wood structures. There were 12 projects strongly related to odor and gases emanating from livestock and poultry structures. Greenhouse related projects accounted for 6 projects, while storage of agricultural products accounted for 6 projects. There were 10 projects that were difficult to place in a category. There were no projects from minority institutions. There were eight projects from industry funded thru special grants or SBIR. The aquaculture projects (6) consisted of three funded by SBIR and the rest funding for the NE Regional Aquaculture Center. There was only one non-land grant university project.

The situation with this PA is that there is a small amount of resources, relative to other PAs, devoted to these topics, ranging from environment in livestock structures to design of wood members for strength and durability. The issue is whether there is justification for advocating additional resources and whether there are new topics for this PA that should be addressed.

Inputs

CSREES programs, funding levels (Federal, state, local), personnel; etc.

Funding:
The projects from a CRIS search showed that 35 out of 73 were funded by Hatch funds. There were a 16 special congressionally mandated grants listed but several of these were

the same grant with additional funds each year. There were 6 SBIR projects and 8 NRI projects. The NRI projects were mostly related to wood structures and the elements (strength of fasteners, strength of members, etc.) of these structures.

There were numerous other projects that might not be captured in the CRIS system because the project may have been entered in as another PA. For example, there have been several research and extension projects on the subject of odors and gases from livestock and poultry structures. They may have been entered in to PA 141 Air Quality, PA 133 Pollution Prevention and Mitigation, or PA 306 Environmental Stress in Animals.

The funding for PA 401 is the lowest for all of the nine PAs reviewed in this portfolio. There was a total of $32,660,000 of the total of $651,064,000 accounted for by PA 401(1998-2002). This reflects the perception of the importance placed on this topic by LG administrators and funds available for this PA. The funding categories are: CSREES administered, Other USDA, Other Federal, State Appropriations, Self-Generated, Industry, and Other Non-Federal. The CSREES administered includes: Hatch, McIntire-Stennis, Evans-Allen, Animal Health, Special Grants, NRI Grants, SBIR Grants, and Other.

The main sources of CSREES funding for PA 401($32,660,000) over the five year study period were state appropriations ($17,432,000), special grants ($4,441,000), and Hatch ($2,889,000). State appropriations and Hatch funding was relatively stable over the period while special grant funding varied considerably from year to year. There was only $433,000 from NRI funds and $994,000 from SBIR funds over the period.

Some of the other sources of funding besides CSREES contributed little to this PA. There was slightly over one million each from other USDA sources, self-generated, industry, and other non-federal for the five year period. In nearly all cases PA 401 had the lowest funding compared to the other two engineering related PAs (402 and 404) and all the PAs (9) considered in this review process. The funding sources where PA 401 did do better in comparison to the other PAs was in SBIR, where it was third out of nine.

Personnel:
There are no NPLs at CSREES who have a majority (or a minority) of their effort devoted to PA 401. This means that there is no leadership in identifying and promoting new directions or needs that would come under this PA. The closest leadership would be Richard Hegg who is one of the persons who leads the manure management effort of CSREES. Manure management structures which may incorporate livestock structures and the management of odors and gases can be directly related to PA 401.There are few multi-state committees (NE-164, NE 126, and S-291) focused on subjects related to PA 401. There is no competitive grant program in CSREES with a focus on agricultural structures and facilities.

The faculty effort towards PA 401 ranged from 14.1 to 21.5 scientist years per year (SYs/yr) with an increasing trend. This number was about one-half that of the other two

engineering PAs and much lower than the six economic related PAs except for PA 611, Foreign Policy and Programs. This small number of SYs is reflective of the trend in Land Grant universities to not fill vacant positions in research, extension or teaching with engineers focused on livestock and agriculture buildings and structures.

Outputs

Research, education and extension activities conducted; publications, citations, patents, BMPs developed, new knowledge gained, new products developed, students trained; etc.

PA 401 covers subjects from design of components of agricultural structures such as fasteners for roof trusses to management of greenhouses for hydroponic vegetable production. For the five year period there was an average of 100 publications per year for the 73 CRIS projects. A majority of these publications were research oriented but several were extension oriented. No information on the number of citations or patents was sought. Information on the number of students trained in either undergraduate or graduate programs was not obtained.

Many outstanding extension publications or other types of outcomes have been produced at various LG universities where there still is an active agricultural structures program. An example of extension outputs are the fact sheets from Penn State Agricultural and Biological Engineering Department related to livestock structures. These are available via their web site. The titles are shown below.
Horse Stall Design Features G-95
Horse Stable Flooring Materials and Drainage G-96
Horse Stable Manure Management G-97
Fire Safety in Horse Stables G-100
Horse Facility Resources G-106
Natural Ventilation for Dairy Tie Stall Barns G-74
Natural Ventilation for Freestall Barns G-75
Tunnel Ventilation for Tie Stall Dairy Barns (revised 01/04) G-78
Principles of Measuring Air Quality: Evaluating Livestock Housing Environments G-80
Instruments for Measuring Air Quality: Evaluating Livestock Housing Environments G-81
Evaluating Mechanical Ventilation Systems: Evaluating Livestock Housing Environments G-82
Selecting Rated Ventilation Fans G-85
Inlets for Mechanical Ventilation Systems in Animal Housing G-91
Self-Adjusting Baffle Inlet to Improve Air Distribution G-92
Ventilation Improvements for Veal Calf Housing Using 50-Calf Room Example G-93
Make Your Own Ceiling Inlet Air Speed Monitors G-94
Ventilating Greenhouse Barns-Guidelines for Livestock Production G-102
Selecting Tunnel Ventilation Fans G103
Miscellaneous Animal Housing Fact Sheets
Sheep Housing Design Criteria G-5

Odor Management in Agriculture and Food Processing: A Manual of Practice for Pennsylvania G-40
Odor Control for Animal Production Operations G-79

The MidWest Plan Service (MWPS) is a university based publishing cooperative dedicated to the publishing and disseminating research-based, peer reviewed, practical and affordable publications that support the outreach mission of the 12 North Central Region land-grant universities plus USDA/CSREES. Established in 1929 and publishing since 1933, MWPS is one of the oldest regional cooperative efforts of land-grant universities in the United States. To date more than 2 million agricultural building plans and 1.3 million related publications have been disseminated by MWPS.

A REEIS search for outputs related to livestock and agricultural structures will provide numerous publications and projects that would not be in the CRIS system. These would cover a wide range of topics from electrical systems in buildings to odor management in confined livestock buildings.

Outcomes

Immediate (changes in knowledge, skills, abilities; decisions made). Intermediate (changes in behavior). Long-Term (problems solved, improved profitability, new markets, etc.)

Two examples of special grants are Ohio State University and the project, “Hydroponic Tomato Production” and Michigan State University and the project. Advanced Technology Application to Eastern Hardwood Utilization”.

A Hydroponic Vegetable Program began in the spring of 1999 to foster hydroponic greenhouse vegetable businesses in Ohio by providing horticultural, marketing, business planning, and greenhouse design support. The support was provided by direct contact with individuals, seminars, tours, interactive Internet websites and a demonstration greenhouse at the Toledo Botanical Garden. This work greatly increased the chance of success for new hydroponic vegetable and flower growers. Some were small farm operators looking for alternatives to commodity crop production and others were looking for new economic ventures in high tech agriculture. Six new commercial hydroponic lettuce production enterprises were started in Ohio as a result of the project activities in 2001 and 2002 and a major Toledo grower began growing and marketing hydroponic orchids in cooperation with a Taiwan orchid company in 2002. The interactive web-sites were tracked to show that over 5000 users in 2002.

The main goal of this Michigan State University project is to extend the service life of forest products particularly hardwood species through preservatives, reuse of treated wood, recycling of wood removed from service and the application of biotechnological means for the production of high decay resistant wood. This project is providing basic and applied information that is essential to Michigan's $9 billion forest products industry and to maintaining the vitality of hardwood-based industries throughout the US.

Moreover, its focus on increasing utilization efficiency and product life have yielded utilization efficiency increases as high a 22 percent, which translate into less wood harvested and moves the US toward truly sustainable forest utilization patterns.

Analysis

(1) Relevance

Structures and facilities are a necessary component of a farm for the production of plant or animal products. Traditionally these have been structures and facilities to store feed, seed, and animals to maintain quality with minimal expense. This also includes specialized facilities such as greenhouses and aquaculture structures. Agricultural structures and facilities design will always be relevant in addressing issues related to environmental stewardship, animal health and wellbeing, food safety and food security, international competitiveness and profitability, and worker health and safety.

New directions: In the future there will be more processing of the raw agricultural products but this will probably be done in centralized facilities (soybean processing, biomass conversion, ethanol production, processed foods, etc.). There may be some advanced processing on the farm for energy products (conversion of biomass to electricity), or manure treatment (anaerobic digestion, liquid- solid separation, nitrogen recovery, phosphorus recovery, pathogen removal, etc.).

There is no USDA or Congressional initiative directed to farm structures and facilities. There is no stakeholder group that specifically identifies the needs for farm structures and facilities. The gradual reduction over the years in faculty at LG universities doing research, education and extension on structures and facilities is indicative that this topic is of lower priority than in the past. However, the engineering design and economic analysis of the land-grant universities with leadership from USDA-CSREES was a dominate factor in shaping the recent Environmental Protection Agency regulations for Concentrated Animal Feeding Operations.

(2) Quality

All MWPS publications receive stringent review by professionals in relevant fields. MWPS publications are recognized for exceptional quality and have earned awards for technical information from the American society of Agricultural Engineers and for information presentation from the Agricultural Communicators in Education.

(3) Performance

Information on performance is briefly summarized in the outcomes and output sections shown above.

Engineering Systems and Equipment (PA 402)

Overview

Problem Area 402, *Engineering Systems and Equipment*, concentrates on increasing production efficiency while decreasing dependence on labor through mechanization of agricultural and forestry production tasks. The scope of this problem area, though broad, does have important limitations. PA 402 includes:

1. Tillage, planting, nutrient and chemical application, and harvesting systems including geographical information systems, sensors, and robotics but not including irrigation and drainage systems; and,

2. Handling means for animals, plants, animal products and plant products, but not food and non-food product processing, storage, and marketing;

The manual of classification in use between 1998 and 2002 does not clearly differentiate between this problem area and problem areas 205, 207, 307, 404, 501, and 511.
It should not include: Food and non-food processing; crop, herd, and forestry management; or irrigating systems. As a result, about 35percent of the projects that cite 402 focus primarily on systems and equipment as defined above while 9percent focus on structures and facilities (PA 401), 19percent on instrumentation and control systems (PA 404) and 42percent on other areas (including PA's 205, 207, 307, 501, and 511).

Situation

According to data collected by the National Agricultural Statistics Service (NASS), in 2002 United States farms spent at least $48.3 billion (25.4percent of all farm expenditures) on labor related expenses. This sum does not include the equivalent of the principal operator or his families' hourly wage, i.e. profit. In sharp comparison, NASS estimates that U.S. farms spent $26.2 billion (13.6percent) on farm machinery and equipment including maintenance and fuel. This figure also includes farm building renovations and repairs, so the actual amount spent on machinery and equipment is somewhat lower. Given that the average farm spends at least twice as much on labor as it does on machinery and equipment, agriculture's research and outreach community has a responsibility to develop novel and improved systems to reduce labor costs and increase farm production efficiencies.

The above data also does not account for lost time due to farm work related injuries, illnesses, and fatalities. Even conservative estimates of the cost of farm-related fatalities, injuries, and disease suggests that the agricultural safety and health problem is a $4.5 billion annual issue (National Safety Council, 2001) with substantial potential for large returns on investments made to reduce or eliminate the losses.

New engineering systems, especially equipment and machinery designed to reduce labor demands while preserving product and environmental quality, hold great potential to

reduce labor costs while increasing machinery related costs less than a commensurate amount which would hopefully result in increased profits (or at least reduced debts) for producers.

Inputs

Between 1998 and 2002, CSREES invested $12.4 M in PA 402. Other USDA agencies, other federal agencies and other non-federal entities matched CSREES with approximately $46.3 M (or approximately 15 outside dollars to every four CSREES dollars). About $39.6 M of these non-CSREES funds came from non-federal sources, making the ratio of non-federal to federal support approximately two to one. Approximately two-thirds of CSREES' investment came through non-competitive formula funds (62percent of these funds – Hatch [57percent] and McIntire-Stennis [5percent]) or special grants (38percent) while competitive programs funded the remaining third (11percent NRI, 27percent SBIR, and 62percent other which includes IFAFS). With the exception of Hatch and the "Other" competitive funds, no discernable funding trend exists. Hatch funds supporting PA 402 decreased approximately 8.9percent per year over the five year period. IFAFS critically influenced work citing this PA: going from $0 in 1999 to $613 k in 2000 to $1.49 M in 2001 back down to $447 k in 2002.

Although CSREES and other USDA contributions to these projects remained relatively constant over the relevant five year period, other federal contributions increased an average 29 percent each year, state appropriations increased 2.4 percent per year, and private grantors support increased approximately 8.3 percent each year.

Problem Area *Engineering Systems and Equipment* competes with 77 other problem areas for financial and human resources. The table below lists different CSREES funding streams, the funds reported to CRIS over the five year period for each funding stream, the amounts associated with PA 402, the values of an imaginary "average" PA, and the percentage deviation. Notice that in all but one of the fund categories, the amount invested in PA 402 falls far below the average. In fact, it seems that 1890 land-grant institutions, veterinarians, and NRI awardees do not develop systems and equipment. As one would expect, this PA commands more than an equal share of small business funds since tangibles like systems and equipment hold profit potential.

FUNDING TYPE	CRIS-WIDE TOTALS	PROBLEM AREA 402	"AVERAGE" PROB. AREA	% + OR -
Hatch	$832,993,000	$4,712,000	$10,679,397	-56%
Mc-Stennis	$101,972,000	$418,000	$1,307,333	-68%
Evans Allen	$143,712,000	$0	$1,842,462	-100%
Animal Health	$23,315,000	$0	$298,910	-100%
Special Grants	$357,138,000	$3,114,000	$4,578,692	-32%
NRI Grants	$497,729,000	$445,000	$6,381,141	-93%
SBIR Grants	$64,785,000	$1,137,000	$830,577	37%
Other CSREES	$523,139,000	$2,545,000	$6,706,910	-62%
CRIS Total	$2,544,920,000	$12,371,000	$32,627,179	-62%

These funds resulted in approximately 330 distinct projects that cited PA 402. Project teams applied a total of 181 scientist years (usually a project director or principle investigator's time) and 570 other professional years (usually a technician, graduate student, or field worker's time).

Commensurate with the minimal resources, CSREES did not dedicate focused leadership to this problem area between fiscal years 1998 and 2002 and currently continues this trend. However, recognizing the importance of this PA's goal, an interdisciplinary group forwarded a proposal in early 2004 to develop a new funding program intended to reduce farming's dependence on labor through the development of agricultural production machinery and equipment for which the manufacturing market share remains too small to justify dedicating commercial resources to its development. Such a funding opportunity would reduce agriculture's demand for labor and reduce labor's exposure to hazardous work environments. Many agricultural commodities will not be able to continue to compete with international producers without drastically reducing labor costs. Successes could positively impact homeland security efforts and would decrease the number of illnesses, injuries, and fatalities on farms. CSREES remains hopefully that such a funding opportunity could become available in the near future and that staff may in the future more heavily invest their time in related works.

CSREES supports students through tuition assistance and fosters innovative approaches to classroom education. Between 1998 and 2002, the Challenge Grants Program funded two projects with particular implications for PA 402; one, "Application of Finite Element Analysis to Undergraduate Core Courses in Biological Engineering, and a second, "Creating a Student-Centered Ag Engineering Tech Curriculum," with CSREES funding totaling $199,680. This funding does not appear in the associated tables and charts due to the difficulty in discerning what percentage of these projects pertain to PA 402. Engineering related agency investments through Higher Education Programs between 1998 and 2002, including tuition assistance and program grants, totaled $3,394,020.

A relatively new multi-state committee, NE-1008, has emerged to investigate, although not overtly, harvesting techniques with an eye toward market quality. "Assuring Fruit and Vegetable Product Quality and Safety through the Handling and Marketing Chain"

has three state cooperators out the twelve participating on the committee performing research and development in this area.

Note that the funding amounts provided pertain to research and integrated, meaning activities that incorporate aspects of research and classroom education, public outreach, or both. Outreach funding lines (i.e., Extension Smith-Lever b & c or Higher Education Programs) are not tied to accomplishments through a centralized database for the years covered by this report. However, this report does contain accomplishment information garnered from Extension accomplishment reports.

Outputs

Of the 35 percent of PA 402 projects that focus on machinery and equipment, five key work areas emerge; namely, (1) assisted navigation systems through GPS, (2) equipment and machinery management, (3) equipment and machinery improvements to increase production, (4) high throughput controlled environment systems, and (5) farm input dosing systems responsive to field needs. CSREES funded projects yielded at least 855 publications (between 3 and 4 publications per project). Of the 11 SBIR projects citing 402, five produced a total of seven patents. An example of each of these kinds of projects follows.

(1) CONTROL OF PRECISION APPLICATION EQUIPMENT FOR SITE-SPECIFIC CROP MANAGEMENT (The Ohio State University)

This project sought to integrate new soil sensor technologies with farm input application actuation components while developing an automatic guidance system for the vehicle. The project evaluated several commercially available components while searching for the optimum system in terms of components and settings.

(2) EQUIPMENT AND PRODUCTION SYSTEMS FOR FIELD CROPS (Purdue University)

By developing machinery selection criteria and management techniques for precision and reduced tillage cropping systems, the project sought to give producers tools that both contribute to their operations' bottom lines while addressing environmental quality and regulatory requirements.

(3) MACHINERY SYSTEMS MANAGEMENT FOR SUGARBEETS, DRY EDIBLE BEANS, AND CHICORY (University of Nebraska)

Recognizing that technological advances in field equipment will reduce crop production costs and improve harvested crop quality, this project developed equipment modifications and evaluated equipment effectiveness by measuring crop yield, quality, and production efficiencies following implementation of experimental modifications.

Specifically, the project developed equipment modifications to remove soil from the combine during harvest of dry edible beans. The project began with a full scale model of a combine clean grain cross auger and elevator. The project examined combinations of auger speed, auger design, screen design, and auger to screen clearance for soil elimination and seed damage. The project also examined these dry beans for mechanically induced seedcoat damage by evaluating adjustments, accessories, and operating practices of a Case-IH combine.

(4) AUTOMATION-CULTURE-ENVIRONMENT SYSTEMS (ACESYS) FOR CONTROLLED ENVIRONMENT BIOPRODUCTION (The Ohio State University)

Automated growing systems, housed in controlled environments, replete with sophisticated instrumentation and control systems, hold great promise for adaptation into advanced life support systems capable of supporting human life for long-duration space missions. A recent accomplishment has developed a stereo-camera system to track plant growth, predict plant needs, and deliver appropriate environmental modifications just in time.

(5) PRECISE INJECTION OF NH3 USING PULSE-WIDTH MODULATION METERING (Capstan Systems, Inc. Topeka, KS)

Objectives for this project included: (a) develop a multi-port, pulse-width modulated application control system for anhydrous ammonia fertilizer; (b) develop a distribution manifold to capture the cooling associated with expansion of ammonia downstream of the metering valves and use the cooling to condense incoming ammonia; (c) determine the expected durability of novel metering valves for ammonia; (d) integrate the valves and manifold into a complete, field-worthy control system with embedded software for maintaining desired thermodynamic state of the ammonia; (e) evaluate the physical performance of the system and compare it to typical conventional equipment; and (f) share demonstration prototypes with commercial users to determine acceptability under working conditions.

Each of the previous five examples pertain to applied research projects. Although our partners have conducted education and outreach activities related to engineering systems and equipment, none primarily focused on this problem area have occurred. The following section on outcomes will integrate research, education, and extension related activity outcomes.

Outcomes

PA 402 lends itself well to the archetypical model of advancing knowledge: research develops new knowledge that education and outreach methods transmit to the segments of the public that need it most. For each of the five work areas typified above, find below examples of general outcomes cited in Agricultural Experiment Station, Extension, or combined accomplishment reports. Additionally find specific outcomes that each of the example projects laud.

(1) Assisted Navigation Systems through GPS

General benefits include:

- Reduction in minimum skills required to successfully navigate a tractor
- Ensures optimum field layout for production or resource conservation purposes
- Reduces time required to prepare fields

Specific benefit identified by example project:

- Increased profits for reasons similar to those listed above

(2) Equipment and Machinery Management

General benefits include:

- Assists producers adopt a rational basis for selecting equipment for purchase, maintenance activities, farm task assignments, and later sale or salvage
- Provides a common framework for factoring equipment and machinery business decisions into the farm's greater economic outlook
- Facilitate greater crop yields and potentially greater profits

Specific benefit identified by example project:

- The combine residue distribution guidelines developed will help crop producers minimize soil erosion in some fields and improve crop performance when using no-till and other high-residue planting methods.

(3) Equipment and Machinery Improvements to Increase Production

General benefits include:

- Adaptation of commercially produced equipment systems to minor use crops and specialized applications to make such ventures more profitable
- Reduces equipment maintenance demands while increasing equipment longevity
- Improvements to process outputs' quantity or quality results in an increase of saleable product

Specific benefit identified by example project:

- Information on broken root tails that cause volunteer chicory growth, and better understanding of harvester lifter wheel performance to reduce root breakage, was used to improve the chicory harvester performance and greatly reduce harvest losses

(4) High Throughput Controlled Environment Systems

General benefits include:

- Reduces labor costs
- Improves production volume, uniformity, and quality on an area basis

- Produces food, fiber, flowers, or oxygen while conserving resources independent of ambient conditions

Specific benefit identified by example project:

- The implementation of controlled environment systems analysis tools accompanied by information gathering interfaces on the internet enables the decision support functions to be made available in a real-time fashion, thus encouraging broad user participation and effective information integration within the scientific and engineering communities.

(5) Farm Input Dosing Systems Responsive to Field Needs

General benefits include:

- Saves farmer time and money through more efficient application of fertilizer, pesticides, and other chemicals
- Protects natural resources through the introduction of less nutrients, hormones, and pesticides

Specific benefit identified by example project:

- Multi-Point Pulse Width Modulation metering of injected anhydrous ammonia can lower application cost, increase crop yields, and lessen nitrogen residue in the soil
- The product produced substantially more uniform lateral distribution than current systems of regulators and manifolds, important because greater uniformity implies better nutrient utilization by plants and lessens grower need to over-apply ammonia in guaranteeing minimum application rates for all plants.

To ensure an adequate supply of trained professionals in the discipline of agricultural machinery and the mechanical arts, many universities offer agricultural mechanization programs. CSREES collected graduation rates and faculty staff levels in various academic programs between 1993 and 2000. Although graduation rates remained fairly steady from 1998 through 2000 at about 450 per year, faculty staffing levels fell precipitously from 141 in 1998 to 117 in 1999 to 102 in 2000. As faculty staffing erodes, typically student enrolment follows.

Analysis

(1) Relevance

Because *Engineering Equipment and Systems* does not represent a problem in and of itself, the problems working citing this problem area touches on crop planting, management, and harvest; animal systems measurements, environmental control, and transportation; and food quality and safety assurance systems. Project teams have diverse attributes, with members having engineering, crop and animal sciences, plant pathology, food chemistry and microbiology, and economics backgrounds. The breadth and depth of this problem area's coverage remains a function of critical issues and the research,

development, education, and outreach communities' creativity. It seems unlikely that engineering equipment and systems would ever serve as the focal point for an agency initiative.

Nevertheless, the problem area does focus on critical needs. Production agriculture has not fully recognized its labor crisis. Any initiative from the Homeland Security department to alter foreign worker programs or removal of import tariffs and restrictions could dramatically affect production volumes or retail costs. Inherently, equipment and machinery innovations hold the most potential for increasing production efficiency rates since human influence remains greatest over inanimate rather biotic systems. Projects advancing knowledge in machinery and automation systems associated with fruit, vegetable, and nursery production address these critical needs. Projects should consider expanding their outreach efforts to machinery dealers and equipment designers, since equipment innovations should benefit both the service and producer communities.

Considering a distinct lack of leadership in this area, the agency and its partners have achieved much and integrated the interrelated approaches to advancing knowledge of research, education and outreach. This appears most evident in the work area of "equipment and machinery management" in which researchers continue to study equipment capabilities, estimate operating and maintenance costs based on producer experiences, record the experiences of the most successful operations, digest this knowledge, teach it in the classroom to future producers and agriculture service workers, and develop best practices and manuals to assist today's producers maximize their operations. Equipment and machinery management remains a staple of about a third of all Cooperative Extension Services.

(2) Quality

Although CSREES has not conducted any stakeholder assessments to gage how much priority to assign to this problem area, studying the funding source levels and understanding how those funds become available to projects involving PA 402 seems instructive. Most funds supporting PA 402 work came from Hatch formula funds, followed by special grants. State and territory agricultural experiment stations internally compete for these funds and so each institution sets its own priorities for these funds. Similarly, state and territory institutions of higher learning lobbying efforts usually lead to their members of Congress including special grants of benefit to their constituencies in the annual agriculture appropriations bills. Both of these funding mechanisms depend entirely on stakeholder preferences. This portfolio review seems like the first opportunity for all engineering systems and equipment related projects to receive an evaluation.

Project reports indicate access to modern fabricating and testing equipment and no reports read indicate an inability to complete a project due to a lack in appropriate equipment. Additionally, no reports indicate endless repetitions of the same experiments only to verify results already widely known. With three exceptions, each project spanned no more than five years. Project teams seem fairly well connected with contemporary knowledge which they apply to their experimental designs and in preparing their

education and outreach efforts. For this problem area, the basic constraints of plant and animal properties, machinery and equipment function tests, and production methods change very slowly or imperceptibly.

(3) Performance

Without having the benefit of a national agenda or coordinated approach to solving a specific set of problems associated with engineering systems and equipment, in the aggregate, projects have performed remarkably well. One half to two thirds of all projects do not seem to complete the scope of work originally intended with in the time frame of the project, however 80 percent to 90 percent do report a significant finding that advances knowledge. Because of the non-competitive nature of the funding for most of these projects, CSREES has not instituted controls to encourage project objective completion nor has CSREES undertaken a comprehensive evaluation of these projects until now.

Evidence

1. Multi-state committee NE-1008:

   http://www.lgu.umd.edu/showInfo.cfm?trackID=1154

2. Example PA 402 Projects

   a. Assisted Steering and GPS: http://cris.csrees.usda.gov/cgi-bin/starfinder/0?path=fastlink1.txt&id=anon&pass=&search=(AN=0181790)&format=WEBTITLESF

   b. Machinery and Equipment Management: http://cris.csrees.usda.gov/cgi-bin/starfinder/0?path=fastlink1.txt&id=anon&pass=&search=(AN=0063820)&format=WEBTITLESF

   c. Machinery and Equipment Improvements: http://cris.csrees.usda.gov/cgi-bin/starfinder/0?path=fastlink1.txt&id=anon&pass=&search=(AN=0177639)&format=WEBTITLESF

   d. Controlled environment agriculture: http://cris.csrees.usda.gov/cgi-bin/starfinder/0?path=fastlink1.txt&id=anon&pass=&search=(AN=0187034)&format=WEBTITLESF

   e. Input Dosing Systems: http://cris.csrees.usda.gov/cgi-bin/starfinder/0?path=fastlink1.txt&id=anon&pass=&search=(AN=0183974)&format=WEBTITLESF

3. Patents Funded Through SBIR Projects

a. Find specific patent numbers at:
http://patft.uspto.gov/netahtml/srchnum.htm

Patent numbers include: 5394949, 5498541, 5653389, 5704546, 5950741, 6117313, and 6712950

Instrumentation and Control Systems (PA 404)

Overview

The problem area, Instrumentation and Control Systems (404), aims to create the scientific and technological knowledge base that will enable producers, processors, and land managers to collect, analyze, and apply precise and timely information. Agency-wide programmatic direction supports three, sequentially dependent activity areas: (1) data collection, (2) analysis and interpretation, and (3) decision support for application to management or policy making. This includes sensing devices, information and decision-support systems, simulation models, controllers and actuators, communications, and new agricultural practices and infrastructures that are compatible with increasingly data-rich environments. Because these systems create entirely new agricultural and natural resource capabilities, training new professionals and outreach to end-users are essential companion objectives.

During the reporting period 1998-2002, the published definition of Problem Area 404 was the following.

RPA 404. Instrumentation and Control Systems

Instrumentation and information systems are important elements in all aspects of pre- and post-production agriculture. Sensors for detecting and monitoring and processing of the collected data can provide improved control of the production and processing of biological and non-biological materials.

Areas of research include but are not limited to:

- Development of instruments, research technologies, and procedures that enhance agricultural efforts.
- Determining accurate and precise standards of measurement.
- Development of sensors, image processing techniques, automation, decision support systems, controls, and models.

Exclude research on:

- Experimental design and statistics (Use RPA 901)

Nearly all other programmatic areas within the agency benefit from the research and application capabilities afforded by developments in this problem area. These include, but are not limited to, agricultural & food safety/security, air, soil & water quality, inspection & monitoring, nutrient management, carbon management, agricultural & forest production, water management, pest management, invasive species, forest management, ecosystem studies, wildlife management, and animal & plant health.

Because of the broad applicability of instrumentation and control systems, inputs, outputs, and outcomes are diffused throughout the agency efforts on many national issues (see Inputs, below).

The following logical organization of Problem Area 404 depicts three broad emphases along with several subordinate topics.

Biophysical sciences and chemistry
- Basic research
- Materials & processes
- Proof of concept

Engineering and technology development, testing, and validation
- New devices and/or systems
- Laboratory, and in situ, testing
- Application development

Adoption, economics, and decision support
- Aides & barriers for adoption
- Applications & economics
- Information management & decision support

Situation

Need

Direct, human observations can provide only general and unreliable qualitative information about crop development and health, food safety, and environmental quality. Furthermore, such observations are extremely limited in time and location. We often need more exact quantitative measurements with greater frequency and at many locations. Measurement needs cover a broad range of spatial scales (from landscape-level assessments to bacteria counts on individual food products) and vastly different time frames (from decadal climate change to continuous air monitoring near livestock operations). Sensor systems can make these needed measurements at high spatial and temporal frequencies. Engineered sensors and companion instrumentation and software extend human observational capabilities to help ensure that our crops are healthy and productive, our food is safe and nutritious, and our indoor and outdoor environments remain uncontaminated. Advances in biometrology and information technologies are required to address our need for timely and reliable information that has temporal and spatial relevance.

Issues

Food safety and quality represent one of the greatest public issues/concerns nation-wide. Safety and quality are very dependent on inspection and monitoring methods that can detect contaminants and discriminate defective (or poor quality) product. Whereas manual, microscopic, or bio-assay inspections cannot be performed quickly and accurately on 100 percent of any food product, sensor and instrumentation technologies

currently under development and testing promise to offer inspection capabilities that are accurate, fast (real time), and consistent. These technologies can range from detecting: internal bruising of apples to 10 cells of *Listeria* (a particularly virulent food pathogen) to insect infestations in a ship's cargo of grain.

Like crop production, animal production economics exhibits small profit margins. This makes the growth, development, reproduction, and well-being of each animal critically important for a profitable enterprise. Current technologies allow producers to monitor individual animal feed consumption, feedlot movement, temperature, lameness, milk production, meat composition and quality, and weight gain—often without any human intervention or presence. While animal tagging has been commonplace for decades, it is now possible to attach electronic tags that can measure and record animal condition, e.g., temperature or heart rate. Elevated temperature can signal estrus onset or a possible disease condition. Electronic tags can also be used for identification and marketing purposes. Many feeding, measuring, and monitoring systems have also been developed or proposed for aquacultural applications. Total investments in animal care and feeding during the course of each animal's production life are significant. New tools and technologies can help producers capture a return on that investment.

Environmental quality is another area where sensor-based monitoring can be very helpful. For example, air quality monitoring around confined animal feeding operations can be used to keep ammonia or odor emission within acceptable limits. Water monitoring for nitrogen and phosphorus runoff from agricultural lands can help regulate freshwater algae blooms and costal-zone hypoxia. An ability to quickly and accurately measure carbon sequestration in soils can facilitate more widespread application of a carbon-credit and trading marketplace. These types of measurement activities create special problems, however, because the elements being measured are molecular scale and smaller and they need to be quantified over large land areas. Nevertheless, these applications are scientifically possible; it remains to develop the engineering and technology capability to make them economical and practical.

Collecting data from one instrument, or many instruments, is only the first step in the overall decision-making process, which might be inspection, monitoring, tracking, etc. Often, many other components, e.g., data bases, simulation models, mathematical optimization, must be combined to form a fully developed decision support system (DSS). The final output of a DSS is a recommendation, interpretation, or prediction regarding the situation of interest, such as crop treatment, food safety, or water quality. DSSs may also incorporate economic models or calculations to determine which courses of action are reasonable. Other exogenous factors that might need to be considered include operational cultures within the organization or the industry or current financial markets.

Inputs

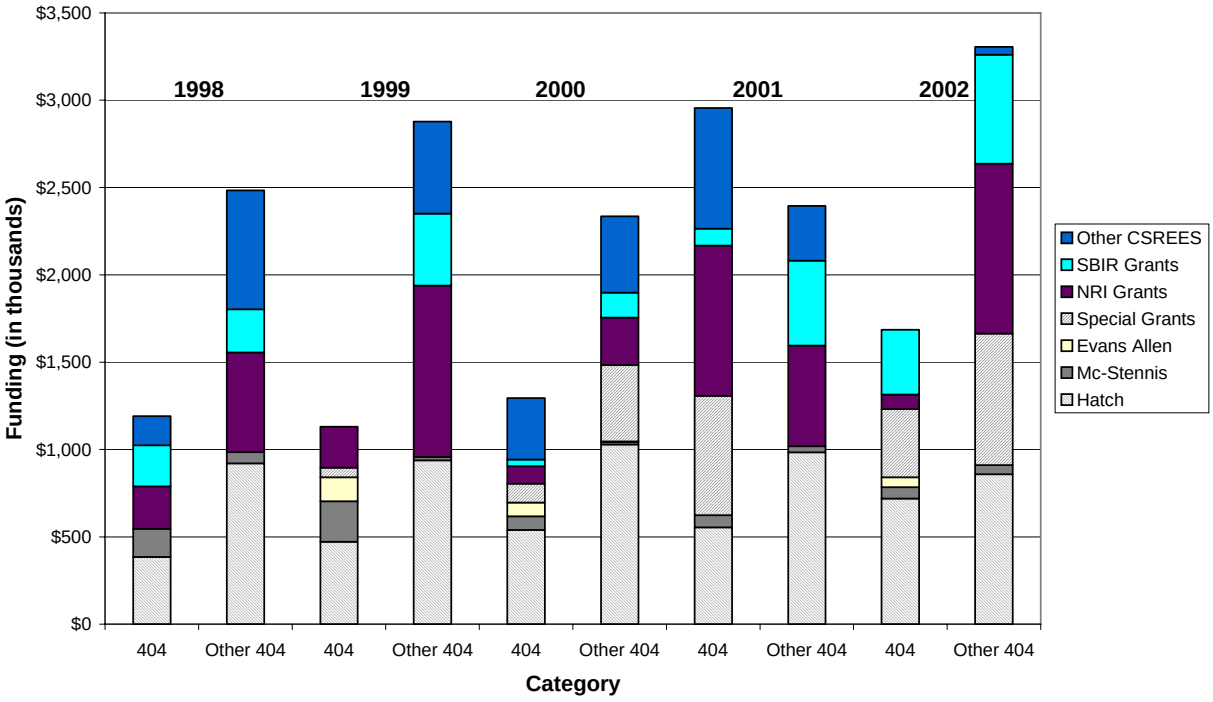
As noted above, because this engineering and technology problem area is broadly applicable across many of the agency's emphases, it appears almost everywhere. Many

funding opportunities in the National Research Initiative, the Initiative for Future Agriculture and Food Systems, the Small Business Innovative Research Program, the Section 406 Programs, Hatch, Smith-Lever, and McIntire-Stennis projects, and Integrated Pest Management support work in Problem Area 404. Work is supported that includes technology development, as well as, information systems and decision support. Both areas are covered by the Problem Area description. However, when funded projects are classified for recording in the Current Research Information System, the assigned problem-area classification usually focuses solely on the problem being address, e.g., food safety, soil quality, post-harvest inspection, but fails to account for the engineering component of each project. This results in a serious under-reporting of 404 activities. While similar under-reporting problems are not uncommon in other problem areas, they are most pronounced in 404 due to its sole emphasis on enabling technologies.

Realizing this classification problem, some additional searching was conducted to uncover "Other 404" projects. Keyword searching was used (biosens*, sensors, instrumentation) to find non-404 classified projects that should have been partially classified as 404. Furthermore, based on a brief survey of project PIs from this "other" listing, it was estimated that on average approximately 40 percent of the effort in those "Other 404" projects was actually associated with instrumentation, sensors, etc. Both bar charts in Figure 1.4.1 (CSREES Funding) and Figure 1.4.2 (Total Funding) provide separate data for 404-classified projects and "Other 404" projects. In almost all cases, the latter exceeds the former (more than doubling the total 404 effort), and indicates that work on instrumentation, controls, and sensors is vastly under reported.

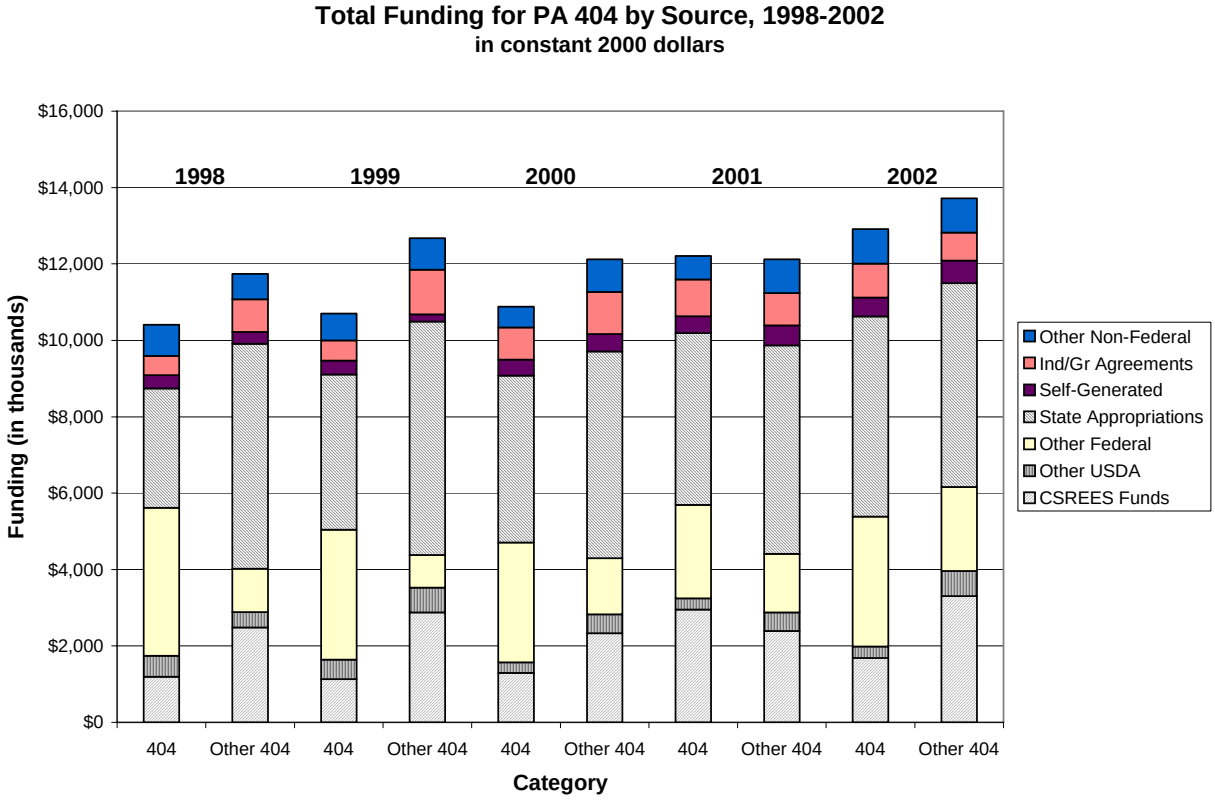
Figure 1.4.1

CSREES Funding for PA 404 by Source, 1998-2002
in constant 2000 dollars



Several other observations can be made concerning these data. It is apparent that the total of all CSREES support is much less than state support. In fact, the total federal support appears to be approximately equal to state funding. In most years, total CSREES support for 404 efforts appears to be about equal to non-CSREES federal support (Other USDA + Other Federal). But, a larger proportion of non-CSREES dollars support 404-classified projects (which tend to focus more on technology development) while, just the opposite, a larger proportion of CSREES dollars support *applications* of technology to agricultural problems ("Other 404"), primarily applied engineering, information systems, and decision support. This is not unexpected given that there are no strictly "engineering" grants programs offered by the agency. Applicants for CSREES funding necessarily, then, skew their proposals toward the application discipline and steer away from highlighting their project's engineering component. This application focus carries over naturally to the classification process for awarded projects.

Figure 1.4.2



As CSREES moves toward a greater emphasis on issues-based programming, it is unlikely that any predominantly engineering grant programs will materialize. Issue-focused programs will encourage proposals that clearly identify their benefit to solving problems within a particular issue area. Any engineering components of such projects are then viewed as vehicles to achieving project objectives, but not as objectives unto themselves. This has some intuitive appeal and one academic[1] suggests that recent changes to biologically based engineering programs nationally (from agricultural engineering) have freed those curricula from specific areas of application. However, it does create problems for engineering researchers and specialists in academia in two ways: (1) academic engineering researchers are still encouraged to develop engineering systems for industrial agriculture that may not readily address agency issue areas and (2) even when submitting a proposal that properly describes a project in terms of an issue, these researchers often run into peer-review panels with little or no engineering expertise to properly evaluate their project's potential contributions. Engineering research opportunities are provided by the agency's SBIR program, but that program does not offer the best R&D model for academia participation. The response by engineering researchers has been to seek support from other sources, either their states or industry for applied research, or other federal agencies (e.g., NIH or NSF) for more basic research.

[1] R. E. Young, "Comparison of "Bio"-type Engineering Undergraduate Curricula from Two Application Origins: Agricultural and Medical," Dept. of Agricultural and Biological Engineering, Penn State Univ. 2004.

An impediment to the latter, however, is that anything "agriculture" is often viewed as applied research ab initio. Researchers are then forced to describe their projects in ever more basic-research terms, pushing any aspects of agriculture farther into the background.

Personnel involvement in 404 projects is listed in Table 1.4.1. The data seem to be fairly similar between 404 and "Other 404" projects. The combined effort results in more than 60 scientist full-time employees (FTEs) on an annual basis across all funding sources.

Table 1.4.1 Personnel allocations for Problem Area 404, 1998-2002.

		1998	1999	2000	2001	2002	TOTAL
404	Scientist Years	28.9	29.3	26.4	29.0	41.6	155.2
	Other Personnel	76.9	84.1	92.8	95.5	111.2	460.5
Other 404	Scientist Years	33.3	32.8	30.6	28.0	36.6	161.2
	Other Personnel	119.3	120.0	108.8	113.0	111.6	572.8

CSREES supports training of new professionals and teaching enhancement though higher education grants, scholarships, and fellowships. Scholarship and fellowship support appears in Table 1 for engineering disciplines (ag, food, forest, and environmental), and grant funding to support teaching enhancement for agricultural engineering faculty appears in Table 1.4.2. Because these funding amounts cover engineering broadly, they represent educational expenditures for several problem areas (401, 402, and 404).

Table 1.4.2. Scholarships and fellowships for engineering disciplines, 1999-2002 ($000)

	FY AWARDED				
PROGRAM AREA	1999	2000	2001	2002	GRAND TOTAL
Multicultural Scholars Program			74.3		74.3
National Needs Graduate Fellowship Grant Program		966.0		1,794.0	2,760.0
TOTAL	$0	$966.0	$74.3	$1,794.0	$2,834.3

There are several additional sources of agency inputs to this problem area: external reports, national leadership, and inter-agency collaborations. External reports help provide national direction for the program and provide the agency with a "reality check" that its efforts are consistent with the viewpoints of others in the agricultural arena. The

National Research Council has produced a couple of agriculture-related reports recently that are pertinent to this problem area: one dealing with precision agriculture[2] and a second addressing agriculture, food, and environmental research for the Research, Education & Extension agencies of USDA[3]. Several specific recommendations and challenges from those reports appear below.

Table 1.4.2. Teaching enhancement grants for agricultural engineering, 1999-2002 ($000)

	FY Awarded				
PROGRAM AREA	1999	2000	2001	2002	GRAND TOTAL
1890 Capacity Building Grants Program	629.7	437.3	1,467.8	100.6	2,635.4
Challenge Grants Program	434.1	299.2	100.0	366.1	1,199.4
TOTAL	$1,063.8	$736.5	$1,567.8	$466.7	$3,834.8

- PA requires new approaches to research that are designed explicitly to improve understanding of the complex interactions between multiple factors affecting crop growth and farm decision making.
- The potential of PA is limited by the lack of appropriate measurement and analysis techniques for agronomically important factors.
- Data collected at the field scale can be assembled into regional data bases. Mechanisms are needed to find value in these data by: establishing data collection and interchange standards; creating institutions for collecting, managing, and networking data; and developing policies to facilitate data sharing and access while ethically protecting ownership interests and confidentiality.
- Unbiased, systematic, and rigorous evaluations of the environmental and economic costs and benefits of PA methods are needed.
- Workable decision support tools based on precision agriculture are need that will enable producers to adjust the timing and amount of production inputs while minimizing waste and environmental impacts.
- Understanding the effects of new technologies, e.g., genetically modified organisms, will require improved risk assessment and communication methods, and enhanced ecosystem models and other analytic frameworks.
- Large gaps exist in our ability to predict and mitigate species invasions.
- We need a greater understanding of the production of ecosystem and environmental services from agricultural lands, e.g., biodiversity, carbon sequestration, and water quality, and ways to measure and monitor those benefits.

[2] National Research Council, *Precision Agriculture in the 21st Century: Geospatial and Information Technologies in Crop Management*, National Academies Press, Washington, 1997.
[3] National Research Council, *Frontiers in Agricultural Research: Food, Health, Environment, and Communities*, National Academies Press, Washington, 2003.

- Environmental research needs to address appropriate geographic and time scales so that results will have relevance to long-term changes. In addition, there needs to be a better integration of leading-edge environmental science concepts with emerging technologies.
- New scientific tools, such as…rapid [food pathogen] detection methods, provide new opportunities for epidemiology and risk assessment.

The National Assoc. of State Universities and Land-Grant Colleges issued a report in 2001 that provides an agricultural roadmap[4] for the nation's colleges of agriculture for the next 10-20 years. That report issued seven challenges for agriculture and identified several research topics for each. Selected topics appear below.

- Developing innovative technologies to reduce the impact of animal agriculture on the environment;
- Integrating long-term weather forecasting, market infrastructures, and cropping, and livestock management systems to rapidly optimize domestic food, fiber, and fuel production in response to global climatic changes;
- Creating broad-based, comprehensive models to assess the socioeconomic impacts, risks, and opportunities associated with global climate change and extreme climate events on agriculture.
- Developing better methods to protect the environment both on and beyond the farm from any negative impacts of agriculture through optimum use of cropping systems including agroforestry, phytoremediation, and site-specific management;
- Decreasing our dependence on chemicals with harmful effects to people and the environment by optimizing their use in effective crop, weed, pest, and pathogen management strategies;
- Developing better methods to protect the environment both on and beyond the farm from any negative impacts of agriculture through optimum use of cropping systems including agroforestry, phytoremediation, and site-specific management;
- Decreasing our dependence on chemicals with harmful effects to people and the environment by optimizing their use in effective crop, weed, pest, and pathogen management strategies; and
- Eliminating food-borne illnesses

National leadership in the agency rests primarily with National Program Leaders (NPLs). It is their responsibility to guide, promote, and facilitate efforts within their area(s) of expertise in partnership with industry, academia, other federal and state agencies, and non-governmental entities. Given the breadth of Problem Area 404, there are numerous program staff involved in this work, including NPLs in the following areas: food systems, plant systems, animal systems, environment and natural resources, education programs, and engineering. While there is one NPL in the Processing, Engineering, and Technology Section of the agency that has lead responsibility in this problem area, there

[4] National Association of State Universities and Land-Grant Colleges, Experiment Station Committee on Organization and Policy, *A Science Roadmap for the Future*, Task Force on Building a Science Roadmap for Agriculture, Washington, 2001

is truly a community of activity that cuts across the agency and the disciplines represented. In addition to managing competitive grants programs, the NPLs also manage special grants, participate in intra- and inter-agency committees, and work closely with universities through multi-state committees and program reviews.

Collaborations with other agencies offer CSREES the opportunity to share resources, in some cases, or to share expertise regarding common problems, in other instances. For most intents and purposes, the most effective and useful partnerships involve sharing funds in a joint grant solicitation. The Initiative for Future Agriculture and Food Systems (IFAFS) contained substantial funding that allowed agency NPLs to partner effectively with other agencies. The Advanced Spatial Technologies Program in IFAFS enabled CSREES to offer a joint grants program with NASA for integrated research, education, and extension projects related to site-specific management and precision agriculture. NASA funds some similar activities under their AG2020 Program. A combined grantee workshop has been held for the past three years to highlight and discuss advances generated by both programs.

Other funding partnerships occur in less obvious, more indirect ways. For three years, NASA funded geospatial Extension positions at six land-grant universities. Even with this external support, however, it is reasonable to assume that some Smith-Lever formula funds (extension) were also combined in those projects. It was also the expectation of those awards that the recipient institutions would eventually pick up 100 percent support for those positions, using state appropriated funds, Smith-Lever, or other funding sources. In this case, CSREES partnered with NASA in an indirect way using formula funds.

The initial IFAFS collaboration between NASA and USDA evolved into a joint inter-agency working group consisting of NPLs from several REE agencies (including CSREES), NASA staff, and administrators from both USDA and NASA. This collaboration culminated in a memorandum of understanding between USDA and NASA (signed May 30, 2003) that pledged the two organizations to continue working together on remote sensing technologies and applications (see Exhibits). Subsequently, eight focus areas of application were identified and individual working groups convened for each focus area. Several CSREES NPLs participate in those working groups. In addition, that MOU led directly to joint USDA/NASA funding in FY 2004 of 3 additional geospatial Extension positions.

In cases where agency funds are lacking, NPLs are participating in programmatic development at other federal agencies (e.g., EPA, NIH, and NSF). In many instances, funding opportunities provided by those other agencies can be tweaked slightly, or more broadly marketed to colleges of agriculture, to make those offerings viable sources of funding for our traditional customers.

Outputs

While numbers of scientific publications are not a good absolute measure of program performance (owing to a large percentage of publications appearing after project

termination), they represent one of the few metrics of program outputs that are regularly collected. A small sampling (30) of the 397 funded projects in the "Other 404" category suggests that approximately 3.2 publications were generated in every project year. By applying this approximation to all project years for 404 activities (1868 project-years), we estimate a total of 5977 publications for the 1998-2002 reporting period. Dividing the total funding expenditures in the reporting period by this estimate of publications, we arrive at approximately $20,200/publication.

Training graduate students is often viewed as more beneficial in the long run than large numbers of publications. Our estimates indicate that over both 404 categories approximately 125 FTEs in the "Other Personnel" years (Table 1) were allocated annually to graduate students. This translates into 250 half-time graduate students receiving training each year.

Because data on many types of outputs and outcomes for funded projects are just not collected by funding agencies, an example from one of our large programs is provided below to indicate the effort expended and the impacts generated. Because this project is funded under the special research grant authority, it cannot, by law, have extension or education components.

Global Change/UV-B Monitoring Program

Neither of the prior categorizations of inputs (404 and Other 404) captured the agency's largest program in this problem area, the Global Change/UV-B Monitoring Program (see Exhibits). It is a $2.5M agency line item in the President's budget, although actually funded at lower levels during 1998-2002 (approx. $1M, $1M, $1.5M, $1.5M, and $2.25M respectively). The U.S. Department of Agriculture initiated this program in 1992 with a grant to Colorado State University. This program also contributes to the CSREES Strategic Plan Goal 5, "Protect and Enhance the Nation's Natural Resource Base and Environment" by determining the impact of UV-B and photosynthetically active radiation on crops, animals, forests, rangeland, and the resulting effect on the environment and the U.S. agricultural production system. In addition, this program contributes to the U.S. Climate Change Science Plan as part of the global ground-based observing system in support of long-term climate monitoring and prediction. The structure of the program is ideal for conducting research at the regional and national levels which promotes the analysis of the response of human and natural systems to multiple climate stressors.

This UV-B network has been growing since its inception, and has now reached 33 instrumented monitoring sites. Instrumentation maintenance and expansion, along with data delivery, consume approx. 75 percent of the program's budget annually. Significant progress has been made to make more of the data products available directly from the program's web site (http://uvb.nrel.colostate.edu/UVB). Users can view graphic displays of instantaneous cloud and aerosol optical depths and daily column ozone. Graphs as well as files of the data used to generate them are available for download. Recently, hourly and daily sums, clear sky calibration checks using the Sun, and continuous UV spectra that allow UV-B plant doses to be determined have been added to the Data Products area of the web site. The program's data are used by a wide variety of

researchers and organizations. In particular, NASA uses their aerosol optical depth estimates to correct satellite imagery. In addition, the program has partnerships with the Univ. of Illinois and NASA Goddard to partially fund one scientist each.

The program promotes UV-B and related effects research in scientific outlets (29 refereed papers and 25 proceedings articles during 1998-2002, 33 more in 2003) and graduate education (currently 5 graduate students and 2 post-doctoral associates). Principal investigators Slusser and Gao served as co-chairs for 4 international UV conferences (UV measurements, modeling, and effects I, II, II, IV), 2 national UV workshops, and 3 International Ecosystems Dynamics, Agricultural Remote Sensing and Site-Specific Agricultures conferences. They also served as co-editors for 7 SPIE proceedings and three UV special issues for: Journal of Agricultural and Forest Meteorology, Journal of Optical Engineering, and Journal of Photochemistry and Photobiology.

To better serve the needs of agricultural researchers, the program continues to provide data and technical guidance to the community who use its measurements to study agricultural and forest plant responses to UV-B radiation and other climate stressors. It is expected that data requests will increase from other research groups, such as the environmental, chemical (coatings and protectants) and medical communities. In addition, the program supports eight subcontracts to further specific research objectives related to UV-B effects. The following listing provides some program outcomes.

- Clouds have greater impact on year to year variability than column ozone.
- UV Spectroradometer and Filter radiometer Intercomparison (1998-2003); Refined and improved calibration and stability of UV data;
- Developed a method for determining aerosol absorption.
- Higher levels of UV-B could have negative effect on photosynthesis and production; developed one-dimensional and three-dimensional UV canopy radiation transfer models; sorghum epicuticular wax experiments were completed and results showed that the reflectance could be related to wax amount.
- Quantified several phenological, growth and physiological parameters as affected by UV-B with other stressors; identified heat and UV-B sensitive parameters for plant breeders; quantitative UV-B information built in the cotton simulation model ; fiber quality negatively affected.
- The exposure needed to induce “sunburn” was evaluated for four soybean cultivars; the biomass impacts of UV-B reach a maximum at approximately 1.5x ambient with the plant mitigating any additional impacts on biomass with higher UV-B; the phenolic compounds, such as hydroxycinnamates, provide extensive UV-B protection

The program is currently developing an integrated crop impact assessment system that fully couples the Earth’s climate, ultraviolet-visible solar radiation, and crop growth models. The assessment system will assimilate satellite and in-situ observations and predict climate-crop interactions. In particular, the program is developing an advanced model infrastructure to quantify the impacts of important environmental stressors, including temperature, moisture (drought), nutrients, UV radiation, CO_2 concentration,

and aerosols and other air pollutants, on agricultural crop yield and quality. Early work on this project is making use of supercomputer capabilities at the Univ. of Illinois. As their computing need grows, we hope to couple this program's effects modeling work with another CSREES special grant on Computational Agriculture that applies high-performance computing to data-rich agricultural problems. It is hoped that such collaboration will strengthen both programs.

Analysis

(1) Relevance

Traditionally, much of the effort in Problem Area 404 was devoted to agricultural production practices. Over the past decade, however, the scope has broadened to include food systems and ecological and environmental benefits. For example, much recent research on detection for food safety is a key component of USDA's agenda and well-support by Congress in CSREES appropriations. Furthermore, over the past decade, agricultural engineering departments (where much of this work is conducted) have transitioned into biological engineering departments (see footnote #1 and exhibit). Dramatic curricula changes in those departments have kept education of professionals in step with this expanded research agenda. Agency personnel and expenditures have mirrored that evolution at the universities. While no data have been generated for this report, it is our belief that many 404 research projects contain a significant "developmental" component (versus "basic" or "applied") that readily lends their results to delivery by Extension personnel. In addition, as producers and managers request more valuable and timely information about crops and natural resources, development and application of enabling, sensing and information technologies has ever increasing importance.

(2) Quality

Many of the application areas mentioned above hold periodic stakeholder meetings to ensure that program direction is appropriate. Over time, these have, at least in part, led to the current level of support for 404-related projects. A Nanoscale Science and Technology Workshop was held at CSREES in 2002; nanotechnology is also a Presidential Initiative. The report from that meeting has directly influenced the new NRI Nanotechnology funding opportunity in CSREES. Based on informal discussions with PIs from 404 projects, it seems that they often supplement CSREES funding with state support and funding from other agencies (e.g., NIH, NSF, DARPA). Passing peer review from other funding sources helps validate our agency expenditures in their work. In the case of the Global Change/UV-B Program, it will soon be the only such network in the U.S. (EPA is phasing out theirs) and is the most extensive one in the world. This means that it will only continue to grow in importance and impact.

(3) Performance

Productivity estimates for publications ($20.2K/publication) and for graduate student training (250/yr), along with the extraordinary curricula changes in agricultural and biological engineering departments recently (which NPL-led departmental reviews have helped shape), suggest that the agency is moving in the right direction for this problem area. In the case of precision agriculture, crop consultants, fertilizer dealers, and equipment manufacturers have been bringing recent developments to producers. In other instances, newly created devices and processes are supported and commercialized via the agency's SBIR program. It is our sense that where research is more closely tied to delivery (extension), such as integrated programs, impacts are much more immediate because the technology transfer step is readily identified and fully integrated. Strictly research projects don't benefit from that mixture of assignments and, consequently, experience more deferred outcomes. It is a long road from idea to data to conclusions to product/process to delivery to adoption to impact; CSREES only participates in a relative small part of that progression for any single project. Until the agency engages is a larger portion of that full process, it will always be exceedingly difficult to tie agency activities to final impacts.

Economics of Agricultural Production and Farm Management (PA 601)

Introduction

The focus of Problem Area 601 is on the economic choices farmers and ranchers make to access and allocate resources for the production of commodities, services, and products. These resources are what help farmers and ranchers to minimize production and other forms of risk thereby assisting them to optimize farm income. CSREES' role involves program operational responsibilities, administrative oversight of projects funded by various sources of funds, and the interaction with various stakeholder groups involved and interested in this problem area. Economics of Agricultural Production and Farm Management cuts across two major programs within CSREES, namely the Risk Management Education (RME) Program and the Farm Management Program.

The RME Program is funded directly by the Congress ($5 million annually), with additional work being conducted on various projects funded through Hatch, Smith-Lever, Special Research Grants and Federally Administered Grants projects. Approximately .35FTE of a National Program Leader is dedicated to the RME Program.

There is no directly funded Farm Management Program, per se. However, this program does have a dedicated National Program Leader (NPL) with approximately .20 FTF of his time allocated to this and related issues. The program is funded primarily at the state and regional level via Hatch funding, Smith-Lever funding, Special Research grants, and Federally Administered grants.

The Risk Management Education Program and the Farm Management Program are discussed separately in the following two sections.

Risk Management Education Program

Overview

The purpose of the CSREES RME Program is to develop educational and training programs that emphasize improving the ability of producers and their families to more effectively manage risk associated with farming and ranching, thereby improving farm profitability, net income, and family well-being.

Risk is obviously an important aspect of the farming business. Producers must choose among numerous alternatives that reduce the financial effects of the uncertainties of weather, yields, prices, costs, government policies, global markets, and other factors and influences that can cause wide fluctuations in farm profitability and net farm income. The CSREES RME Program identifies five general types of risk for which partners in the land-grant university system and non-profit and for-profit organizations develop and deliver risk management education products to producer. The areas for which these

products are developed and delivered are production risk, price or market risk, financial risk, institutional or legal risks, and human or personal risks.

Funding is authorized by The Agriculture Risk Protection Act of 2000 (Public Law106-224, June 20, 2000) which amended "the Federal Crop Insurance Act to strengthen the safety net for agricultural producers by providing greater access to more affordable risk management tools and improved protection from production and income loss, to improve the efficiency and integrity of the Federal crop insurance program." Congress added a new subparagraph to Section 524, Education and Risk Management Assistance, Section 524 (1) (B): The Secretary, acting through the Cooperative State Research, Education, and Extension Service, shall carry out the program established under paragraph (3), Partnerships for Risk Management Education (partnerships are with the land grant university system, CSREES, for-profit and non-profit organizations in the private sector.

Subparagraph (A) directs the Secretary, acting through the Cooperative Research, Education, and Extension Service, shall establish a program under which competitive grants are made to qualified public and private entities (including land grant colleges, cooperative extension services, and colleges or universities), as determined by the Secretary, for the purpose of educating agricultural producers about the full range of risk management activities, including futures, options, agricultural trade options, crop insurance, cash forward contracting, debt reduction, production diversification, farm resources risk reduction, and other risk management strategies.

The legislation directs the Commodity Credit Corporation to make available for the CSREES RME Program and the Risk Management Agency's (RMA) Targeted States Program a total of $10 million for fiscal year 2001 and each subsequent fiscal year. Of the $10 million, $5 million is specifically allocated to CSREES.

It should be noted that the CSREES program is one of several USDA's management education programs. The others are managed by the Risk Management Agency (RMA) with an annual budget of $25 million.

Prior to 2004, there was minimal coordination between CSREES and the RMA regarding their respective risk management education programs. However, in the spring of 2004, CSREES initiated a meeting of the RME program managers in RMA and CSREES. That meeting was the first of its kind and set the stage for developing a closer, more coordinated relationship between the two agencies' programs. The initial step in this effort was to ensure each agency was aware of what projects were funded by the other to minimize the potential for inadvertent duplicate funding of projects. Future plans call for the coordinated release of Requests for Applications to enhance the potential of joint funding projects that address each agency's goals, and to use a consistent format for progress and final reports.

In accordance with the Agricultural Risk Protection Act of 2000, CSREES began a Risk Management Education Competitive Grants Program in 2001. CSREES established four regional risk management education centers that were required to compete annually to

receive funds. These centers (Northeast-University of Delaware; North Central-University of Nebraska-Lincoln; Southern-Texas A&M University, and Western-Washington State University) used the granted funds to establish their own competitive grants programs to fund regional risk management projects. A "Digital Center for Risk Management Education" was established at the University of Minnesota via a standard CSREES RME grant. The Digital Center provides electronic support to the four regional centers with regard to electronically accepting pre-proposals, proposals, progress reports and final reports, and an archival service for all projects funded under the RME Program as well as linkages to other sites with relevant risk management information.

In FY 2004, a series of changes to the structure of the program were initiated. First, funds that were allocated to a national competition were instead distributed to the regional centers with the proviso that they will conduct a competitive grant program for multi-regional projects. Second, a set of common operating guidelines were developed which provides specific protocol for a wide range of procedures. Third, "Streamlining Agreements" were established with each center to give them responsibility for processing awards. Fourth, the competition for center grants will be done every fourth year instead of every year.

Situation

The overall goal of the Risk Management and Farm Management programs are to enhance the profitability of farmers and ranchers. Specifically relating to risk management, the goal is to identify those aspects of risk management that farmers and ranchers need help with, and to develop educational and training tools to assist them in achieving adequate or acceptable risk management knowledge for them to make informed decisions. In addition, this goal is first accomplished by providing leadership in identifying and meeting research (applied), education and extension needs of producers in the risk management area. This is carried out by the four risk management education centers each of which has an advisory council composed of representatives from stakeholder groups (farmers, agricultural insurance, RMA, commodity groups, NGOs, banking and lending institutions, state departments of agriculture, etc.) These councils meet twice a year. The first meeting is to provide to the respective center director their learned judgment as to the current regional needs and priorities that form the basis of each center's Request for Applications. The center directors use this information as the basis of change each year for their respective RFAs. The councils meet the second time to review proposals and recommend to the center directors projects to fund and the level of funding for each.

The second way CSREES assists in achieving the overall goal is the fair and equitable distribution and efficient management of funds made available to CSREES for these purposes. These include Smith-Lever (extension) funds, Hatch (experiment station) funds, RME Program funds and congressionally earmarked funds that include Special Research funds and Federally Administered Project funds.

Commencing in FY 2004, CSREES will distribute the entire $4,800,000 ($200,000 is allocated to CSREES for administration of the program) to four regional centers and an electronic support center on a competitive basis. The four regional centers will use these funds to run their own competitive programs regionally, but will also entertain multi-regional projects. Additionally, these centers will support other risk management education activities for various audiences that their advisory councils believe need additional assistance. However, the focus on all their activities is on producers and outcomes, as opposed to activities and outputs.

The electronic support center will provide a number of services to the four regional RME centers, including electronic publication of regional RFA's, electronic receipt of pre-proposals, proposals, annual progress reports, and final reports. Additionally, the electronics support center will provide archiving of all funded projects and their results with public access, links to other risk management education activities, and other pertinent risk management information.

The RME Program is designed first and foremost to emphasize the development and delivery of information on risk management information and tools for producers, with an equal emphasis on specific outcomes for the targeted audiences. The proposal receipt structure and progress reports structure are designed with these two areas of emphasis in mind. The guidelines for proposal preparation as published by each of the centers have a consistent format that emphasizes outcomes in terms of behavioral change of targeted audiences. The current supporting Digital Center at the University of Minnesota actually builds (electronically) the template for progress and annual reports for each proposal as they are accepted for review. Hence, those who eventually receive a grant from these centers have the outline for their progress reports and final reports so that the reports are consistent in format for all four regions.

In addition to RME Program activities, there were many funded by CSREES and other Federal agencies as reported on CRIS. Of the total 2049 projects that included Problem Area 601, 1779 were funded by CSRESS through a multitude of funding sources (Hatch, McIntire-Stennis, Evans-Allen, Animal Health, Special Grants, NRI grants, SBIR grants, other CSREES funds). Of these, 391 contained "risk management" either in their title or in key words. Thirteen- of the projects were conducted by the Economic Research Service, and were primarily focused on the economics of agricultural production and farm management. ARS funded 79 projects with Risk Management and 13 of those incorporated economics, at least peripherally. CSREES funded approximately 286 of the 391 projects with risk management, and 97 of these incorporated economics as a major emphasis. For example some dealt specifically with livestock marketing, other with alternative agricultural practices or business (for example, bio fuels), while others examined optimum timeliness of marketing various commodities to maximize revenues. Still others examine various forward contractual options, environmental risks, labor-related risks, and marketing or price risk.

Inputs

In FY 2001, $4.8 million was made available for CSREES' RME Program. A competition was run at the national level, and four centers were funded. Since the competition was held so late, the four centers in FY 2001 provided each land-grant university in its region with a block grant to begin developing risk management programs in each of the states. In FY 2002, the remainder of the funds was then allocated based on competitions held by each of the four centers. Also in FY 2002, because funds were not obligated by August, the Congress decided to utilize $6, million of the $10 million elsewhere, and then allocated only $2M to CSREES and $2M to the RMA risk management education programs. Since FY 2002, $5.0 million has been made available to CSREES to fund the REM Program. Total State and Federal funds captured in the Current Research Information System (CRIS) for the 601 problem area ranged from $14.3 million in 1998 to $22.8 million in 2002. During this same time span, CSREES contributions from all sources amounted to $3.5 million in 1998 and $5.5 million in 2002. Given the distribution funds by funding source by CSREES in the 601 Problem Area, it is estimated that over a million dollars were expended in 1998 and more than $3 million was expended in 2002 on projects that directly or indirectly addressed risk management issues. This estimate is based on the assumption that most of the extension projects and many of the Special Grants specifically incorporated economic analysis specifically related to risk management.

Outputs

Two years of Risk Management Education are covered by this evaluation, FY 2001 and FY 2002. During that period, 81 projects were funded at the regional level. Each of the five risk management categories were addressed within each region, and there appears to be adequate funding of projects that target socially disadvantaged farmers and ranchers, underserved farmers and ranchers, and women in agriculture. Additionally, a number of workshops and conferences that addressed risk management issues were also funded in each region. At the Federal level, two forms of grants were funded, center grants and standard grants. Each of the four centers received funds in FY 2001 and FY 2002.

The Risk Management education centers each develop a regional newsletter, and annually the four center directors get together and develop an annual progress reports for the entire program, with Congress and Congressional Staff the targeted audience. Additionally, the center directors actually visit various congressional delegations and personally present the annual progress report. This has been an effective communications strategy.

The regional RME center directors also decided early on to develop a program that is outcomes oriented, following the model developed by Harold S. Williams, Arthur Y. Webb and William J. Phillips, published by the Rensselaerville Institute. This approach is referred to as outcome funding. As a result of this decision, the pre-proposal and proposal design emphasizes the target audience, how they will participate in the project,

and what will be the expected outcomes, and finally, how those outcomes will be verified. When a proposal is received by the Digital Center, a progress report and final report outline are automatically prepared that provides a consistent template for all reports, emphasizing outcomes, regardless of the region.

The verification system, as it is known, is nearly complete, and should be operational this fall. Once completed, the public will have access to annual progress reports, final reports, and will gain a better understanding of actual accomplishments. The progress reports are formatted such that the project director must report progress against the expected outcomes initially identified in the funded proposal. Part of this also entails discussions with the appropriate center director if expected progress against the outcomes is not being satisfactorily achieved. This would then lead into a negotiation process by which adjustments to the project would be made to hopefully achieve most of the expected outcomes.

Each funded project will have a final report available to the public via the Digital Center and the regional centers. These projects will provide multi-faceted risk management educational curricula, new risk management education tools, new risk management delivery methods, with the ultimate goal of enhancing the risk management knowledge lever of producers and their families and thereby positively impact net farm income and the long-term viability of the agricultural enterprise.

Outcomes

In Texas, producers and commodity group representatives met to evaluate how they might improve the "Master Marketer" series of risk management training sessions. The group identified the need for an advanced topic series (ATS), and prioritized a list of 10 topics on which they need additional risk management knowledge. More than 250 producers are expected to participate in the 10 2-day short courses on topics ranging from advanced hedging futures and options strategies, to helping producers be more disciplined in executing their marketing plans. Producers will also be provided the opportunity to develop their own unique commodity-specific plan in future short courses

The dairy sector has been evolving to more of a market-oriented situation, and so in Pennsylvania two projects were funded. In one 130 dairy producers learned how to better manage the financial risks of their business by implementing Best management Practices in Business & Information Management. The other program is designed to assist dairy farmers in improving their forward contracting and hedging abilities to enable them to protect their milk revenue and farm equity.

Eighty-seven producers, agriculturalists and educators in Montana and northern Wyoming, learned a number of things, among them are the importance of choosing insurable units wisely, the details of how to calculate approved production histories (necessary for many insurance programs), information on specific insurance products, the process for requesting actuarial changes, and details on the 2002 Non-Insured Crop Disaster Program.

From a human risk mitigation perspective, more than 70 farmers, managers and farm labor supervisors representing a number of agricultural operations in Southern California, took part in a series of interactive labor management training seminars using Spanish. Over 90 percent of the work force and their supervisors in the four counties (Orange, Riverside, Imperial, and San Diego) working for approximately 10,000 agricultural enterprises are Hispanic. As a result of the success of this program, the San Diego Farm Bureau, USDA's NRCE and FSA in Riverside County, have stepped forward to sponsor similar workshops in the future.

A number of partners representing extension at the universities of New Hampshire, Vermont and Main together with the Connecticut department of Agriculture, the New England Small Farm Institute , Maine Farm Link, Land Link Vermont, and the University of Vermont's Center for Sustainable Agriculture came together to develop workshops on the intergeneration transfer of the farm. The workshops are designed for producers throughout the region dealing with estate tax provision, legal methods to protect assets from taxation, individual goals related to farm estates, tools to use to transfer farm assets, and business structure that fit the farm family's estate planning goals. Each workshop will be tailored to the geographical area in which it is being presented to ensure relevance and immediate usefulness.

In the North Central region, 23 workshops on "Pilot Livestock Revenue Insurance Producer Education" were present across the region with over 600 pork producers attending.

The projects noted above are just a sample of what has been and is being funded to assist producers in becoming more knowledgeable in managing the multitude of risks associated with the agricultural enterprise. Immediate and intermediate changes are taking place, and new opportunities are being identified.

For example, the Pennsylvania Department of Agriculture with Penn State University developed a new insurance idea that emphasized whole-farm insurance coverage. Many farms, particularly in the Northeast and South have a multitude of crops, some of which have insurance programs, but many more that do not. An insurance product was developed and piloted in Pennsylvania in 2001. In 2002 it was expanded to the entire Northeast, and recently, testimony was provided by the Director of the Western RME Center to expand the product into the western States. It is though the help of the Risk Management Education centers that improved knowledge of such products are developed.

Farm Management Program

Overview

Farm management, simply stated, is all about managing land, labor and capital so as to obtain the highest possible returns consistent with the farm and/or farm family goals and values. This rather simple statement belies the complexity involved in achieving the desired ends.

With the exception of the Initiative for Future Agriculture and Food Systems (IFAFS) in which one program area was dedicated to farm management in a broad way (Farm Efficiency and Profitability), there are no dedicated funding programs within the National Research Initiative or in the Section 406 integrated programs that deal with farm management from an economic perspective. Obviously, there are many funded projects that involve one or more aspects of farm management in the SARE Program. Other sources that fund farm management projects are Hatch funding, Evans-Allen funding, Smith-Lever funding, Special Grants and Federally Administered grants. These are funded at the State and multi-State level, but not in any coordinated, national effort.

The responsibilities of the NPL for Farm Management center on reviewing the above noted projects to ensure they meet the goals and objectives of the funding criteria and parameters specific to the funding source, participating in multi-State project meetings, reviewing proposals for Special grants and Federally Administered Grants (Congressional earmarks) to ensure they meet the parameters established in the authorizing and appropriations language, and participating with the regional extension committees organized around farm policy, farm marketing, and farm management. Another responsibility is to keep interested parties informed of possible funding opportunities within in CSREES and other agencies in the USDA, foundations, and other governmental agencies. However, having only 20 percent of the time of one NPL assigned to the farm management area makes for very thin coverage, considering the large amount of agricultural research, education, and extension resources that are dedicated to farm management.

Situation

The structure of agriculture has changed significantly over the last decade, and continues to develop in a dichotomous fashion, increasingly large farms producing a greater share of total production, and increasing numbers of small farms, with middle-size operations declining. Another change that is occurring is the increased “industrialization” or concentration in the livestock sector, and in particular finishing yards and packing plants. As a result, there are now fewer buyers for grain, decreasing the marketing “power” of individual farmers. And within the retail sector, internationally as well as nationally, more and more of the retail space is being controlled by fewer and fewer companies, increasing their marketing power in terms of their purchasing power, and therefore, marketing power. Consumers, here and abroad have concerns with GMOs and food

attributes that are creating challenges on the demand side of the equation. On top of all of this, is the increase in international trade which has benefited some sectors but has had devastating short-run impacts in other agricultural sectors and commodities. A further compounding situation is the increasing emphasis being place on homeland security and the apparent vulnerability of the food production and distribution systems in this country. In addition, financial institutions are becoming more concentrated as well that in some areas have resulted in less credit being made available, and often at higher costs. The liabilities arising out of environmental issues, such as pesticide applications, runoff, manure management, in-field nutrient management, air quality standards, etc. also poses many challenges to today's producers.

This setting results in an economic and political climate that requires farmers interested in long term survival to practice the best farm business management practices they can. Cutting-edge managerial practices need to be adopted. It is from the farm production plans, farm finance plans, farm marketing plans, and farm strategic planning that comprise the bulk of the farm business plan and identifies the managerial needs and requirements. The challenge, from CSREES' perspective, is to try to ensure that adequate resources are being pumped into the development of alternative farm planning products, managerial tools, and long-term strategic planning tools, and to ensure an adequate delivery system exists through which these products may be passed on to the farmers who need them. However, that is a topic for PA 602- Business Management, Finance and Taxation.

While the Risk Management Education programs of CSREES and RMA address many of the concerns surrounding farm management, there is not a distinct, funded farm production and farm management program in USDA per se. The various States through their own funding, formula funding, and other sources carry out many excellent farm management programs, but they are done often without the assistance of a national program. Are we currently allocating resources to the real needs of producers? While the regional extension and research committees meet and information is exchanged, the system does not have a formal national arena where issues that are national in scope may be discussed and addressed. Is there a need for a more coordinated approach in terms of identifying high-priority needs within the farm management arena and then reallocating resources accordingly?

Have we adequately addressed the ramifications of revised or new trading agreements, marketing products/commodities that are genetically modified, and the interrelationships of farms and their local communities. Current and future farm managers will need managerial skills in a number of areas, but most importantly will be skills in communication, business and economics, and understanding the implications of technology, in terms of production and marketing.

Inputs

In the 601 Problem Area, Economics of Agricultural Production and Farm Management, CRIS information notes that $14.3 million was spent in 1998, nearly $15 million in 1999,

$18.4 million in 2000, $22.5 million in 2001, and $22.8 million in 2002. With the exception of FY 2001, state appropriations represented approximately half of the expenditures (Table 1.4.4). CSREES, on the other hand, through its various funding sources, provided $3.5 million in 1998, $3.4 million in 1999, $5.6 million in 2000, $8.2 million in 2001 and $5.5 million in 2002. CRIS also cites an increasing number of total projects funded from1998 (225) to 2002 (351) (Table 1.4.5). A "blip" occurred in 2000 and 2001 when the Initiative for Future Agriculture and Food Systems was operational and funded a program entitled, "Farm Efficiency and Profitability," emphasizing small and medium-size farming operations. Through the five year period, CSREES funded projects that covered the entire spectrum with regard to the economics of farm production and management. However, with regard to the number and type of projects funded from all CSREES sources as reported in CRIS, there were many projects that referenced Problem Area 601, but in fact were only peripherally related to economics. The conclusion reached was that many used PA 601 if the results of the project were judged to have economic implications, as opposed to actually having economic content in the plan of work. Hence the number of projects in CRIS that come up with economics and farm management as the key search words, overstate the actual number of projects that actually involve economics in the plan of work. It also is important to remember that one project may make reference to numerous problem area codes and assign percentages of effort (and by implication, percentage allocation of the funds) that may or may not reflect, in the final analysis, actual efforts.

Outputs

In examining the CRIS reporting system, and the farm management regional extension committees work, the outputs with regard to PA 601 are numerous and cover everything from publications in peer-reviewed journals, university publications, popular publications and the popular press, books, radio and television shows. The content included model development; curriculum development; technical information development and delivery to producers; whole farm systems analysis; policy implications for farms and the agricultural sector (in all of its many dimensions); development of financial, marketing, production, resource management, business and strategic plans; economics of agronomic developments and engineering technologies; analyzing economic implications and the bottom line with regard to enterprise diversification; value-added alternative; international trade agreements and flows and implications for demand and supply; exploring economic impacts of alternative marketing strategies and agronomic practices as they impact food and commodity attributes; improving production efficiencies, and work to enhance farm profitability.

Outcomes

In both the Risk Management Education Program, and in the Farm Management Program, short term outcomes have been the development and delivery of information to professionals, farmers, and the general public that have resulted in better understanding of the agricultural production and farm management issues, including implications of policy on production and management. There has been an increase in new knowledge

development and from that, new formal and informal curricula have been developed. Another example of possible outcomes can be inferred from a new program in which CSREES is significantly involved. CSREES' responsibilities in the Trade Adjustment Assistance to Farmers and Fishermen Program requires the preparation of technical information and advice to help farmers and fishermen adjust to import competition on all approved commodities and to provide that information and advice to the producers of those commodities or fish species. The ultimate aim is to change behavior of the producers so that they in turn implement certain changes that result in a more competitive enterprise. While the program has been in effect for less than a year, comments on the program evaluation forms point to approximately 30 percent to 65 percent of the producers who have attended the training session wish to receive more specific information on their business in order to make changes to their operations. This testimony suggests that the methods and products developed are appropriate and relevant, and have elicited comments that suggest appropriate change may well occur in the future. The positive response has been gratifying to those who developed and deliver the information to producers and fishermen. As more information is developed regarding trade adjustment assistance, longer term outcomes in terms of problem identification and alternative solutions may also result.

Analysis

The relevance, quality and performance of both the Risk Management Education Program and the Farm Management Program are combined in this section.

Relevance

1.1 Scope: The extent of coverage as represented in the portfolio for PA 601 is certainly broad and appears to cover the important aspects of topics included in PA 601. State funding for projects in the farm management arena is significant, and in most years of the period covered by this review, represented over half of the total funds.

1.2 Focus on Critical Needs: The key here is whether or not there is adequate interaction with stakeholders to ensure that needs have been identified and reflected in projects funded, technical information developed, and in requests for applications. A very large part of farm management involves risk management. Advisory councils composed of stakeholders (representatives of academia; working farmers; commodity organizations; NGO's; banking and financial institutions; RMA; farm management, farm policy, and farm marketing specialists; state departments of agriculture, etc.) provide recommendations in a formal and documented manner to each of the risk management education centers. Other projects undergo university and organizational review to ensure resources, are for the most part, being expended on critical needs. Additionally, the center directors also interact with other groups such as regional committees, regional agricultural economic groups, the American Agricultural Economic Association, etc. These groups also provide input in terms of their views of high priority needs, regionally as well as nationally. Unequivocally, it is viewed

that there is adequate stakeholder input to ensure that the majority of work is focused on identified needs.

1.3 Identification of Emerging Issues: The interaction with stakeholders and other groups provide an adequate forum whereby emerging issues are identified and incorporated into various programs and projects. CSREES conducts three "hearing sessions" for stakeholders and others annually in the various regions. Likewise, the RME centers also hold an annual meeting specifically to gain information on emerging issues and critical needs. In addition to the stakeholders, others may point out emerging needs in the popular press, peer-reviewed journals, editorials, etc. Could we be doing a better job? Perhaps. Would it be advantageous to have a national symposium to discuss emerging issues and other critical needs? Perhaps. In regard to the RME Program, adequate means and structures exist to meet this identification need; in terms of farm management, conclusions are less definitive.

1.4 Integration of CSREES Programs: Overall, with the exception of the RME Program, which is essentially an extension-driven program, there appears to be adequate integration of research, education and extension activities within the farm management arena. However, in many instances there is not true integration. The Initiative for Future Agriculture and Food Systems (IFAFS) emphasized the necessity for projects to integrate the functions of research, education and extension.

1.5 Multidisciplinary balance: Problem area 601 and Portfolio 1.4, by their very titles, emphasize economics. In an analysis of projects with PA 601 in 1998, there were 35 projects that incorporated economics and at least one additional field of science; and in 2002, there were 107 such projects (Table 3). It is our view that this reflects the growing emphasis on the value in interdisciplinary work in terms of solving problems. The IFAFS Program emphasized not only integration of function but also interdisciplinary efforts, which may at least explain some of the increase. (IFAFS was funded in FY 2001 and 2002.)

Quality

2.1 Significance of outputs and findings: In reviewing pertinent CRIS projects, significance of outputs and findings relative to the initial objectives of the projects appear to be satisfactory. However, this is a judgmental call. Papers presented in many multistate project meetings were well-received and appeared to capture the original objectives. University Plans of Work and Annual Reports seem to indicate that the efforts undertaken as part of Portfolio 1.4 have outputs and findings that are significant.

2.2 Stakeholder Assessment: From the stakeholders of risk management education programs and trade adjustment assistance programs, the response has been very positive. Comments, such as "exceeded my expectations," "the case farm exercise was great," and "excellent presentation," are typical of the responses on evaluation forms. In the Farm Management Program, the NPL gets good feedback from

meetings with committees, multistate projects, and other groups of people who are often preparers of the outputs and findings. Informal conversations and CSREES "listening sessions" also provide information, which for the most part, indicate that stakeholders are relatively satisfied with efforts in Portfolio 1.4. It should be noted that the verification system currently being built at the Digital Center for Risk Management Education will provide an assessment of outcomes achieved versus expected. This system may serve as a model for future evaluation systems where results are measured against previously defined expected outcomes.

2.3 Alignment of Portfolio with current science: It is the view of CSREES that the portfolio in the risk management arena and farm management arena certainly is aligned with current science.

2.4 Methodological Rigor: In examining the CRIS records and attending meetings of the regional committees, regional projects, multistate projects, CSREES concludes that methodological rigor is being employed. For the most part, the review of Hatch projects, Special Grants, and Federally Administered grants also attest to the satisfactory employment of methodological rigor. In the Competitive grants arena, this is a key component on any project evaluation. Overall, methodological rigor is being employed in Problem Area 601 and in Portfolio 1.4.

Performance

3.1 Portfolio Productivity: From CRIS records of projects funded by the various CSREES funding categories, and from materials developed and delivered to producers via the RME and TAA Program, CSREES concludes that there is adequate Portfolio productivity. Could it be better? Certainly. But a key component is the necessity to develop an evaluation system against which progress reports are provided. Currently, project evaluation is conducted on an ad hoc basis as schedules of NPLs permit.

3.2 Portfolio Completeness: Overall, CSREES concludes that work is being completed. However, in conducting fundamental research extension and education activities, the expected outcomes may in fact change over time as knowledge is developed and gained, hence initial expected outcomes may not always be achieved.

3.3 Portfolio Timeliness: Overall, projects are being completed in a timely manner. Few projects are funded for a period that exceeds three years. In most cases these timelines are met, but approximately 5-10 percent of the time, no-cost extensions are provided. All grants must be concluded within five years.

3.4 Agency guidance relative to portfolio: Research, education, and extension activities in Problem Area 601 are aligned with USDA and CSREES' Strategic Goal 1 to "enhance economic opportunities for agricultural producers."

3.5 Portfolio accountability: In 1999, universities were required to develop 5-year Plans of Work, and then to ensure that funded projects were relevant to the program description, goals and objectives. Annual progress reports are reviewed against the stated aims of the Plans of Work. So in this sense, portfolio accountability appears satisfactory.

Table 1.4.4 CSREES Funding by Category, PA 601, 1998 – 2002 ($ thousands)

	1998	1999	2000	2001	2002	GRAND TOTAL
Hatch	$1,456	$1,440	$1,739	$1,599	$1,753	$7,987
Mc-Stennis	$36	$19	$21	$22	$30	$128
Evans Allen	$948	$790	$933	$969	$1,089	$4,729
Special Grants	$608	$657	$664	$982	$1,755	$4,666
NRI Grants	$351	$250	$375	$567	$221	$1,764
SBIR Grants	$0	$0	$0	$66	$0	$66
Other CSREES	$96	$192	$1,843	$4,028	$640	$6,799
TOTAL CSREES	$3,495	$3,348	$5,575	$8,233	$5,488	$26,139

Table 1.4.5 Funding From All Sources, PA 601, 1998 – 2002 ($ thousands)

	1998	1999	2000	2001	2002	GRAND TOTAL
CSREES Funds	$3,491	$3,349	$5,572	$8,234	$5,487	$26,133
Other USDA	$855	$826	$1,087	$850	$1,657	$5,275
Other Federal	$622	$889	$590	$2,766	$2,958	$7,825
State Appropriations	$7,514	$8,237	$9,174	$8,511	$10,499	$43,935
Self-Generated	$802	$878	$718	$728	$714	$3,840
Ind/Gr Agreements	$470	$478	$708	$588	$790	$3,034
Other Non-Federal	$549	$619	$585	$787	$703	$3,243
TOTAL FUNDS	$14,303	$15,276	$18,434	$22,464	$22,808	$93,285

Table 1.4.6 Interdisciplinary Work, PA 601, 1998 & 2002

PROBLEM AREA		1998		2002	
601 Economics of Agricultural Production and Farm Management		Number	Percent	Number	Percent
	100%	110	76	138	56
	76-99%	2	1	8	3
	51-75%	6	4	11	4
	26-50%	6	4	34	15
	25% or less	21	15	54	22
	Total	145	100	245	100

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