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Two major components of the research title, as changed by Congress, address sustainable agriculture. First, the purposes applicable to the entire research title (discussed in chapter 2) emphasize sustainable agriculture. The purposes emphasize that all federally funded agricultural research and extension of USDA “be designed to, among other things, ...enhance the environment and natural resource base upon which a sustainable agricultural economy depends...enhance the long-term viability...of the food production and agricultural system...[and] enhance the quality of life for farmers, rural citizens, and society as a whole...” Notwithstanding the key importance of these provisions, this aspect of sustainable agriculture has not been emphasized here because of time constraints and because the General Accounting Office (GAO) published a study of USDA’s management of the sustainable agriculture program in 1992 (31).

Second, as a continuation of Congress’ interest in sustainable agriculture, it established through FACTA—in Subtitle B—the Sustainable Agriculture Research and Education (SARE) program as a successor to the Low-Input Sustainable Agriculture (LISA) program

addressed in the Food Security Act of 1985 (the 1985 farm bill).

The purposes established by Congress in FACTA for SARE in this subtitle are “to encourage research designed to increase knowledge concerning agricultural production systems that:

1. maintain and enhance the quality and productivity of the soil;
2. conserve soil, water, energy, natural resources, and fish and wildlife habitat;
3. maintain and enhance the quality of surface and ground water;
4. protect the health and safety of persons involved in the food and farm systems;
5. promote the well being of animals; and
6. increase employment opportunities in agriculture.”

In addition Congress reaffirmed in FACTA the definition of sustainable agriculture which it first established in the National Agricultural Research, Extension, and Teaching Policy Act of 1977 as follows:

1. “satisfy human food and fiber needs;
2. enhance environmental quality and the natural resource base upon which the agriculture economy depends;
3. make the most efficient use of nonrenewable natural biological cycles and controls;

4. sustain the economic viability of farm operations; and
5. enhance the quality of life for farmers and society as a whole.”

Sustainable agriculture involves a *systems* approach, which Congress emphasized by establishing integrated crop management and integrated resource management as key components of this subtitle. It defined them as:

“an agricultural management system that integrates all controllable agricultural production factors for long-term sustained productivity, profitability, and ecological soundness” and

“livestock management which utilizes an interdisciplinary systems approach which integrates all controllable agricultural production practices to provide long-term sustained productivity and profitable production of safe and wholesome food in an environmentally sound manner.”

When the purposes and definitions are taken together, it is particularly significant to note that sustainable agriculture includes three essential components: 1) agricultural production and productivity; 2) conserving, enhancing, and sustaining the natural resource base on which “the agricultural economy depends,” including general environmental quality; and 3) the economic and social quality of farmers and farming. It is the efficacious combining of these three components that characterizes sustainable agriculture.¹

Congress has been interested in sustainable agriculture since it devised the 1977 definition quoted above. This interest reflects emerging recognition of degradation of soil and water resources; the adverse impacts of chemical pesticides on environmental and human health; the steady decline of the economic and social vitality of the rural and farming sector; steadily decreasing farm numbers and growing evidence of increasing proportions of larger farming opera-

tions and part-time farmers; and increased competitiveness in agricultural production. Congress also aimed to address the unease of observers who argued that these concerns have received only limited attention from USDA and the land-grant university and state agricultural research system, if not outright neglect (23). This concern was reflected in the 1985 Farm Bill by Congress’ intention that USDA determine how to do more research to preserve natural resources and environmental quality concurrent with ensuring agricultural productivity. USDA responded by giving increased attention to alternative agriculture,² including establishing the LISA program in 1988. Congress appropriated \$3.9 million for the new program. During this time, also, the Board on Agriculture published a major study on sustainable (alternative) agriculture (4).

A particularly significant feature of the SARE program deserves special comment: specific provisions for administering and managing the program encourage, and enforce, the collaborative nature of the research-application process. Although this pairing has long been a feature of the agriculture research and application (extension) system, it is given new force and cogency by the SARE program. The key feature is a set of regional administrative councils that manage the SARE program and are to be composed of “farmers utilizing systems and practices of sustainable agriculture,” agribusiness, “nonprofit organizations with demonstrable expertise,” “state departments engaged in sustainable agriculture programs,” and the customary array of leaders from the federal and state agricultural research and extension systems. These regional councils are responsible for project review, selection, and recommendations for funding of the grants to be awarded. A national advisory council, also established by FACTA, is comparably composed, and makes recommendations for

¹ Many of the conflicts and contentions related to sustainable agriculture arise because one of these three components is emphasized at the expense of the others. The three components must be considered together, in an integrated fashion, in order to fully understand their interactions, congruences, and synergies.

² These concerns were also marked by a range of titles and descriptions for what was intended: organic farming, alternative agriculture, and sustainable agriculture are just three of the names used, even though each means something considerably different from the others.

project approval and funding to the Secretary. Thus, the users of research are centrally involved in guiding the research program and full partners in it. This “market pull” for the SARE program contrasts with the “market push” of research findings separated from application.

IMPLEMENTATION

Congress established in FACTA three separate but interrelated programs: Chapter 1: Best Utilization of Biological Applications; Chapter 2: Integrated Management Systems; and Chapter 3: Sustainable Agriculture Technology Development and Transfer Program. Each is discussed in turn below.

For this subtitle, Congress in FACTA authorized a total of \$80 million to be divided among the chapters as follows: \$40 million for Chapter 1; \$20 million for Chapter 2; and \$20 million for Chapter 3. Appropriations, however, have been substantially less. The LISA program, which preceded SARE, received appropriations for FY 1988, \$3.9 million, (its first year of appropriations) and for FY 1989 and FY 1990, \$4.5 million each year. SARE received \$6.7 million for each of the first three years, FY 1991–1993. Authorization of the SARE program was accompanied by a substantial percent increase in funding, emphasizing Congress’ commitment to sustainable agriculture. For FY 1994, \$7.7 million was appropriated for SARE, and funding was first provided for Chapter 3, the so-called training program, at a level of \$3.1 million. For FY 1995, SARE appropriations were \$8.1 million and training appropriations \$3.5 million. No funding has been provided for Chapter 2, and it is not likely that this chapter will receive funding in the foreseeable future. There have been no earmarks, sequestrations, or special requests for any of these appropriations.

Four major general implementation steps have been taken. First, SARE has been administratively located and supported within the Cooperative State Research Service (now the Cooperative State Research, Education, and Extension Service, or CSREES), as was the

LISA program before it. Given the intended extramural character of both LISA and SARE, this administrative location is appropriate. When the extension-based national training program (Chapter 3) was funded, a new office of Sustainable Agriculture Programs was established in CSREES and a director appointed effective February 1995. Second, the National Sustainable Agriculture Advisory Council, stipulated in FACTA, was established (see below in discussion of Chapter 1). Third, an administrative advisory group has been evolving for the Office of Sustainable Agriculture Programs. Its membership includes two representatives of each SARE region and representatives of the Agricultural Research Service (ARS), Natural Resources Conservation Service (NRCS), and the Environmental Protection Agency (EPA). This senior-level attention to sustainable agriculture is a positive development. Fourth, an inter-agency working group was established in August 1995 to advance sustainable agriculture research and extension throughout USDA. This development is discussed further in the section below.

■ Chapter 1: Best Utilization of Biological Applications

Appropriations for the SARE program are summarized above. In addition, a related program for Agriculture in Concert with the Environment (ACE) was jointly established by USDA and the EPA in 1991. It is a grant program to fund projects competitively that focus on pollution prevention in agriculture and on environmental and ecological aspects of agriculture, purposes complementary to and supportive of those for SARE. The ACE program is discussed concurrent with SARE, with which it is most closely associated. Funding of the companion ACE program derives from USDA and EPA on a 1:1 matching basis. For FY 1995, a total of \$2.0 million was available.

The purposes of SARE include conducting “research and extension projects to obtain data, develop conclusions, demonstrate technologies, and conduct educational programs that promote

the purposes...including...projects that (1) facilitate and increase scientific investigation and education in order to [among other things] reduce, to the extent feasible and practicable, the use of chemical pesticides, fertilizers, and toxic natural materials in agricultural production; improve low-input farm management...; promote crop, livestock, and enterprise diversification; and (2) facilitate the conduct of projects in order to [among other things] study farms...using farm production practices that rely on low-input and conservation practices; take advantage of the experience and expertise of farmers and ranchers through their direct participation and leadership in projects; transfer...information to farmers and ranchers concerning low-input sustainable farming practices and systems; and promote..." partnerships among the various participants and organizations relevant to sustainable agriculture.

The SARE program is carried out through its own competitive grants program organized and managed by the four regional administrative councils authorized by this chapter.³ Each regional council is composed of representatives of the relevant federal and state agricultural research and extension agencies (such as ARS, CSREES, state extension service, state agricultural experiment station [SAES], NRCS, state agriculture departments engaged in sustainable agriculture), farmers involved in sustainable agriculture, agribusiness, state or U.S. geological survey organizations, and other persons knowledgeable about sustainable agriculture. Each regional council receives an equal amount of funding (\$1.7 million in FY 1995⁴) for allocation on a competitive basis to research and extension projects in the region. Each regional council establishes the priority areas for its emphasis and issues a call for proposals; preproposals may be

invited. The technical and scientific merits of each proposal are evaluated by a technical committee established for this purpose by each regional council, and written and numeric evaluations are provided by the committee to the council. The regional council combines these evaluations of technical and scientific merit with its own evaluation of the relevancy and merit of the proposals for advancing sustainable agriculture goals. Recommendations for funding are forwarded to the National Sustainable Agriculture Advisory Council which makes recommendations to the Secretary through the CSREES for projects suitable for funding. As a practical matter, the decisions by the regional councils are supported by USDA except in isolated and special cases. The ACE program is also administered through the regional councils using the same mechanisms, and the same technical committees for evaluating the proposals.

A review of the projects illustrates their breadth and type. Projects last up to two years (Northeast region) or three years (the other regions). Funding per project varies from \$50,000 to \$250,000. SARE/LISA grants averaged \$76,800 between 1988 and 1992 and \$95,600 in 1993; ACE projects averaged \$71,500 and \$61,600, respectively. Of the 2,169 proposals received for the SARE and LISA programs between 1988 and 1993, 367 (about 26 percent) were funded, 65 projects in 1993. In 1993, 178 projects were active, ranging from 58 for the North Central Region to 35 for the Northeast, with the Southern and Western Regions having 43 and 42, respectively. Consistent with provisions for the federal-state matching grants program, the projects require a nonfederal match of not less than 50 percent of the project expenditures. These projects received \$27.9 million in

³ The four regions correspond to the four land-grant university research and extension regions. The Northeast region involves the states of Pennsylvania, Maryland, and Delaware and all states to the northeast of them. The North Central Region involves Ohio, Indiana, Illinois, Missouri, and Kansas and the states to the north of them. The Southern Region involves North Carolina, Kentucky, Arkansas and states south of them, including Oklahoma and Texas. The Western Region includes Montana, Wyoming, Colorado, New Mexico and all states to the west of them, including Alaska and Hawaii.

⁴ This is a total of \$6.8 million to the regions from the total SARE funding of \$8.1 million for FY 1995. The remaining funds (\$1.3 million) are used for administration and for information dissemination.

federal funds during this 1988–1993 period, which was matched by \$30.7 million in nonfederal matching funds. Nationally, SARE and ACE projects with an experimental component and on whole farm systems received the largest share of the federal funding (55 percent), followed by whole farm demonstration and education, training, and information transfer (36 percent). Subject areas receiving the major portion of funding were communications, education, and marketing; field crops; and soil, water, nutrient, and waste management. Regional emphases varied somewhat from these national emphases, but were generally consistent. Rural quality-of-life projects received the least funding among the defined categories (29).

The content of the projects is left to the discretion of the proponents. Quite often successful proposals include economic components, as well as extension and outreach components (which are weighed heavily in the evaluations of research projects). An educational component is estimated to be part of 20–30 percent of the projects (16). Both the ACE and SARE programs successfully address the three components of sustainable agriculture (including economic viability) and incorporate research and extension into a common program. ACE and SARE have also been successful in nurturing diverse projects that represent the range of growing and farming conditions in the region (as called for in the chapter) and in ensuring that a reasonable proportion of crop and livestock projects are funded.

To further projects that relate to farmers and draw on their experience and expertise—beyond the extent to which the research and extension projects already do so—producer grants are also awarded directly to farmers for applied research and demonstration projects. The North Central region started its producer grant program in 1992, the Northeast in 1993, and the Southern and Western regions in 1994. To fund these, each regional council allocates \$100,000 from its allocation for SARE projects. Proposals are reviewed by the regional councils and awarded competitively based on merit and relevancy, just as for the research and extension proposals. For

example, in FY 1993, the North Central council made 31 grants, ranging from as low as \$575 (for establishing hazelnut windbreaks on an Iowa farm) to as high as \$5000 (for replicated manure use trials in Wisconsin, rotational grazing for custom dairy heifer feeding in Wisconsin, and grazing on former CRP [Conservation Reserve Program] acres in Minnesota).

The regional administrative councils are aided in their administration of the programs by four regional host institutions (University of Vermont, Northeast Region; University of Nebraska, North Central Region; University of Georgia, Southern Region; and Utah State University, Western Region) also authorized in the chapter. These host institutions manage the grants process, negotiate budget and contracts, and provide administrative and fiduciary oversight. They also provide for information, education, and outreach about sustainable agriculture, including newsletters, speakers, publications, and other types of electronic and printed communications.

A crucially important element of sustainable agriculture—for both SARE and ACE programs and also for sustainable agriculture as a USDA mandate and responsibility—is the extent and quality of involvement of the several USDA agencies that are relevant to and involved with sustainable agriculture. Clearly, the agencies are involved through their representatives in the regional administrative councils and on the National Advisory Council. SAES are involved because much of the project money flows through them and to their scientists. Support for the programs varies among the regions, but it appears to be steadily increasing.

Based on all the evidence, the SARE program is well administered and is meeting the needs and purposes envisioned in the chapter. The widespread and strong constituency support for SARE is graphically illustrated by the successful advocacy for continued funding through FY1995, in spite of the federal budget stringencies.

A second major provision of this chapter is the Federal-State Matching Grants Program. Funds have not been appropriated by Congress for it,

nor have funds otherwise been provided. The program does not exist, nor is there discussion or evidence that its implementation is being, or should be, contemplated. The rationale for this appears to be that the current programs (SARE and the training programs described for Chapter 3, combined with existing state programs) meet the intent of this provision.

■ Chapter 2: Integrated Management Systems

Notwithstanding the definitions for integrated crop systems and integrated resource management systems, and the emphasis on systems in the subtitle, this chapter has not been implemented as a part of SARE and related programs. Congress has not appropriated funds for it, nor has USDA otherwise allocated funds to it. In fact, at the beginning of FY 1994, Congress specifically stated by letter that the funds appropriated for training were to be spent for the purposes of Chapter 3, not for those of Chapter 2. Given the success of the SARE program and its coverage of both plant/crop and livestock areas, it is reasonable that this program be held in abeyance, especially if its purposes can be addressed as part of SARE, as it appears they can be. Indeed, a separate program is philosophically not consistent with the entire rationale for sustainable agriculture (which is to think *systematically*, not compartmentally). To date, a significant number of the projects funded have addressed integrated management systems, and proposals of this type are encouraged. This could be further strengthened, if necessary, by further encouragement in the call for proposals and in the instructions to the technical committees reviewing the proposals.

■ Chapter 3: Sustainable Agriculture Technology Development and Transfer Program

This is commonly referred to as the training program (and that name will be used in this review) because training is the principal element of the chapter, given funding to date. Funding was first

provided for FY 1994 (\$3.1 million). This program and the SARE program are incorporated into, and managed integrally by, USDA's Office for Sustainable Agriculture Programs.

The training program, like the research and education program (SARE), is organized and managed through the regional councils, assisted by the regional host institutions. For FY 1995, \$693,000 was provided to each of the regions. The chapter established that the funds were to be allocated to proposals on a competitive basis. This has been done, using merit and relevance to training needs as the principal criteria for making the awards. Each regional council established a merit and relevancy review process for these awards of a type similar to that used for evaluating the research and extension projects. A technical review committee was specifically established for the training awards. The same approval process was used, involving the regional and national councils and, finally, approval by CSREES on behalf of USDA.

The work of the regional host institutions for the training programs warrants specific comment. These institutions are also the regional training centers specified by the chapter. Each regional host institution has a coordinator for training in the region. Functions carried out by the host institutions, and coordinator, include participation in the Sustainable Agriculture Network (a national network of more than 700 persons and groups involved in providing information about sustainable agriculture); talks and presentations; and preparation and distribution of printed publications including booklets, bulletins, and newsletters. In addition, all publications are made available in two additional, electronic forms: distribution of diskettes for use in personal computers and downloading from the Internet.

It may be expected that this program will yield good results, based on the already established and positive record of the regional councils for the SARE program. However, it is too early to determine the effectiveness of the projects (which last two and three years), because a number of them have only recently been completed.

A second program was established by the regional councils to create, first, a strategic training plan for each state and, then, an implementation plan. This involved a one-year allocation of \$10,000 to each 1862 and 1890 land-grant university (\$3,000 to the District of Columbia) from the total training funds. The regions continued this funding (\$10,000–15,000 per land-grant institution) for a second year (FY 1995) from their regional allocations. It is too early to determine the effectiveness and value of this program.

This chapter specified that additional programs be undertaken. One of these programs, geared to providing technical guides and handbooks, has not been explicitly done. Rather, the information components of the SARE program, the information and knowledge dissemination functions of the regional host institutions, and the materials for the training program have received priority. To a significant extent, the outputs from these activities should suffice. In any event, the regional councils are in a good position to determine whether guides and handbooks should be prepared in addition to the documents already developed and prepared. Another effort, which involves the training of cooperative extension agricultural agents and is required by the chapter, is being implemented as a goal that each will be trained, but on a voluntary rather than a required basis. In a third effort, regional sustainable agricultural specialists were established in the form of sustainable agricultural training coordinators for each of the four regions, and each state extension system has identified a sustainable agriculture training coordinator.

THE PLACE OF SUSTAINABLE AGRICULTURE IN USDA'S OVERALL PROGRAM

As noted at the outset, Congress has directed that sustainable agriculture be emphasized in USDA's overall program. To date this emphasis and attention, by the relevant agencies and by the policy leadership of USDA, has been lacking. For example, the 1992 study by GAO discusses the agencies involved and the extent to which

effective leadership and management have been provided. The agencies include ARS, the Cooperative State Research Service and Extension Service (now combined into CSREES), Economic Research Service (ERS), National Agricultural Library, Soil Conservation Service (now the NRCS), Animal and Plant Health Inspection Service. GAO also examined USDA's management of its sustainable agriculture programs, including the congruence and/or conflict of policy, goals, and management. It found no single entity "responsible for overseeing or coordinating the entire issue." GAO also found program management for sustainable agriculture to be fragmented and lacking "in clear and comprehensive goals for the nine agencies involved..."(31).

There has, however, been interest and emphasis by some specific programs. For example, and as already discussed in a previous chapter, the National Research Initiative Competitive Grants Program (NRICGP)—after intensive discussion with representatives of the sustainable agriculture advocacy community—has incorporated the relevancy criterion of contribution to the long-term sustainability of U.S. agriculture into its call for proposals and its commission to proposal reviewers. In addition, one of NRICGP's programmatic cross-cuts is sustainable agriculture. More than \$14 million currently goes *directly* to sustainable agriculture research, with much more applying indirectly to sustainable agriculture. NRICGP is one of the few agencies where social and economic research (a key aspect of sustainable agriculture research and extension) can be specifically funded. The state agricultural research and extension systems, which are partially supported by federal funds, have a variety of programs for sustainable agriculture.

ARS is also increasing its attention to sustainable agriculture. There was a collaborative effort between the leadership of the LISA and SARE programs, and ARS and other USDA agencies, to determine to what extent research projects contributed to sustainable agriculture. Although the results may have had some interest, the process was refined to provide full utility, and its

utility in any event was substantially limited because its methodology called for categorizing projects based on the research summaries in the Current Research Information System (CRIS) documents. CRIS, however, is a source that is open to varied interpretation relative to what is actually being done in research projects.

No matter what other actions have been taken, there has not been—until now—a systematic initiative by USDA to provide the senior policy leadership and integration of effort that sustainable agriculture warrants as a major cross-cutting issue. Very recently (August 1995), an initiative was established by the Deputy Secretary to provide this leadership and integration. More than 50 persons are meeting biweekly to create action plans, which are to be completed by December 1995. Several agencies are involved, including the science and education agencies (such as CSREES, ARS, and ERS), NRCS, and other relevant agencies in USDA such as in rural development and in marketing.

Creation and action by this interagency group is an important step toward establishing sustainable agriculture as a priority program within USDA. It should help to integrate the work among the several agencies relevant to sustainable agriculture and increase collaboration and cooperation among them; provide a coherent management system for USDA's work in sustainable agriculture; and provide USDA accountability. It remains to be seen what will emerge. Optimally, it would include clear emphasis throughout USDA; a streamlined and clear USDA management and oversight structure; clear, compelling goals and objectives; a system of funding that combines USDA leadership and emphases with incentives and opportunities for scientists and extenders/appliers; a system of accountability, including clear criteria and expectations; a set of expected achievable and meaningful outcomes; measurable performance indicators; and clear roles and expectations for each of the relevant agencies, separately and also collaboratively with cognate agencies. A particularly valuable outcome would be a *unified and integrated strategic and operational plan*, which

incorporates each of the relevant agencies (and state and other partners) separately and collectively.

PERSPECTIVES ON SUSTAINABLE AGRICULTURE

Clearly, sustainable agriculture is an issue of major proportions: in its inherent substantive content; its longevity as a Congressional concern and interest; and in the pervasiveness and inclusiveness of its organizational and intellectual components. Further, it is a particularly attractive meeting ground where environmental and social interests and perspectives converge with food production and agricultural productivity interests.

Just as important, sustainable agriculture is an inextricable component of sustainable development—a recent, momentum-creating international emphasis. This is particularly apt because agricultural development is the basis for social and industrial development, and sustainability of the environmental resources needed for agricultural and food production is a vital international concern.

If sustainable agriculture is a key issue—and if sustainable agriculture is embracing of much of what we can call the agriculture/food/environment research and extension system and should thus be embedded in that system—then it deserves, and should be accruing, major attention and support from USDA and the entire agricultural research and extension system. This support is still only limited, compared with what it reasonably could be. Nonetheless, it is important to point out that support is increasing.

It further follows that a leadership and management system of commitment, stature, and influence needs to be in place to guide and support development of research and extension for sustainable agriculture. This involves creating effective organizational means for bringing together the agencies (inside and outside USDA) relevant to sustainable agriculture, using their expertise, and combining them together so as to create strategic and operational approaches that

integrate their special capabilities. Leadership and commitment must be fused with strategic focus and operational plans to produce results that combine the best that can be obtained and create new direction and strength.

Irrespective of what directions may be taken in the future, a particularly important feature of the SARE program, as already pointed out, bears examination: the way in which the SARE and national training programs are organized, directed, managed, and reviewed. This feature involves combining the separate but congruent interests of knowledge users, knowledge extenders and applicators, and knowledge producers into an effective organizational framework. It involves both a “market pull” from the knowledge users based on their needs and a “market push” from the knowledge producers based on their research interests and opportunities. The

organizational approach established by FACTA and implemented in the field combines researchers and extenders, farmers and agribusiness enterprises, associated governmental agencies, and involved non-governmental organizations into an effective, and enthusiastically supported research selection and management system that is results-oriented.

The agricultural research and extension system, of course, enjoyed much success by using this paradigm. Indeed, the system continues to be an especially powerful model for research, development, and application, both nationally throughout all of American society and worldwide. But the evident success of this paradigm for sustainable agriculture gives it renewed emphasis and compels the view that other major issue-oriented programs could profit from its intensified use.