



The Early Years

The LISA, SARE, and ACE Programs

Reflections of the Founding Director
by J. Patrick Madden

Table of Contents

The Early Years

The LISA, SARE, and ACE Programs

By J. Patrick Madden

[Conception](#)

[Phase I](#)

[Phase II](#)

[Phase III](#)

[References](#)

[Glossary](#)

[Appendix I](#)

[Appendix II](#)

[Appendix III](#)

Conception

Conception of the Program.

During the Dust Bowl of the 1930's Americans became alarmed about the rapid deterioration of agricultural productivity caused by ill-advised farming practices and adverse weather. Federal and state government programs to prevent soil erosion stemmed from that crisis. The sustainable agriculture movement of the past decade reflects a continuation and deepening of that concern. While soil erosion remains a serious problem in many places, the goal of the sustainable agriculture movement is much broader. A primary motivation is elimination of the damage chemical-intensive farming methods inflict on human health, natural ecosystems, water quality, soil health, and long-term productivity. Sustainable agriculture is a goal: to make food and farming systems ecologically beneficial, economically sound, socially acceptable, and based on interdisciplinary scientific knowledge (Madden and Chaplowe 1997: 3-32).

Early Motivational Factors

The first seeds of what has grown into the SARE Program were sown in 1962 by the publication of Rachel Carson's classic book, *Silent Spring*. This book was the first highly popular and definitive work highlighting the ecological damage being done by agricultural pesticides. Until this time, it was generally believed that pesticides were harmless to the environment, and when used properly, posed no threat to human health and water quality. Mounting concern by environmentalists and others in the 1960's led to formation of the Environmental Protection Agency (EPA) and to increasingly severe restrictions on use of agricultural chemicals. Public awareness of environmental and health risks has dawned slowly, as more scientific evidence has emerged (Benbrook 1996, Hewitt and Smith 1995).

A very important publication in the history of the U. S. sustainable agriculture movement is the *USDA Report and Recommendations on Organic Farming* (USDA 1980). This report, ordered by Secretary of Agriculture Bergland in 1979, compiled and interpreted scientific evidence regarding the yield, net returns, and other performance indicators of organic farming in the United States. It also provided a number of recommendations regarding research, education, and public policy, buttressed by case studies of 69 organic farms in 23 states, making concrete the principles underlying organic farming. This USDA report, a landmark in the sustainable agriculture literature, was rejected by the incoming Reagan administration in January 1981. Simultaneously, the Administration abolished the newly established position of Organic Resources Coordinator, held by a member of the USDA Study Team for Organic Farming, Garth Youngberg.

These events signaled clearly that the USDA was not ready to promote more widespread adoption of organic farming methods. An important contributing factor was the infamous statement by former Secretary of Agriculture Earl Butz, that tens of millions of Americans would starve if all farmers adopted organic methods. Even today, most farmers and scientists contend that organic agriculture is not capable of providing adequate food and fiber for the expanding world population. Neill Schaller (personal correspondence) has observed that as a result of this resounding rejection in 1981 by the Reagan Administration, many advocates for organic farming began supporting the term "sustainable agriculture," in the hope that its use could ultimately invite respect for organic agriculture. Youngberg has observed that advocates for organic and other low-chemical approaches to farming did not explicitly link their mode of farming with sustainability until the 1980's, and that sustainability has effectively replaced organic farming as the motive force for development of alternatives to chemical-intensive agriculture. He wrote:

Sustainability, after all, is an enormously powerful symbol. In terms of its emotional and evocative meanings, it probably ranks alongside such concepts as freedom, liberty, and democracy. ... the very thought of an unsustainable agriculture immediately conjures up images of massive human deprivation and suffering, and ultimately, mass starvation. What could be more important than sustainability? It is difficult to imagine a more powerful symbol. (Youngberg, et al., 1993, p.296)

Despite his major set-back, Youngberg has established the most effective and professionally respected organization on the sustainable agriculture scene, now called the Henry A. Wallace Institute for Alternative Agriculture. The Institute supports an excellent refereed journal (*The American Journal of Alternative Agriculture*), a policy "think tank," various conferences, and other activities to promote sustainable agriculture.

The third major publication to intensify the debate was the National Academy of Sciences report, *Alternative Agriculture* (National Research Council, 1989). This report contains a summary of the scientific knowledge (circa 1986) under categories such as tillage, biological control of pests, legumes as a source of nitrogen, etc. But the authors wisely recognized that reductionist knowledge of isolated components of a farming system cannot provide a clear understanding of the functioning of ecologically friendly farming systems. Therefore they included (as Part Two) a series of case studies describing in detail the operation of 14 farms across the US. The case studies provided a sense of cohesiveness missing in the disciplinary reviews of scientific knowledge about components or sub-parts of the system.⁽¹⁾ The report soundly disproved the widely held axiom that sustainable agriculture is inherently destined to produce low yields and low incomes.

Certain segments of the scientific community bitterly rejected the National Academy of Sciences report, particularly Part 2 (the case studies). This firestorm of opposition was a harbinger of the scientific community's resistance to the holistic, interdisciplinary research methodologies later advocated by many of the organizers and proponents of the LISA Program. This opposition has subsided somewhat, but remains a barrier to scientific analysis of sustainable whole-farm systems and agriculture's impacts on ecological systems.

Funding for the NAS committee and the staff work leading to publication of this report was provided in part by the Paul O'Connell (then the Deputy Administrator of Cooperative State Research Service in USDA) in anticipation of possible federal funding for what was to become the LISA Program. In fact, when this report was published in 1989, O'Connell submitted it as an important part of that year's annual report to Congress on the LISA Program.

A fourth major historical document was the 1990 General Accounting Office report on "Alternative Agriculture," which articulated the widespread and growing public concern over the increasing dependence of US agriculture on chemicals, and their detrimental effects -- endangering the environment, human health, the economy, and quality of life. Here are a few salient excerpts from that report:

- The use of agrichemical in conventional agriculture can endanger human health in two ways. Consumers may be exposed to agrichemical residues on the food they eat and the water they drink, while farmers and farm workers face heavier and more direct contamination from handling agrichemical and working in fields where they have been used ...
- One survey of shoppers in early 1989 showed that 82 percent believed that chemical residues posed a "serious hazard" to the health of consumers.⁽²⁾ Agrichemicals also pose an ongoing threat to the safety of surface and groundwater supplies used for drinking. ...
- Whether food safety concerns are justified or not, farmers who rely on agrichemicals may face a loss of productivity if these chemicals become unavailable for use or a loss of income if they cannot sell products treated with them. Either way, farmers who have become dependent on these agrichemicals are at economic risk. ...
- Agriculture also causes nonfarm damage, since farming is a primary nonpoint source of water pollution.⁽³⁾ The major sources of agricultural pollution are sediment (from soil erosion) and nutrients from fertilizers. ...
- Deposited soil obstructs waterways and fills reservoirs; suspended soil chokes water life, depresses recreational use, and increases water purification costs. Increased nutrient

levels promote algae growth, which depletes available oxygen; decreased oxygen limits the population of larger plants and animals. ...

- The health, environmental, and economic concerns associated with conventional agriculture have led to a growing interest in the development of alternatives that would lower health risks, protect farm resources, reduce adverse environmental effects, and improve long-term farm profitability and competitiveness. Farmers, environmentalists, consumers, and researchers have begun to seek, study, test, adopt, and advocate alternatives to conventional agriculture. ...
- Alternative farming methods are also gaining recognition as an important area of scientific inquiry at several universities and agricultural research centers.

(USGAO, 1990, pp.14-23).

The historical importance of this report lies in the credence it imparted to the concerns motivating the establishment of a USDA grants program to support sustainable agriculture research and education, especially the need to make US agriculture safer for humans and the environment, and more productive for future generations.

The primary effort during the 1980s to make U. S. agriculture more sustainable was a competitive grants program in USDA, focusing on improving the scientific, educational and practical foundation of farming systems in harmony with Nature. The competitive grants program called Low-Input Sustainable Agriculture (LISA, predecessor of the SARE Program) was initiated in 1988 under the Food Security Act of 1985.

The importance of the role played by Senator Patrick Leahy and his staff, notably Kathleen Merrigan, in gaining Congressional approval of the enabling legislation and funding for the LISA Program cannot be over-estimated. Schaller has observed that Merrigan "continued to defend and promote the Program throughout the agony of the 1990 farm bill debate." She also participated in meetings during the formative stages of the program, repeatedly emphasizing the intent of Congress, that farmers must be heavily involved in the Program. (personal correspondence)

The primary goal of the LISA Program was to develop and promote widespread adoption of more sustainable farming and ranching systems that will meet the food and fiber needs of the present while enhancing the ability of future generations to meet their needs and promoting quality of life for rural people and all of society. Compared with conventional, chemical-intensive production methods, "more sustainable production systems" significantly reduce or eliminate dependence on synthetic chemical pesticides and other inputs and practices that now

endanger farm workers, harm the environment, impair water quality, or utilize resources at a rate faster than they are naturally regenerated or replaced by scientific and technological innovations. More sustainable farming systems include ecologically based management strategies such as modern, biologically intensive and ecologically sensitive versions of integrated pest management (IPM), for example. The LISA Program's approach for attaining this goal was by sponsoring research and education designed to enhance the productivity and profitability of ecologically sound production systems.

Now that the Program (currently called SARE, Sustainable Agriculture Research and Education) has become well established, the scope of projects has been broadened to include a few socio-economic projects oriented toward the broader social goals of enhancing of the quality of life for farm families, workers, communities, and all of society. The federal appropriation has grown from \$3.9 million in 1988 to about \$12 million in 1998.

The Rodale Connection

While several influential members of the US Senate and House of Representatives in the 1980's favored sustainable agriculture, the political power necessary to obtain an appropriation for this new initiative did not materialize until a major lobbying effort was mounted. The leading organization in this lobbying effort was Rodale Press, which provided about \$50,000 for lobbying by a Washington-based firm, McMahon and Associates (including Sandy Schlecker). Many powerful organizations were recruited to muster grass-roots support for the start of funding to support research and education on sustainable agriculture. This highly effective lobbying effort included bringing knowledgeable witnesses from politically potent districts to Washington for Congressional hearings, among many other activities. The end result of this effort was the first Federal appropriation for sustainable agriculture research and education, \$3.9 million, December of 1987 (for fiscal year 1988).

The Rodale Institute played a major role throughout the formative years of the Program. A Rodale grant was used by a Pennsylvania State University professor (this author) to conduct the survey of US organic farmers and to begin preparing the case studies that later enriched the NAS report, *Alternative Agriculture*. Dick Harwood, then the research director for the Rodale Institute, served as a member of the NAS committee that prepared that report, and I observed his major impact on its quality and effectiveness. The Rodale Institute long-term experiment comparing organic and conventional farming systems, which was primarily the brain-child of Harwood, did much to establish the credibility of sustainable agriculture research. John Haberern, vice president of the Rodale Institute, served on the Program's project selection committees and performed many other essential services to keep the Program moving forward. Meanwhile, Bob Rodale provided the visionary energy and monetary support to enable and

direct the many Rodale contributions to this cause. Without the Rodale input, I doubt the LISA program could have been established and maintained.

Initial Policy Statement

Before the Program could get under way, it had to receive official status within the USDA. This status required an official policy statement, signed by the Secretary of Agriculture. As a pragmatic stratagem for gaining approval of this essential document, Paul O'Connell worked behind the scenes with a handful of sympathetic USDA employees, such as Klaus Flach in the Soil Conservation Service and Neill Schaller then in the Economic Research Service, to draft and gain internal approval of an enabling policy statement. This statement was deliberately vague, intended to fly beneath the radar screen of antagonistic USDA officials, who almost certainly would have killed the document. Yet it was strong enough to serve as justification for what we were about to create. With consummate bureaucratic skill and finesse, and with the support of Schaller, Flach, a few other colleagues in USDA, O'Connell deftly side-stepped formal review procedures. He persuaded Assistant Secretary Orville Bentley to initial the document, and got it on the Secretary's desk for signature. This document, presented in the Appendix, became the first official USDA statement indicating the Federal government's support for research and education programs on sustainable agriculture.

In subsequent years the leadership of the LISA Program continued to cite this document as USDA policy -- conveniently ignoring its one-year termination date, January 18, 1989. And even though no subsequent Departmental policy was promulgated for several years, the Program survived and slowly expanded.

1. These case studies were prepared by Patrick Madden, with major input from Edward Schaefer.
2. Survey conducted by the Food Marketing Institute, a supermarket trade group. (Steimel, p. F1.)
3. Nonpoint-source pollution is diffused pollution resulting from water runoff from urban areas, agriculture, and the like; point-source pollution occurs from a pipe or other discrete sources from factories, waste water treatment plants, or confined animal feedlots.

Phase I

Organizing The Program.

Paul O'Connell and Dixon Hubbard were the USDA officials who had the greatest impact on the establishment of the LISA Program. Many of the events leading up to the establishment of the Program are summarized here. From the first frantic months of 1988 through the establishment of the LISA and ACE Programs, and the struggles to devise good procedures -- these were exciting years!

A Thorn by Any Other Name

Naming of the Program was problematic from the outset. Paul O'Connell observed that the staffs of the relevant Congressional Committees felt strongly that the term "low-input" must be included in the Program title, to ensure people that it was not going to advocate complete termination of synthetic chemical pesticides and fertilizers, or propose immediate and widespread adoption of organic farming systems. Alternative terms thought to be less ambiguous and divisive, such as *lower* input (Clive Edwards) and *low external input* (a Dutch organization, Information Centre for Low-External-Input and Sustainable Agriculture, ILEIA) were proposed but rejected by O'Connell because he perceived that Congressional attachment to "low-input" was a sensitive issue. Therefore, the term low-input was included in the Program's initial title, despite many reservations, and predictions that it would be misinterpreted and maligned by many audiences.

This ominous prophecy was fulfilled. Advocates for chemical input industries ridiculed the term low-input as a guarantee of low yield, low income, mass starvation, and destruction of the agrichemical industries. The extreme advocates for organic agriculture also opposed the term "low-input," because it seemed (correctly) to imply that some chemical pesticides could still be used. In quest of a title having a recognizable acronym, I suggested the title Low-Input Sustainable Agriculture (LISA). This suggestion, offered in January of 1988, was rejected by O'Connell as being "too cute." Instead, the title adopted was Low-Input Farming Systems Research and Education (LIFSRE) Program. This awkward title remained in effect until June of 1988, when the director of an experiment station (who prefers to remain anonymous) sent a message to me recommending the title be changed from LIFSRE to LISA, standing for Low-Input Sustainable Agriculture. On this recommendation, the LISA title was once again offered to CSRS, and this time it was accepted. This title remained intact (despite almost continuous attack by chemical companies and their advocates) until the Program was officially renamed by the 1990 Farm Bill. Initially intended as a joke by a Congressional staffer, and then gleefully embraced by a Congressman, the title was changed to "Best Use of Biological Alternatives," designed so that

the acronym would be changed from LISA to BUBA. While "Best Use of Biological Alternatives" appears in the enabling legislation, BUBA has never been widely adopted as the Program's acronym. Instead the Program has been called Sustainable Agriculture Research and Education (SARE).

First Guidelines Released

Many essential details of the organizational structure and functioning of the Program had been conceptualized and negotiated by Paul O'Connell before the appropriation was approved in December 1987. Since no Federal position was available to hire a person to direct the Program, O'Connell arranged a cooperative agreement with the Pennsylvania State University to provide my services as the founding Director of the Program during 1988. The process of developing the Program Guidelines was greatly expedited by two factors. The first and most powerful influence was Paul O'Connell's keen understanding of the intent of Congress and his knowledge of how the federal government and the USDA land-grant university system operates. Paul provided essential guidance as I drafted the Program's preliminary operating guidelines.

Another very important contributing factor was input from the California Sustainable Agriculture Research and Education Program (SAREP), developed over a year earlier under the direction of Bill Liebhardt and Jill Auburn. Their experience in administering a sustainable agriculture research and education competitive grants program was invaluable in shaping the draft guidelines of the federal Program, and in preparing the first call for proposals. [\(1\)](#)

We formed an *Ad Hoc* Advisory Committee from USDA agency personnel plus Experiment Station and Extension, including representatives from each of the four CSRS regions. (The Northeast, North Central, Southern, and Western Regions are defined in the Glossary.) We also selected a host institution in each region.

Several key decisions were reflected in these January 1988 guidelines, many of which have continued to the present time:

The LIFSRE (later called LISA) Program was to be administered through a single agency, CSRS (recently renamed Cooperative State Research Education and Extension Service, CSREES) in close cooperation with the Extension Service. O'Connell told me my first responsibility as Program Director was to be sure Extension was involved in every aspect of the Program's administration. During the extreme pressure at the formative stage of the Program, I inadvertently failed on several occasions to fulfill this order.

CSRS would administer the Program through its four regions, Northeast, North Central, Southern and Western.

We selected a host institution in each region, based primarily on track record of support for sustainable agriculture. When some of the administrators of these host institutions expressed concern that they were being selected without a legitimate search and review process, I assured them (based on a conversation with Paul) that this selection was strictly an *ad hoc* choice, to be reviewed after the first year and possibly moved to other institutions. Despite my well-intended promise that the selection of host institution would be reviewed in 1989, I was (wisely) over-ruled. Because of the enormous bureaucratic complication and expenditure of energy required to re-locate a regional host institution, everyone agreed it would be far better to continue with the four selected institutions until there was good reason to change.

At each of these host institutions, the university administration was asked to designate a Regional Coordinator who would be the chief executive officer of the Program in that region. The persons selected were Fred Magdoff of the University of Vermont, (who continues in this role to the present time); David Schlegel at the University of California, (who retired and was replaced by Phil Rasmussen as the host institution shifted to Utah State University); Chuck Laughlin at University of Georgia (who served for 2 years and was replaced by Bill Brown at the second host institution, Louisiana State University; and subsequently by Gerald Arkin in 1993 when the host institution was returned to Georgia where it is now administered jointly by the University of Georgia and Fort Valley State University under the direction of Rick Welsh); Warren Sahs was the first Regional Coordinator for the North Central region at University of Nebraska (followed for one year by Jim DeShazer, and currently by Steve Waller).

Each region would select an Administrative Council (AC) to work with the Regional Coordinator in administering the Program of the region, and the AC would select a regional Technical Review Committee to review proposals for technical merit, relevance to Program goals, and other selection criteria patterned after the national guidelines. The size and composition of the ACs and Technical Review Committees have varied across regions and from year to year.

Variability was expected across regions regarding the details of administrative procedures used. The administrative procedures, as determined by the AC of each region, were to be reviewed by the Director of the LIFSRE Program, who would recommend approval by CSRS.⁽²⁾

After each regional AC has selected a list of projects to be funded and has approved an operating budget for the regional program, the Regional Coordinator prepares a plan of work and submits it to CSRS for review and approval. The specific configuration and content of the plan of work has varied substantially across regions and through time. Basically, the plan of work describes the procedures used in issuing a call for proposals and in selecting projects to be

funded, membership of the AC and Technical Review Committee, a description of projects proposed for funding, and the overall budget for the region's program for the fiscal year. As LIFSRE Director, I recommended that Paul O'Connell approval of the plan of work on behalf of CSRS. Then the Administrator of CSRS would sign on behalf of the Secretary of Agriculture, and it became a done deal.

The *Ad Hoc* Advisory Committee met in Washington on January 27-28, 1988, to review the preliminary LIFSRE guidelines. Representatives of various USDA agencies, land-grant universities, non-profit organizations, and Congressional staff people (including Kathleen Merrigan, then on the staff of Senator Leahy) attended that meeting, to discuss and fine-tune the proposed Program guidelines.

Following this meeting of the *Ad Hoc* Advisory Committee, Paul and I revised the draft Guidelines, prepared a call for project proposals. In subsequent years, each of the Regional ACs composed and distributed their own calls for proposals, based on perceived problems and opportunities in their region. The director of the national program was able to provide substantial assistance to each region, based on experience with all the other regions.

In 1988, we distributed these Guidelines and the national call for proposals to the Regional Coordinators, who then send them to all land-grant university experiment station and extension directors, to all other institutions of higher learning known to have agriculture-related programs, and to various public and private organizations thought to have an interest in sustainable agriculture.

Not Everyone Came to the Table

Early opposition to the Program at some of the universities was manifested in many ways. Many of the land-grant university officials were determined to control the Program, to prevent it from embarrassing their long-standing conventional (read chemical-intensive) research and education programs. And they were determined if any good came of this Program, they wanted to take the credit. In one state, the faculty never saw the LIFSRE Guidelines and the 1988 call for proposals, because it was discarded by the university administrator to whom it was sent. This was the only state in that region not submitting any proposals for the LIFSRE Program that year. In an apparent attempt to justify his actions, this administrator later sent me a letter highly critical of the Program, as he understood it, plus some materials he had presented in 1984 as Congressional testimony, in which he strongly opposed research on sustainable agriculture. Here are excerpts from my reply to him; by the time I wrote this letter, the Program's name had been changed to LISA.

Thanks for sending your materials pertaining to the LISA Program. The August 2, 1984, letter to

Jesse Helms contains a number of valid points, some of which have fortunately been incorporated in the current legislation and the LISA Program. For example, profitability of innovative systems is now stressed: three- to five-year grants are permitted in LISA; and top quality scientists are participating in the Program.

The letter also contains some important misconceptions, which I will comment on briefly, even though I realize your thinking on some of these topics may have changed in the past four years. First is the importance of the whole-farm approach. The essence of low-input/ sustainable farming systems (whatever they are called) is the substitution of management for certain kinds of purchased inputs. The kind of management that succeeds in these farming systems incorporates scientific knowledge of biological pest control, soil management, allelopathy, genetics, economics, and other sciences. The challenge of the research and education funded under the LISA Program is to improve the profitability and reduce the risks of low-input management strategies.

The statement in your 1984 letter to the effect that within 200 feet of your office door is a 107 year experiment ... comparing high- and low-input systems, is a reflection of a widely held misunderstanding of the importance of the management resource in low-input systems. As you probably have observed from the emerging literature in this area, simply withdrawing pesticides and chemical fertilizers with no change in management (such as adoption of crop rotations, enhancing natural enemies of pests, etc.) is not a scientifically valid representation of the low-input/ sustainable alternatives being examined by scientists and farmers. Your plots, while valuable for some rather specific scientific purposes, are a caricature of the many commercially viable low-input systems that have been documented through use of the whole-farm approach.

*Several whole-farm case studies (including four that I have been examining for several years) are included in the National Academy of Sciences report forthcoming in February. Incidentally, the NAS panel conducting that study (Alternative Agriculture) (chaired by Bob Miller of NC State and including John Pesek of Iowa State, for example) came to the unanimous conclusion that the whole-farm approach is essential to an understanding of the strengths and weaknesses of alternative farming methods and systems. The article by Willie Lockeretz in the summer 1987 issue of **American Journal of Alternative Agriculture** discusses several situations under which on-farm research is especially advantageous.*

Particularly important in the context of LISA is the need to examine interactions among several enterprises; to study the long-term effects of a production methods or system that has been used for several years; and to analyze a production method or management system practiced by farmers but has not received attention of researchers.

As you know, some remarkable innovations have been made by farmers down through the decades, and some really exciting ideas are making their way into the agenda of the scientific community. In some instances what appears to be a success story turns out to be a mirage of inaccurate measurement or reporting; or it may be an isolated incident not applicable on a commercial scale at the present time. But sometimes it contains the germ of a new paradigm that can lead to a major scientific breakthrough. The whole-farm approach should never become the entirety of our research enterprise; but neither should it be excluded as a source of innovative hypotheses and opportunities to document farm management strategies that integrate findings from a wide array of biological and physical science research.

Your discussion regarding substitution of less expensive inputs is, as you know, standard production economics. The juxtaposition of LISA with production economics is that economics takes as given the current state of the art, the shape of the production function; we are seeking to change the nature and shape of the production functions, to permit profitable adoption of farming methods that are environmentally benign. It is not just a matter of moving to a different position on today's production function, but of moving to a new and better one.

I appreciate the opportunity to read your materials and to continue a dialogue regarding the place of the LISA approach in the agricultural scientific enterprise.

To his credit, this administrator realized he had made a mistake, and with admirable integrity, he wrote the following message to me:

Thanks for your letter of 11 November, 1988. We found it very helpful in thinking through our growing involvement in the LISA Program and related issues. We are taking the liberty of circulating your letter to our department heads. They are working with us to establish a formal sustainable agriculture program. We hope to use this program as a means to coordinate the many activities underway at this University that relate directly to sustainable agriculture and to help us communicate with interested groups in the state.

Later this administrator became an active and constructive member of his region's LISA program Administrative Council. Many other administrators and scientists who were once skeptical have also become advocates.

Jump-Starting the Program

The LIFSRE Program was started with deliberate haste, realizing that mistakes would be made, but also recognizing that Congress was eager to see if the Program would fulfill their expectations. They wanted to see concrete evidence that this would be a science-based,

grassroots, problem-solving program, featuring involvement of farmers and non-profit groups, as well as universities in the management and oversight of the program. They expected the substance of projects funded to depart significantly from "business as usual," which we understood to mean single-discipline reductionist studies focusing on a small component of the overall farming system, without considering the ecological, managerial, or social context in which that component resides. We understood that Congress wanted to see interdisciplinary teams developing and promoting adoption of farming methods and systems that would be profitable, environmentally sound, and socially acceptable.

Experts familiar with the workings of the Federal Government say that a new program such as this one typically requires a minimum of eighteen months to become established, to develop guidelines and a call for proposals, to select proposals for funding, and to get the funds distributed so the projects can begin. Through the intense efforts of the Washington staff, the regional offices, and the regional Technical Review Committees and ACs, this entire process was compressed into one third the usual time: six months. By June of 1988, all four regions had evaluated their proposals (a total of 371 were submitted).

The regional Technical Review Committees determined that 130 of these proposals were acceptable in terms of relevance to the goals of the program, contained appropriate and feasible methods and contained plans for making the findings readily available to farmers. The regional ACs selected 53 of these proposals for funding; several similar proposals were combined through negotiation, to form a total of 49 projects. If more funding had been available, at least an additional 77 projects would have been funded, and a longer duration of support would have been provided for the projects that were funded. This would have required roughly five times the funding available (about \$20 million).

The 1988 Annual Report to Congress described the portfolio of projects funded in each region. The report listed the project title, principle investigator, and other major participants. Farmer involvement in the projects was highlighted. Private non-profit organizations were listed explicitly. The objectives were presented, along with the amount of federal funds granted and the matching contributions (which actually exceeded the federal funds). A total of about \$836,000 dollars of grants was distributed by each of the four regions. An updated and expanded version of that report was published in 1990 (Madden et al. 1990).

Congress was very favorably impressed by how rapidly the Program was established. They were particularly impressed by the extent of farmer involvement, the diversity of the project portfolio, and the lack of "business as usual" flavor. The FY 1989 appropriation for the Program was increased 14 percent, while the funds for virtually every other USDA program was reduced.

This contrast was not lost on the adversaries of the Program, who earnestly hoped that it would simply disappear. Neither was this contrast ignored by the proponents of sustainable agriculture who rejoiced in the survival and positive trend in funding of the Program.

First Year Postmortem

Recognizing the hasty manner in which the LISA Program was being established, and intuiting that we were making plenty of mistakes, we determined early in 1988 that we would hold a review conference at the end of the first year, to determine ways to improve the operation of the Program for subsequent years. The conference was held September 7-8 in Washington, DC⁽³⁾ Speakers included the Assistant Secretary for Science and Education (Bentley); Administrators of CSRS, Extension Service, and Agriculture Research Service; staff members from the Senate and House Agriculture Committees; private sector speakers from Rodale Press, Farm Bureau, Noyes Foundation, and private pest control consultants, including the flamboyant and highly regarded organic farming consultant from California, Amigo Bob Cantisano.

Many useful suggestions were provided, including extending the amount of time permitted for preparation of proposals, including farmers on the proposal review panels, and other operational matters. In the discussion groups, several issues emerged regarding the management of the Program. Responses to these issues have varied somewhat from one region to another since 1988. The issues raised during this conference are as follows:

How to select regional AC members to represent farmers, private research and education organizations, and foundations.

How to select Technical Review Committees so as to ensure broad representation of institutions and disciplines.

How to conduct project proposal reviews fairly and with professional legitimacy; avoiding conflict of interest. Issues included whether persons submitting proposals would be allowed to sit on the review panel; and whether some or even all of each region's review panel should be external to the region.

How to ensure that the profitability, resource requirements, and risks of low-input farming methods emerging from the projects be accurately assessed and made readily available to intended users, especially farmers.

- How to conduct progress reviews of multi-year projects to ensure continued high quality of work and relevance to Program objectives.

How to provide adequate time and guidance for preparation of proposals. Training sessions?
More explicit format for proposals? Examples of proposals approved in the first year?

How to ensure that all public and private organizations and individuals have a meaningful opportunity to participate in the Program.

How to conduct long-range planning to provide the basis for identifying high priority topics for project proposals.

Reporting procedures to provide timely reporting to meet legal reporting requirements and to accurately indicate progress made, remaining gaps, and emerging priorities.

Responses to these and other emerging issues have been codified into national guidelines and regional procedures.⁽⁴⁾

Evolution of Project Evaluation Criteria

During the first year of the Program, we were constantly reminded that Congress was looking suspiciously at the Program, expecting that it would revert to "business as usual." To prevent this from happening, we placed very high priority on getting projects in the portfolio that included multiple disciplines and multiple institutions, including private organizations and farmers. For example, one of the evaluation criteria used in 1988 and 1989 was, "extent of multi-discipline, multi-institution, and multi-state involvement" -- what I termed "functional integration of multiple organizations". Meaningful involvement of both public and private organizations, as well as farmers and farm organizations, was strongly encouraged. Wording of this criterion in the 1989 regional calls for proposals varied somewhat from region to region.

The results of this evaluation criterion were mixed, both positive and negative. A positive result was that Congress became convinced we were not doing "business as usual." The portfolio in the first few years was heavily weighted toward projects featuring multiple disciplines and cutting across state lines, and there was substantial involvement of farmers.

However, as soon as this diverse portfolio of projects had been established, we began revising the proposal evaluation criteria to eliminate distortions that seemed to undermine the quality and efficiency of projects. Specifically, we found many regionally important projects were best done within a single state, and that by requiring multi-state projects the limited project funds were often stretched beyond a reasonable limit. Involving multiple institutions located a great distance apart was a particularly awkward strategy. We also recognized that findings from one location can serve farmers in comparable locations in other states. Emphasis shifted from multiple organizations in diverse states to subject matter applicable to diverse locations in the

region. Interdisciplinary projects continued to be favored, as a means of solving real-world problems.

Creative Ambiguity vs. Semantic Paralysis

During the early years of the Program, many meetings and conferences on sustainable agriculture were convened, often at universities or during the annual meetings of professional scientific associations. These meetings often began with a scientist adamantly assuring the assembly that nothing they might do in this meeting could possibly amount to anything, unless everyone first agreed on an explicit definition of sustainable agriculture. Since reductionist science requires clear and unambiguous definitions, it was both inevitable and appropriate that scientists require a definition of the subject at hand. And while attention to definitions can be healthy, I observed that many of those calling for a definition were demanded a bifurcation of all agricultural practices into two distinct categories, one called sustainable and the other non-sustainable or some other characterization. This position is not surprising, in view of the strongly reductionist orientation of most agricultural university faculty and administrators, buttressed by the academic rewards systems for granting tenure or promotion. These systems typically place very high credence in the candidate's list of journal articles published in the most prestigious refereed journals of that person's academic discipline. In academia and in the peer review process of refereed scientific journals, the types of studies most favored are those featuring a reductionist approach based on the premise that the only scientifically valid way to improve a complex phenomenon or system is to examine its isolated parts, while holding constant or ignoring the ecological context in which that system is found in nature or on farms. This orientation to science gives strong priority to repeatable replicated experiments featuring highly structured, simplified, often unnatural subjects. In contrast, studies of sustainable farming systems require an interdisciplinary approach to understanding and improving natural or whole-farm systems that are typically holistic, chaotic, and biologically diverse. Reductionist studies often ignore synergistic features that make sustainable systems work.

There is a philosophical basis for the difference between those who demand adherence to a rigorous definition versus those who proceed in light of "creative ambiguity". Persons with the first of these orientations tend to feel more comfortable in a climate-controlled lab, doing reductionist work under highly predictable and repeatable conditions -- which often results in many essential contributions to reductionist disciplinary science. Many practitioners and scientists working in the sustainable agriculture recognize the paramount role played by innovation, paradigm shifts, chaos, biodiversity, and natural resiliency.

Progress toward more sustainable agriculture requires both kinds of work. This progress is accelerated with better rapport and more mutual respect across an imaginary line in the sand. Those who are comfortable only in the reductionist mind set need more patience and respect

for those who are going after real-world solutions to real-world problems -- which are often heuristic, messy, unrepeatable, ... but useful to those who are trying to make agriculture more sustainable, more ecologically beneficial, and more socially desirable for present and future generations. And the "real-world problem solvers" cannot attain their fullest potential contribution without the knowledge generated by their reductionist colleagues. Rapport and mutual respect are essential.

During many of the sustainable agriculture conferences of the late 1980s and early 1990s, the clash between the reductionist and holistic orientations became rather heated. The moderator of one such conference (Ron Voss at U.C. Davis) handled the matter of definition with admirable diplomacy. During the first few minutes of the conference, one of the participants angrily insisted that the entire two-day conference come to a complete halt, until everyone in attendance agreed on the definition of sustainable agriculture. Others yelled out their support for his position. The moderator, being a veteran of several such (fruitless) semantic exercises, effectively blocked what could have become total paralysis of the conference. He calmly and respectfully asked who would like serve on a "Definition Committee." He appointed those six to the Committee, and they were happily led away to a room, which they proceeded to fill with stale smoke and heated rhetoric.

Meanwhile, the other 140 or so participants went ahead and created what has come to be known as the California SAWG (Sustainable Agriculture Working Group). Near the end of the conference, the moderator respectfully called upon the "Definition Committee" and asked if they had agreed on a definition. Their spokesperson reported, with intense frustration, they had not reached a consensus. This response was the exact result the moderator and all other veterans of many such discussions had fully expected.

The quest for more sustainable agriculture is a journey, not a destination.

And so it goes. Semantic paralysis is imposed by those who would stop the parade until everyone is marching to the same tune. Creative ambiguity is practiced by those who are willing to press on in the face of less than complete agreement about the definitions, realizing the quest for more sustainable agriculture is a journey and not a destination.

Prelude to NSAAC

On March 20, 1987, the USDA Assistant Secretary for Science and Education (Orville G. Bentley) wrote a memorandum to 27 agencies announcing the establishment of the new "Research and

Education Subcommittee on Alternative Farming Systems."⁽⁵⁾ Bentley asked each agency administrator to designate a member and alternate member of this Subcommittee. As of June 1988, the members included:

- Paul O'Connell of Cooperative State Research Service as Chairperson;
- Harold Ricker of Agricultural Marketing Service;
- Doral Kemper of Agricultural Research Service;
- Neill Schaller and Kitty Reichelderfer, then with Economic Research Service;
- Vivan Jennings and A. J. Dye of Extension Service;
- William Briscoe of Farmers Home Administration;
- Joseph Blair of FSIS;
- Howard Riddick of HNIS;
- Samuel Waters and Jayne MacLean of National Agricultural Library;
- John J. Crowley of OGPA;
- James Walker of OICD;
- Martin Fitzpatrick of OT; and
- Klaus W. Flach of Soil Conservation Service.

We invited the Subcommittee to a meeting on June 23, 1988, to review a list of the titles of projects funded in the first round of the LISA Program. Only six members of the Subcommittee attended the meeting: Ricker, Jennings, Reichelderfer, Waters, O'Connell, and Kemper. The issue of quorum was never raised. O'Connell read the list of projects approved by the Regional Administration Councils, and then moved on to other business.

The Subcommittee was not asked to approve or deliberate on the decisions made by the Regional ACs. This procedure guaranteed that, as O'Connell had prescribed, project selection decisions made at the regional level would not be overturned in Washington. This principle has been one of the cardinal strengths of the SARE Program, protecting it from "pork barrel" pressure in selection of projects and allocation of funds.

In effect, the functions of this Subcommittee were later subsumed (with additional responsibilities) by NSAAC (National Sustainable Agriculture Advisory Committee) following passage of FACTA, (the 1990 Farm Bill). NSAAC included most of the agencies represented on the subcommittee plus other public and private sector members mandated by Congress.

Origins of the ACE Program

Even though the ACE (Agriculture in Concert with the Environment) Program was not officially funded until 1991, the roots of the Program extend back to April 1989. At that point, EPA

officials (Diana Horne and Bernie Smale) contacted CSRS to explore the possibility of joint USDA-EPA funding of projects like those being funded by the LISA Program. The EPA officials perceived that LISA-type projects could make substantial progress toward preventing pollution associated with agricultural chemicals. In response to their inquiry, I contacted the four regional offices, asking for their nominations of projects that were not funded in 1988, but were otherwise rather strong and worthy of funding, specifically projects that could have a beneficial effect on the environment. I presented a dozen project proposals to the designated EPA official (Smale), and he selected two: Gerald Sutter's South Dakota study of a bait to control corn root worms (*Diabrotica*) using less than one percent of the label rate of insecticide, and Ed Schweizer's study of weed management in Colorado based on monitoring weed seeds in the soil. Both of these scientists, incidentally, were Agriculture Research Service (ARS, USDA) employees.

Initially, the target budget for these projects was \$1 million dollars. Subsequently, EPA reduced the budget to \$360,000 dollars for two years, and gave the funds to the Schweizer project. This was, in effect, the first ACE project. However, in the interest of simplicity and to reduce overhead charges, I decided not to have EPA transfer funds from EPA to CSRS, as initially envisioned. Rather I asked that the funds be transferred directly from EPA to ARS. As a result, the Schweizer project was never considered an ACE project. After the EPA funds were transferred to ARS, there was no further contact with the LISA Program.

In early 1991, EPA officials decided to allocate \$1,000,000 to formally establish a joint EPA-LISA/USDA Program. Each year the LISA Program (now called SARE) would match the EPA funds dollar for dollar, from the appropriated funds. The EPA officials also decided the name of the Program should be Agriculture in Concert with the Environment (ACE). The Southern Region had already completed their LISA grants selection for the year, so their share of that year's ACE funds was carried over to the next year.

At first the EPA officials expressed a strong demand that an entirely separate procedure be established for the ACE Program in each region, including a separate call for proposals and selection committee. This approach appeared to be rooted in distrust of USDA and the largely land-grant university base of the LISA Program's operation. During the sometimes heated discussion over this matter, the national and regional administrators of the LISA Program pointed out the enormous cost savings that could be effected (both in monetary and staff resources) by uniting the project selection processes of the two programs. Some of the regional coordinators flatly refused to administer two parallel programs, insisting their administration be combined.

An important EPA concern had to do with the number of votes -- concern that their representative on the committees would be out-voted. We assured the EPA officials that as soon as some of their people had the experience of participating in the Technical Review Committee and the AC process of project selection and funding, their concerns would vanish. This is precisely what happened. EPA found the discussions to be open and all the participants receptive to the views of everyone around the table. The EPA position, which seldom differed from that of the majority, was always heard and respected.

During its December 6-7, 1990 meeting, the LISA Ad Hoc Coordinating Committee (later called the Operations Committee, composed of the national and regional leaders of the Program) decided the new EPA-LISA program must not be administered separate from LISA. The decision to integrate what ultimately became the ACE Program into the LISA (and subsequently SARE) Program administration was a crucial decision which greatly increased the efficiency of administration.

The ACE Program is designed to help prevent agricultural pollution. These efforts concentrate on the following goals:

- reducing the use of agricultural chemicals including pesticides and fertilizers;
- promoting adoption of nutrient management planning and reduced-risk pesticides and/or biological controls; and
- protecting ecologically sensitive areas.

The type of projects to be funded already slightly overlapped those of the LISA Program. For example, in a memo to Paul O'Connell on May 3, 1991, I responded to an inquiry regarding the number of LISA projects to protect fish or wildlife habitat. At that time the North Central Region was evaluating project proposals: three proposals were of this type. The Southern Region had already funded two of these projects. No similar data was calculated for the other regions at that time, but these data established the point.

The EPA official in charge of the pollution branch of the Pollution Prevention Division was John Atcheson. At that time he was the supervisor of Harry Wells, then with the Chesapeake Bay Liaison Office of EPA. Atcheson appointed Harry Wells to represent the ACE Program at the Northeast and Western Region Technical Review Committee meetings and AC meetings in the Spring of 1991. Two other EPA employees were assigned initially to the North Central and Southern Regions. This regional variability, plus the likelihood of having different personnel each year, became a significant concern to me and to the Regional Coordinators. Fortunately for the ACE Program and for those administering the LISA Program, Atcheson decided to

appoint Wells as the permanent representative of EPA in all four regions.

The system worked. Wells' conclusion was:

"based on the pre-proposal reviews and the commonality of interests between EPA and USDA, the ACE Program will meet many of the pollution prevention goals and objectives of the agriculture sector strategy. I believe that as we develop closer working relationships with CSRS, SCS, ES, and other USDA agencies as well as the fertilizer and agrichemical industries, we will begin to address the massive questions of maintaining food and fiber production while reducing the chemical loadings. EPA can, and is beginning to influence the process through its participation in the ACE grant process. Hopefully we can maintain and build upon the momentum started ..." (March 25, 1991 memo from Wells to Atcheson).

1. The term "call for proposals" has been used in place of the more familiar "request for proposals," because the use of the latter term required a significantly more complicated procurement process, including advertisement in Commerce Business Daily, etc.

2. Technically speaking, as a university professor and not a duly appointed federal employee, I was never officially authorized to approve the regional plans of work. I never became a federal (USDA) employee during my years with this program. O'Connell requested my advice on these matters, and he signed the necessary documents.

3. As a prelude to the September 1988 conference in Washington DC to review the first year of operation of the LISA program, I organized a reception in the patio of the Administration Building of US Department of Agriculture. John Haberern of Rodale Institute agreed to contribute funds to subsidize this reception, and I hired a local organic foods wholesaler (Joe Dunsmore) to provide organic fruits, vegetables, juices and snacks.

4. Many knowledgeable people have commented that Congress paid the LISA program a great compliment by codifying many of these procedures into the enabling legislation of the SARE program, in the 1990 Farm Bill (FACT Act 1990).

5. The original members of that subcommittee were as follows: Randall E. Torgerson, ACS; J. Patrick Boyle, AMS; Donald L. Houston, APHIS; T. B. Kinney, Jr., ARS; Milton Hertz, ASCS; J. Patrick Jordan, CSRS; John E. Lee, Jr., ERS; Myron D. Johnsrud, ES; E. Ray Rosse, FCIC; W. Kirk Miller, FGIS; Vance L. Clark, FmHA; S. Anna Kondratas, FNS; F. Dale Robertson, FS; Lester M. Crawford, FSIS; Laura S. Sims, HNIS; Joseph H. Howard, NAL; Charles E. Caudill, NASS; Stephen B. Dewhurst, OBPA; Christopher Hicks, OGC; John J. Crowley, OGPA; Joan S. Wallace, OICD;

Robert W. Beuley, OIG; Martin F. Fitzpatrick, OT; B. H. Jones, PSA; Jack VanMark, REA; Mark Safley, SCS; James R. Donald, WAOB. (Only USDA veterans recall what all these acronyms meant.)

Phase II

Ballet in a Mine Field.

Many crises had to be dealt with during the formative years of the LISA Program, simply to keep it alive. Several of these crises are particularly instructive.

Opposition Accelerates

In February of 1988 I wrote a press release to go out over the signature of Assistant Secretary for Science and Education Orville G. Bentley, announcing the start of the Program. A seemingly innocent statement in the press release became a major issue: "Low-input farming systems is an idea whose time has come. [The goal of the Program is] to provide an abundance of food and fiber in a way that is harmless to humans and the environment, and sustainable for generations to come." This language precipitated intense opposition from certain members of the agricultural chemical industry. For example, the Fertilizer Institute attacked the USDA press release saying it "represents an unprecedented move by the USDA to advocate one farming system at the expense of another -- with no facts to back up the premise. ... Several statements attributed to [the Assistant Secretary] are sharp (and unfounded) indictments of the agricultural input sector and blatant insults to the American farmer." (The Fertilizer Institute's Committee on Government Operations, 1988, p. 25)

Chemical company representatives and their friends and beneficiaries at several universities mounted a campaign to discredit, ridicule, and ultimately demolish the LISA Program. Most of the farm press (which is funded largely by chemical company advertisements) unleashed a barrage of anti-LISA articles and editorials. One example is an article appearing in the *Potato Grower of Idaho* (Summer 1991, page 14) and reprinted in other publications. Entitled "LISA: She's Not My Favorite Girl," the article states:

During the last 50 years, America has assembled the greatest agricultural production machine the world has ever known. Through the proper use of new plant varieties (genetic engineering), agricultural fertilizer and chemicals, irrigation techniques, equipment designs, and above all, education, we have maximized yields of high-quality agricultural produce so our nation and other nations can be properly fed.

Despite our enviable agricultural production record, we have small pockets of vociferous activists in the United States who say we have been running on the wrong track all these years. Among other things, they advocate the elimination of the use of chemical fertilizers and farm chemicals.

They insist farmers should substitute a "natural method" of growing crops by adopting an "organic" approach to the production of our basic food items. This organic approach would mean substituting manures and legumes for commercial fertilizers such as urea and ammonium sulfate. During grasshopper plagues we could hope that two blocks of wood would substitute for airplane application of the appropriate chemicals to kill the crop-eating insects."...

Amazingly, LISA proponents have convinced Washington politicians to allocate several million dollars for research on low-input agriculture. The funds will be used to try to nullify the basic agricultural research on crop production developed by the State and Federal agronomists over the last 50 years.

What would happen to Idaho potato production if LISA's program is adopted or made mandatory by Congress? ... By following a LISA-type program we could anticipate a 60 percent loss in production, or a \$305,000,000 loss in receipts on the farm. The loss would not take into account the dollars that would be lost in the processing and distribution of the finished product. ... Many jobs are involved, many mouths are fed and taxes paid by all facets of the industry.

An article in the *Cotton Grower* (January 1990, page 39) by William Spencer is typical of the misrepresentation of low-input sustainable agriculture:

A low input demonstration plot planted at AgriCenter International in Memphis last year was a "real eye opener," according to Shelby County Agricultural Extension leader Buddy Sanders....No agriculture chemicals or fertilizers were used in the plot to demonstrate the effects of Low Input Sustainable Agriculture. Says Sanders: "It very vividly demonstrated what would happen under LISA the big visual difference was that this plot was just taken over by weeds."

The article went on to say that AgriCenter would also plant "LISA cotton, soybean and vegetable plots." Their demonstration was a gross misrepresentation of sustainable agriculture. The technology being demonstrated under the label of "sustainable agriculture" was actually just poor farm management and benign neglect -- simply taking away chemical inputs without adding the compensating elements of sustainable farming systems, such as mechanical weed control, legume-based crop rotations, landscape ecology, biological control of pests, etc.

These are only two of very many examples of the misinformation widely disseminated by opponents of LISA. These articles completely missed the point that the essence of LISA production methods is not what materials are omitted, but the biological knowledge-based management that is substituted.

Very often when I met with university faculty and administrators in 1988-98, it was necessary to establish rapport by first dispelling the myths generated by chemical company advocates and wrong-headed media reports. For example, I often pointed out that the LISA Program has never advocated elimination of synthetic chemical pesticides and fertilizers. Rather, the Program advocates ecologically responsible use of all farm inputs (including manure) that can cause damage when misused. It funds projects intended to increase the productivity and profit of farming systems that are less dependent on synthetic chemical inputs. I reminded them that EPA was restricting or banning many pesticides, while a rapidly expanding list of pesticides have become obsolete due to genetic resistance by pests. I also reminded them that very few new pesticides were being introduced by the chemical companies, because of the enormous cost (estimated at \$50 to \$70 million) and long delays (up to ten years) in winning EPA approval. Furthermore, the process of developing and promoting widespread use of effective and economical alternatives to pesticides could be long and difficult. Therefore, I argued, the university was faced with a choice between two alternative courses of action: (1) wait until the "train wreck" when growers realized they no have effective and legal pesticides, and that no practical alternatives have been developed, or (2) shift the university's research priorities toward developing those alternatives.

Invariably, this line of reasoning melted the initial animosity and led to fruitful discussions on how to participate in the LISA Program.

Prairie Fire

Perhaps the most threatening and potentially lethal event incurred in the Fall of 1988, in the North Central Region. Some of the most politically powerful support for the LISA Program stemmed from North Central Region private organizations advocating sustainable agriculture. Alienation of these organizations could have been lethal to the Program, particularly during the first year or two of its operation. An unfortunate chain of events clearly threatened the continuation of their good will and their continued support for the Program. However, in retrospect it is clear that this event led to the establishment of an essential principle regarding the role of private non-governmental organizations in the governance of the Program.

One of the private nonprofit organizations seeking to be involved in administering the LISA Program was the Wisconsin Rural Development Center (WRDC), located in Madison, Wisconsin. The Dean of the College of Agriculture at University of Wisconsin contacted DeShazer, opposing the appointment of the Wisconsin Rural Development Center on the grounds that this organization was antagonistic to the College of Agriculture. This history of antagonism stemmed from an earlier event in which the Center opposed a request by the College of Agriculture to have the petroleum overcharge funds allocated to the College. The opposition by

WRDC was successful, and the College of Agriculture was subject to considerable embarrassment over this matter. In an effort to prevent WRDC from gaining a position in the governance of the LISA Program, the Dean's office requested that the College be given the authority to designate which organization in Wisconsin would represent the private sector in administering the Program.

This request seemed reasonable to the Regional Coordinator at the University of Nebraska (Jim DeShazer). So he agreed to this proposal and sent a message to all the land-grant universities in the North Central states, saying the College of Agriculture would be authorized to designate the private sector participants. Neither DeShazer nor the university administrators in the various North Central States appeared to anticipate the severe repercussions this policy would ignite.

The North Central region's private organizations had a legitimate complaint. After all, they had played an important role in getting Congress to appropriate the funds to start the Program. Several of these organizations had been highly effective in assisting the lobbying effort to get the enabling legislation passed and federal funds appropriated to start the Program in the first place. Meanwhile, some of the key leaders in the land-grant system had officially (and at times, vociferously) opposed the Program's establishment. Now some of the land-grants were picking and choosing which of the private organizations would be allowed to help direct the Program. The private organizations were legitimately concerned. They saw that the Program could be usurped by an antagonistic force -- land-grant universities -- which they perceived as historically opposed to organic or even low-input organic farming technologies. Representatives of the land-grant system often expressed irritation at the term "sustainable agriculture, because they felt it implied that the conventional agriculture they had helped to create was *not sustainable*. So the leaders of these private organizations sounded the alarm.

Word of the emerging crisis first arrived reached Washington via an urgent telephone call to me from a long-time friend and colleague, Walter Goldstein. Walter was a staff member at another private organization in Wisconsin, the Michael Fields Institute. He told me that the Wisconsin Rural Development Center leaders were extremely upset at being excluded from the LISA administrative process, and that they were marshaling support from all the other private organizations in the Region. WRDC was threatening to take the matter directly to the Appropriations Committees of the Senate and House, with a request that no further funding be appropriated for the LISA Program.

Paul O'Connell, being extremely knowledgeable regarding the working of the US Government in general and Congress in particular, had said that one of the cardinal realities in Washington is that Congress backs away from controversy. It became very clear that if the politically well-

connected private organizations in the Midwest lined up against the LISA Program, it did not stand a chance of receiving further funds. The continued existence of the LISA Program was hanging in the balance.

During the next two days, I spent all of my waking hours dealing with this crisis. At the time, Paul O'Connell was away from his office in Washington, attending a conference. I contacted him at the conference, and described the rapidly spreading crisis, and we agreed on a strategy for dealing with it: Paul authorized me to modify the Guidelines of the LISA Program immediately, stipulating that the private organizations in each state had the prerogative of selecting their own representatives for the LISA Program administration. This was the first time specific Guidelines were set forth at the national level regarding the manner in which private organizations were to be involved in the administration of the Program. The new language directly contradicted the operating procedures of the North Central Region. Therefore it was necessary to engage in extensive discussions with the DeShazer and key members of the North Central AC, as well as representatives of the various private organizations in the North Central Region, to re-establish rapport. Ultimately the revised Guidelines language was acceptable to both sides in the dispute. The revised Guidelines stated:

"Private research and education organizations in each region should be asked to select their own representatives to the regional Administrative Council and Technical [Review] Committee. Where these private organizations of a region are not currently formed into any kind of decision-making body that can select official representatives, they should be encouraged to form a federation or other such entity for this purpose. This federation should then be called upon to designate a representative to serve on the Regional AC. The AC should determine how many representatives of the federation will serve on the region's Technical Review Committee. These representatives should then be selected by the federation. Each regional AC should devise a procedure for seeking guidance from these private organizations in identifying and selecting appropriate farmers or producers to serve on the AC and Technical Review Committee."

While no "federations" were actually formed, this proposed process served to head off "a train wreck" that would surely have occurred if the private organizations had officially come out against the Program.

An immediate disaster had been averted. However, the long term impact of the way this matter had been handled remained a concern. As the national program Director, I had taken some fairly heavy-handed actions. While this approach seemed necessary as an emergency measure, it clearly was not "sustainable" because it was very "top-down," in direct violation of the principle of self-determination by the Regions. An essential element in long-term resolution of

the matter was to broaden the sense of ownership: the Regional ACs must be invited to develop their own ways of dealing with the issue. Therefore, this revision of the national Guidelines invited the Regional ACs to modify this procedure in appropriate ways.⁽¹⁾

The compromise was tenuous. The private organizations agreed not to approach Congress with a request to terminate funding for the LISA Program. However, they remained highly suspicious that the land-grant university people would use their influence to exclude the interests and priorities of the private sector whenever possible in the grant-making process. I repeatedly assured them this would not happen. And kept my fingers crossed.

During the ensuing North Central Region AC meeting in Kansas City, the private-sector fears were dispelled. One of the leaders of the private sector organizations, Chuck Hassebrook, came up to me during a break and said with considerable surprise and relief that he was pleased to see that the voting on funding of projects was not divided along public-private lines. He commented that the interests and priorities of the private sector organizations were being heard and respected, and that the portfolio of projects being funded was very acceptable to the private sector organizations.

Soon after this incident, the University of Nebraska, as host institution to the Program, assigned Dr. Steve Waller to serve as Regional Coordinator. The excellence of Steve's service to the Program has become widely recognized. For example, his re-appointment as Regional Coordinator was explicitly requested by the AC. Under his administration, a very solid and innovative Regional Program was established. In many ways, the North Central Region was ahead of its time, leading the other Regions in several important innovations and in defending the integrity of the Program.

Each of the Regional ACs devised their own way of including private organizations. In none of the other regions was this a major issue. In the Northeast Region, for example, Rodale Institute was the dominant private organization in the area of sustainable agriculture. A vice president of Rodale Institute (John Haberern) sat as a member of the regional AC. Rodale scientists were also included on the Technical Committees. In the Western and Southern Regions, private organizations were not clamoring to get involved in the administration of the Program, as was the case in the North Central region.

The North Central Region AC employed formal procedures to a degree not found in the other Regions. Formal parliamentary procedures were invoked for reaching decisions; in the other Regions, decisions were reached almost entirely by consensus, with votes rarely and informally taken. A formal rotation scheme (developed by DeShazer) ensured that each North Central state had representation on the AC, and that land grant universities and other kinds of

organizations would be systematically rotated off the AC. Members of the AC seemed very satisfied with the apparent objectivity of this rather systematic quota system for rotating membership of the AC. This system had the advantages of ensuring participation of every state in the AC, and of ensuring a breadth of participation not found in the other regions. A possible disadvantage of this formal rotation system was that it may have had an unintended effect of preventing highly qualified people from serving on the AC because they did not fit into their state's allocation category.

One of many positive aspects of this Region's formal administrative approach was the decision to maintain formal records of all the decisions made and procedures used by the Regional AC. These documents were assembled into a huge loose-leaf notebook that was often updated as new decisions are made. The full set of records was hauled to each meeting of the AC, in case questions would arise as to previous decisions. This systematic approach, while generating a huge amount of paper work, proved to be beneficial to the sound management of the Program in the North Central region. The other Regions subsequently adopted a somewhat similar approach, though with less formality and detail.

In many ways, the North Central AC proved to be the most innovative of the four Regions. For example, the North Central Region's AC was the first to:

- elect its chair from among the members of the AC. Over the years, the chairs of the AC included two farmers (Fred Kirschenmann and Tom Guthrie), a private foundation executive (Karl Stauber), a federal executive (Gus Dornbush of the Soil Conservation Service, USDA), a Cooperative Extension Director (E. P. Christmas), a representative of a non-governmental organization (Ken Taylor) and a university professor (Rick Klemme);
- establish a producer grants program. While under the leadership of Karl Stauber, the North Central AC developed this innovation, which was later adopted by the other three regional programs. Small grants, normally under \$5,000, were given to producers for the purpose of exploring innovative ideas on their farms;
- employ a field coordinator to service the producer grants ;
- include socio-economic projects in the annual call for proposals; and
- develop and publish a strategic plan.

These and other innovations illustrate the energy and commitment invested in the program by that Region's AC.

In retrospect, the "prairie fire" incident played a very important role in shaping (and saving) the LISA Program and its successor programs, and consequently the sustainable agriculture

movement in the US. An important principle was established regarding inclusion of private organizations in the processes of governing and operating the Program.

Threatened Law Suit

Another incident that appeared to pose a serious threat to the Program during its early years occurred in the Northeast Region. In retrospect, the incident seems like the proverbial "tempest in a tea pot". However, at the time this event occurred, the LISA Program was still very new and fragile, subject to termination or reduced funding in the face of any major controversy that might reach Congress.

A farmer using exclusively horse-drawn technology submitted a proposal on January 26, 1990. This proposal was one of 68 proposals reviewed by the Northeast Technical Review Committee on March 22, 1990. Only seven proposals were funded. This proposal ranked number 56 of the 68 proposals.

Review comments written by assigned members of the Technical Review Committee were often rather terse and insulting; and that year the unedited review comments were sent directly to each applicant. These terse comments usually did not reflect the full extent of the deficiencies noted by the Technical Review Committee. Consequently, upon receiving their review comments, some applicants expressed the view that their proposal had been unjustly denied funding.

The horse farmer was one of these disgruntled applicants. He argued (during a telephone conversation) that animal-powered technology was the only truly "sustainable" technology, because it did not depend on non-renewable (fossil) sources of energy. He threatened to complain to his Congressman, and to bring a law suit against the Program and its various administrators at the Regional and National levels. He made a series of very insulting and threatening telephone calls to various Program personnel.

Over the weeks that followed, several conciliatory and apologetic letters were written to the disgruntled applicant -- letters from the National and Regional levels. I responded to his "Freedom of Information Act" request for the names of the reviewers who discussed his proposal, and other administrative data. Because he had demanded privileged information, the request was denied.

He did, however, receive copies of the funded proposals. Upon examining these proposals, the shrillness of his complaint intensified. He complained that several of the proposals funded should have been disqualified on the grounds that they did not strictly follow the format rules in the regional call for proposals. One of the procedural irregularities he cited was that several

of the funded proposals had violated the rule that all objectives must be complete sentences.

However, I pointed out to him that none of the objectives in his proposal were full sentences, and that despite this and other format irregularities, his proposal had been fairly and honestly evaluated (and rejected) by the Technical Review Committee. He abruptly withdrew his attack and I never heard from him again.

Several lessons learned from this incident were shared with the ACs of all the Regions. Several procedural changes resulted:

- Review comments returned to applicants should be carefully edited to purge out insulting rhetoric, and should provide a logical and correct rationale for refusal, if in fact any explanation is given. Un-edited reviewer comments should never be sent to the applicants.
- Each regional program must have carefully worded guidelines. Both the Technical Review Committee and AC must adhere strictly to those guidelines, and should create a paper trail documenting the procedures used to protect against legal actions brought by applicants.
- The Regional AC Guidelines regarding format of proposals must be scrupulously examined, particularly if the Guidelines contain the provision that proposals not following the Guidelines will be excluded from review.
- In this threatened law suit, the plaintiff complained that one of the proposals funded was longer than the eight-page limit. The excessive length of some proposals was a direct result of the large number of participating organizations included in the proposal, a feature strongly encouraged by the intent of Congress and the National Guidelines. Subsequently the Guidelines were modified to remove the prejudice against projects with an extensive array of applicants, by not counting the pages listing the participating organizations and major participants. The page limit applies only to the project narrative.
- Citing the example of our experience with the farmer with horse-drawn technology, I encouraged the regional ACs to refrain from getting very specific on non-essential matters in their calls for proposals, such as the requirement that all objectives must be full sentences.

Some day agricultural history books may refer to events now taking place as "The Revolutions of the 80s."

Storm Clouds Clearing

During the second fiscal year (October 1, 1988 to September 30, 1989) Congress increased the appropriation from \$3.9 million to \$4.45 million. While negative articles continued to appear in the farm press, some positive and supportive indications also began to emerge. For example, *The Furrow*, a nationally distributed Deere and Company magazine, published an article entitled "Low-Input Farming: Ag's Next Revolution?" The article begins with the statement:

Some day agricultural history books may refer to events now taking place as "The Revolutions of the 80s." Unlike earlier agricultural revolutions that brought tractors, hybrid corn, commercial fertilizer, and chemical pesticides to the farm, this one is a revolution in thinking rather than technology.

More and more farmers are finding that modern conventional agriculture with its emphasis on growing only one or two crops, its extensive use of credit, and heavy doses of chemical fertilizers and pesticides, may not be the most profitable way to farm. Related environmental problems, together with concerns over food safety and quality, are putting added pressure on producers to find alternative ways to raise crop and livestock. As a result, many have turned to methods that are coming to be known as Low-input agriculture.

The article goes on to quote Neill Schaller, Director of the LISA Program at that time, regarding the increasing attention farmers were paying toward finding alternatives to chemical-intensive methods of farming. The article also describes three farmers who were successfully using low-input farming methods, including crop rotations, mechanical cultivation, greatly reduced dependence on chemicals, and other methods in harmony with Nature.

With Program staff (O'Connell, Schaller and myself) plus many other advocates for the LISA Program giving speeches and responding to the media and individual inquiries, the tide of opposition began slowly to turn in our favor. For example, in July of 1989, Paul O'Connell represented the LISA Program at the Southwestern Fertilizer Conference, in Houston, Texas. With over 500 prominent members of the agricultural chemicals industry present, O'Connell told the audience "it is imperative that bridges be built between an important agriculture sector like the fertilizer industry and segments of the public that have growing concerns about the environment and the relative safety of our food and water supplies. ... US agriculture will always need a healthy fertilizer industry, but ... some farmers are looking for ways to use more on-farm resources to meet their plant nutrient needs." (O'Connell memorandum to Dr. Jordan, July 21, 1989.) O'Connell reported that the questions following his speech were pointed but not antagonistic. They focused primarily on misconceptions about the LISA Program, which O'Connell dispelled.

Avoiding the Pork Barrel Syndrome

By 1989, questions were already being raised by members of the Congress regarding the amount of funding going to each state and district through LISA grants. At first, I stubbornly resisted answering these questions, fearing they marked the first step toward making LISA into a "pork barrel" program. I argued that attention to the amount of funding allocated to each state and district would accelerate that tendency. However, since it was impossible to avoid answering the questions, I did the best I could to provide accompanying explanations that would convey the reality that the findings from one State or district could help make the agriculture in other locations more sustainable. I listed the institutions receiving funds within each state, and the amount of funds they received, then calculated the state totals.

Happily, my apprehensions have not been realized. The Program has not become a pork barrel after all -- partly because its funding is so small compared with most other federal agricultural research and education programs.

The Threat of "Business as Usual"

The greatest contributions of disciplinary science to the sustainability of agriculture occur when knowledge from several disciplines and on-farm experiences are fully integrated.

From the outset of the Program in 1988, we observed a very powerful tendency among scientists and administrators in the land-grant university system toward reductionist, single-discipline research projects, particularly in studies dealing with biological or physical sciences. Reductionist research requires experiments featuring well designed treatments and controls, and with enough replication to meet the requirements of statistical inference. This method is the backbone of disciplinary science. Strong disciplinary science is essential to the attainment of a science-based foundation of knowledge for agriculture. However, the contribution of reductionist disciplinary science to sustainability is greatly impaired by the fundamental premise that complex natural systems can be properly understood and improved solely through intensive study of isolated components of the system. The greatest contributions of disciplinary science to the sustainability of agriculture occur when knowledge from several disciplines and on-farm experiences are fully integrated.

Each regional program's review of proposals begins with a preliminary examination by the regional Technical Review Committee, to determine the scientific merit of the project proposals, and to recommend projects worthy of funding from a technical perspective. The

Regional AC then decides, based on the Region's priorities, which of the projects approved by the Technical Committee should be funded and the amount of funds to be granted.

During the early years of the LISA Program, I attended all the meetings of the Technical Review Committees and ACs of the four regions. This exposure enabled me to provide insights into lessons learned and innovations hatched in other regions. On very rare occasions, while observing the procedures used at the regional level, I was able to prevent a conflict with Washington authorities by advising that certain actions they were about to take would violate the national Guidelines. When the regional coordinators submitted their region's plan of work to CSRS for official approval, I was able to report to O'Connell that the procedures used were within the national Program Guidelines. In this way, we were able to prevent (as O'Connell wisely insisted) Washington officials from reviewing and overturning any of the Regional AC decisions regarding project approval and funding. This principle of protecting the regional project selection process from bureaucratic intrusion was essential to the integrity of the Program.

At the same time, we had to protect the Program against the very strong tendency among most scientists on the Technical Review Committees and ACs to approve only projects of a type Congress would consider "business as usual". Specifically, most of the scientists on the regional Technical Review Committees seemed strongly to favor only reductionist scientific studies focusing on narrowly defined components of farming systems, utilizing a rigorous experimental design featuring well defined treatments and controls and enough replications to meet the requirements of statistical inference. This type of study was later characterized as an "experimental component" project.

Often during the Technical Review Committee meetings, a scientist would cast aspersions on any proposal that did not contain a replicated experimental design. Further discussion of the proposal was thereby terminated, and the proposal was automatically rejected. The expectation of an experimental design as the key criterion for selection was clearly appropriate for projects requiring that method. However, this expectation was totally inappropriate for other types of project, such as

- exploratory studies, including examination of innovations devised by farmers, in which the treatments could not yet be rigorously defined, and where controls and replications were infeasible;
- educational projects intended to disseminate the findings of research studies;
- whole-farm studies requiring integration of several academic disciplines to examine very complex farm-level ecosystems;

- economic analysis comparing the profitability and other impacts of alternative farming methods and systems;
- quality of life projects intended to discern the impact of alternative farming systems on the well-being of rural people and communities.

During the early years of the Program, most scientists on the Technical Review Committees, as well as those on the ACs, typically viewed such proposals as "messy" and "not scientific," and therefore not worthy of funding. However, it was abundantly clear to persons (such as Ferd Hoefner and Kathleen Merrigan) in touch with sustainable agriculture advocates on Capital Hill that this exclusively experimental orientation would be considered "business as usual", and therefore a threat to the survival and growth of sustainable agriculture research and education under the LISA Program. If the Program's portfolio did not include a healthy mix of interdisciplinary problem-solving projects featuring meaningful involvement of farmers, the federal appropriation of funds probably would have dried up, and the Program would not have been re-authorized in subsequent Farm Bill legislation.

In view of this threat, I engaged in extensive persuasion during the regional Technical Review Committee and AC meetings in the early years of the Program, to prevent the funding of exclusively projects with a reductionist experimental design. The ideal, of course, is a holistic study that includes several replicated experiments, such as the "Sustainable Agriculture Farming Systems Project" conducted by an interdisciplinary team of scientists and farmers at UC Davis (Schlegel et al. 1993). At first, I participated actively in the discussion of projects, and even argued in favor of some studies I perceived as strongly compatible with the intent of Congress, and potentially very helpful toward making US agriculture more sustainable. My direct involvement in the project selection process, as a representative of the national LISA office, was probably appropriate during the formative stages of the Program. However, this top-down involvement soon became incompatible with the principle of regional autonomy, which is so essential to the integrity of the Program. The national Program representatives therefore decided not to enter into the discussion of the merits of proposals during the Technical Review Committee and AC meetings.

The continuing dilemma, however, was how to respect the integrity of the decision making process within the region, while protecting the Program against a powerful tendency toward self-destruction, by funding a very high proportion of experimental component projects, which Congress would consider business as usual. The obvious solution was somehow to persuade the regional programs to fund an appropriate mix of various types of project. The only obvious way to accomplish this goal without undermining the integrity of the regional selection process -- and therefore the integrity of the Program -- was through a strategic revision of the Guidelines

in a way to bring forth a diversified portfolio of projects that Congress would not consider "business as usual". It was important that this change be accomplished without entering into direct, top-down manipulation of the project selection process. It was also essential to avoid the establishment of a Washington-based retrospective review and modification of the projects approved at the regional level -- which could have destroyed the integrity of the Program.

In the Fall of 1988, I set about the task of developing an amended set of LISA Program Guidelines that would be accepted at the regional and national levels. Three key elements in the Guidelines were:

- the intent of Congress,
- appropriate project types, and
- criteria for evaluation of project proposals.

The intent of Congress was gleaned from the enabling legislation, the legislative history, and impressions gained by Paul O'Connell and others in personal contact with Congressional Staff, members of Congress, and Senators.

The first order of business in listing acceptable project types was to acknowledge the essential role of properly selected experimental component projects, so as to avoid alienation of the scientific community. Simultaneously the Guidelines had to legitimize the other kinds of project needed to attain a balanced portfolio consistent with the intent of Congress and the sustainability needs of US agriculture. The list of appropriate project types was designed to engender widespread respect (or at least acceptance) for potentially valuable kinds of projects that were systematically passed over in the regional proposal evaluation process. For example, it was very clear that the LISA Program must fund some integrated systems projects, featuring analysis of whole-farm or ranch systems, as well as educational and quality of life projects -- not just replicated experiments focusing on an isolated component of a biological or physical science system. An excerpt from the revised (November 1988) Guidelines illustrate the point:

"Integrated systems projects functionally integrate the findings of many research studies, plus direct farmer and rancher experience into a managerial (whole-farm or ranch) system or natural system context. This type of study explores and documents synergistic and conflicting relationships among various aspects of the farming/ ranching operations, including crop-livestock systems ... The portfolio of regional ... projects ... should include well documented case studies of farms and ranches relying on low-input and conservation practices that promote the goals of sustainable agriculture ... Educational components of the projects must be designed to effectively transfer practical information to operators of various sizes of farms and ranches, with

emphasis on family-owned and operated farms."
(Madden, Nov. 1988)

The language concerning family farms was deliberately introduced as a result of extensive discussions with private non-profit organizations (particularly the Center for Rural Affairs in Nebraska). It was their perception that the Program was not meeting the needs of family farms. Support of these private organizations was simply essential to continuation of the Program. Without their endorsement, and particularly if they opposed the Program, it would be "dead on arrival" in the Appropriation Committees. Furthermore, I happened to agree with their position on this matter. Therefore, I included it in the draft Guidelines, and devoted massive amounts of time to discussions with representatives of these organizations and the regional and national leadership of the LISA Program to attain consensus.⁽²⁾

The Guidelines definition of integrated systems continues:

"Whereas experimental components studies may focus on an acre or field of one crop in one year or sequence of years, whole-farm or ranch projects may include case studies that take into account the management of an entire farm or ranch or major segment of the operation, preferably for the duration of the crop rotation and beyond."

Farming Systems Projects -- Three Examples

Three examples of integrated farming systems projects are presented here to illustrate the concept.

Farmers, in partnership with a broad-based team of scientists led by Steve Temple at University of California in Davis, are taking the lead in educational programs and the day-to-day management of a twelve-year study. The project, now in its seventh year, is comparing the effects of conventional, low-input (minimal use of synthetic "inputs") and organic farming methods on a variety of important California crops. The researchers report that crop yields of processing tomatoes, safflower, beans and small grains were essentially the same in 1993 across all methods. Low-input corn and tomatoes -- which receive a mixture of organic and inorganic fertilizers -- performed better or equal to crops raised conventionally (with a high reliance on synthetic chemical pesticides and fertilizers). Soil fertility and weeds were the biggest constraints to profitability in the organic system. To boost tomato yields, the primary cash crop in the rotation, tomatoes were grown from transplants instead of seed, which increased yields in both low-input and organic systems. Researchers reported that equal yields are attainable in all types of production methods, but costs in the low-input and organic systems remain high. (Schlegel et al., 1993; project LW89-18)

Elsewhere in California, an on-farm research project led by University of California scientist Frank Zalom developed cost effective non-chemical alternatives to manage vineyard pests and weeds, while enriching vine nutrition and health. A self-seeding cover crop of cool-season legumes and grasses can enhance soil nitrogen while providing a habitat for natural enemies for biological control of such crop pests as leafhoppers and spider mites. The cover crops increased the population of predatory mites, resulting in reduced vine damage by spider mites. Leafhopper control was enhanced by natural enemies such as leafhopper-egg parasites and some spiders. On-farm studies also showed that yearly accumulation of biomass in vine rows from flail-chopping cover crops can help smother weeds, thereby reducing the need for herbicides. (Schlegel et al., 1993; project LW91-26)

A long-term integrated crop-livestock project at Virginia Tech in Blacksburg has developed a cropping system that significantly reduces the use of herbicide, nitrogen fertilizer, and insecticide on corn -- with no loss of income. This on-farm research project, started by John Luna and his colleagues at Virginia Tech in 1988, has shown that rye and hairy vetch cover crops can substantially reduce the need for nitrogen fertilizer while helping to control weeds in corn silage production systems. Corn grown using vetch cover crops as a no-till mulch required approximately one half the non-renewable energy input compared with corn grown using the conventional practice (applying 125 lb. per acre of nitrogen from chemical fertilizer plus herbicides). Herbicide-free corn combined with a modified strip-tillage produced corn silage yields comparable to conventional methods. Reduced-herbicide treatment was also very effective. Corn planted into rye cover crops after applying a greatly reduced rate of herbicide in narrow bands, plus a single cultivation with a no-till cultivator, produced corn yields comparable to the conventional practice of broadcasting herbicides over the entire field. The study also found that, compared with conventional practice, a farming system featuring reduced chemical inputs integrated with on-farm resources can produce identical cattle weight gains and similar net profit, but with a substantially reduced need for nitrogen fertilizer, herbicides and insecticides. (Brown et al., 1993; projects LS88-8 and LS91-37)

Diversifying the Portfolio of Projects

The need for economic analysis of the technologies being developed through these LISA projects was abundantly clear. Unless the emerging technologies are profitable, they cannot be sustainable. It is equally clear, however, that profit is only a necessary but not a sufficient condition for sustainability. Environmental and social dimensions must also be improved, or at least not ruined. Despite the importance of financial and quality-of-life analyses, however, the regional Technical Review Committees regularly discarded project proposals offering to do these types of study. Members of these Committees, lacking familiarity with social science methods and approaches, typically dismissed these proposals because they lacked an experimental design -- a feature not germane to this type of project.

This alarming trend prompted two reactions. First, the national Guidelines were revised to explicitly include economic impact studies among the acceptable types of project. Second, we established (mainly through the initiative of my Extension Service counterpart (Dixon Hubbard) a National Initiative project to facilitate economic and environmental analysis of alternative farming methods and systems, such as those developed by some of the LISA projects. (See also the "National Initiatives" section.)

One of the more important innovations established by the SARE Program was the study of Quality of Life, as related to the sustainability of a community's agriculture. John Ikerd and Cornelia Flora were important leaders in establishing and conducting this type of project. Starting in the Northeast Region, a team of social scientists presented workshops designed to sensitize the Technical Review Committee and the AC to the meaning and importance of quality of life, and to support projects on this subject. This workshop was replicated in each of the regions.

One of our concerns regarding project type was the very strong tendency of review committees to reject all proposals of an exploratory nature. These proposals featured innovative farming methods or practices, often developed by farmers. These proposals offered to test and further developed the innovations, so that later projects could evaluate them scientifically. In the early stages, innovative ideas require exploratory inquiry, prior to establishment of controlled and replicated experiments. In many instances the innovative treatments cannot even be rigorously defined during the exploratory stage. However, it was clear that unless the Program legitimized this type of innovative activity, potentially valuable contributions to the science and practice of sustainable agriculture would be aborted.

To help ensure that the national portfolio of LISA projects met Congressional expectations and the needs of sustainable agriculture, the Guidelines included a series of evaluation criteria for selecting project proposals:

- relevance to the goals of sustainable agriculture,
- methods appropriate to the goals of the project,
- a plan for disseminating the results to intended audiences,
- linkage with integrated systems,
- functional integration involving inter-disciplinary cooperation and involvement of both research and educational activities, and
- cooperation with farmers, non-profit organizations, and other participants.

To ensure that the venerated criteria appropriate for experimental projects would not be imposed on other project types, the language of the methods criterion states:

"The proposed methods to be used will be evaluated according to criteria appropriate for the objectives of the proposal ... Projects containing experimental components are expected to employ appropriate measurable procedures, with replications and controls where appropriate."

This language was intended to make explicit the distinction between experimental component projects, which are strongly favored in the scientific community, versus other equally valuable types of project often rejected, to round out the Program's portfolio of projects, and to ensure maximum progress toward the goal of more sustainable agriculture.

The ploy of using carefully crafted Guidelines to shape the project portfolio and to encourage greater involvement of producers may have had some beneficial effects, but it was not entirely successful. Experimental component type projects clearly remained the dominant type within the Program, accounting for about one third of the projects and one third of the funds awarded (Table 1). That may be about the right fraction for this type of project. Only about one fifth of the Program funds have gone to whole-farm systems projects, and about another 10 percent of the funds go to whole-farm demonstration sites. Furthermore, of the 367 projects funded between 1988 and 1993⁽³⁾, only 14 were exploratory component projects; 4 economic impact assessment projects; 5 environmental impact assessment projects; and only 2 projects focused on quality of life impact. Some of the regional calls for proposals now explicitly request socio-economic projects.

Table 1. LISA, SARE, and ACE Regional Project Grants Funded, Including Continuation Grants, 1988 to 1995. ⁽⁴⁾

Fiscal Year	Programs	NE	NC	South	West	Total
1988	LISA	11	21	9	6	47
1989	LISA	15	17	13	11	56
1990	LISA	16	9	12	8	45
1991	LISA & ACE	19	23	14	20	76

1992	SARE & ACE	16	19	11	18	64
1993	SARE & ACE	14	13	13	19	59
1994	SARE & ACE	18	16	16	18	68
1995	SARE & ACE	17	16	16	15	64
Totals		126	134	104	115	479

The SARE Program has become solidly established. Efforts to dismantle it and to reduce its funds year after year have failed. While it is impossible to determine the effect of any one of the many factors contributing to the stability and growth of the Program, the diversity of the project portfolio seems to have been a positive factor. If the tendency toward exclusively experimental component projects had been allowed to continue, the overwhelming share of projects and funds would have been allocated to this type of project. If this were to happen, the grass-roots support so essential to maintaining Congressional support would long ago have vanished. Efforts of the private non-profit organizations, the regional program staffs, and the national leadership have all played a role in this success.

1. On the same page (page 3) of the November 2 Guidelines the following language appears: "Various organizational policies and procedures will be decided by the Regional Administrative Councils, including the specific composition of the Technical Committees."

2. I was listed as the sole author of the November 2, 1988 edition of the LISA Guidelines. This was a true reflection of authorship — the urgent timing imposed by the "prairie fire" forced us to promulgate the Guidelines literally overnight. Given more time, I would have strongly preferred to put the Guidelines document through a formal review. I would have obtained much more detailed input from Paul O'Connell, Dixon Hubbard, and the Regional Coordinators, and would have included them as authors, as I did in subsequent editions of the Guidelines. In retrospect, there was a subtle diplomatic advantage to my sole-authoring those first Guidelines: if that document had become a serious embarrassment to the Administration, the cognizant federal officials could have disavowed both the document and its author, to save themselves and the Program. Fortunately, those possible events never transpired, and with the passage of time it became possible to transfer authorship of the Guidelines documents to the appropriate officials at the national and regional levels.

3. The data presented here end in 1993, because that was the last year for which I collected these data. More recent data may be obtained from the current Associate Director of the SARE Program, Kim Kroll.

4. Excludes planning grants, producer grants, and small discretionary grants. Double counting due to joint funding of specific projects by ACE and SARE in a given year has been eliminated.

Phase III

Emerging Principles Of Operation.

A comprehensive understanding of the current operating principles and procedures governing the SARE Program can be acquired only by examining the annual plans of work, annual reports, regional handbooks, and minutes of the various meetings. Additional insights could be gleaned from the files of the national Directors of the Program, stored somewhere in Washington DC. The material presented here is intended to supplement that information by offering some observations on the process of emergence.

The Operations Committee

From the first organization meeting in January of 1988 until December of 1990, the effective "Board of Directors" of the LISA Program was called an *ad hoc* committee. Since December of 1990, this group has been called the "Operations Committee."

Membership of the Operations Committee varies from year to year. Typically it now includes the SARE Director, the EPA Liaison (Wells), the four Regional Coordinators, and one or more chairs of regional ACs. At an annual meeting near the beginning of each fiscal year, the Operations Committee meets in Washington to review activities of previous years to determine the amount of funds to be used for administration of the National Program and for various National Initiatives. After subtracting these items and the mandatory deductions required by the USDA, the remainder of the appropriation is divided equally among the four regions, to be used for operating the regional offices and the project selection process, and for funding the SARE and ACE projects. The Operations Committee reviews previous work and proposals of various existing or proposed National Initiative projects.

Procedures for Reviewing Project Proposals

Over the years, many lessons have been learned regarding the process of evaluating project proposals. Some of the more salient principles developed are summarized here.

Early Evolution of the Process

During some of the early regional reviews, all of the proposals were copied and mailed to the entire review panel. The reviewers were asked to give an evaluation score to each proposal and send or bring their scores to the Technical Review Committee meeting. Some problems occurred as a result of this procedure. First, it placed an enormous reading burden on each member of the Committee. Second, virtually all the reviewers in the early years were new to the Program, and were not familiar with its philosophy or the appropriate criteria for evaluation of proposals. After they arrived at the Technical Review Committee meeting, they were given

an orientation which, if they had received it before their reviews, would have modified many of the scores they gave to the proposals. For this reason, it became clear that it was important for the membership of the Technical Review Committee remain somewhat constant from year to year. Typically the regional Guidelines call for no more than about one third new reviewers in a given year.

The third problem with this procedure was that many of the reviewers exhibited an attachment to their initial scores. One Northeast Region reviewer in 1989 made an impassioned plea to his fellow members of the Technical Review Committee to stick closely to the initial scores they brought with them. In a few instances, including his, the reviewers had received review input from persons in the organizations they represented. Consequently these review scores were considered to be very important. Similar expressions of tenacity to the original review scores occurred in the other regions.

In each case, I tried to discourage the members of the Committee from attaching excessive importance to those initial scores. I asked them to listen carefully and with an open mind to the orientation regarding the goals of the Program and the appropriate criteria for evaluation. I asked them to pay close attention to the ideas offered by other members of the Committee during floor discussion of project proposals. As reviewers sit down around a table to discuss proposals, inevitably information comes forth that has a profound effect on the ultimate evaluation scores given by the Committee.

At first there was considerable resistance to my suggestion. Over time, I was able to assemble some rather persuasive data to support my argument that the initial scores should be considered very tentatively. During one of the reviews, for example, a rather dramatic reversal of rank position occurred. A project originally ranked number 53 was ultimately ranked number 11, while the project originally ranked number 11 was ultimately ranked number 53. This was a coincidence, and an extreme example. But there were many others I cited to support the idea of not taking the initial ranking very seriously. Gradually this position was accepted by most of the reviewers -- though it must be repeated, especially to new reviewers.

Flexibility in Use of Parliamentary Procedure

One important principle established during the early years of the Program is the importance of flexibility and sensitivity in using parliamentary procedures during the regional meetings. For example, I noticed during some of the Technical Review Committee meetings that the farmers on the Committee were being consistently out-voted. Proposals they favored were being passed over, or proposals they considered of little value were being funded.

When I noticed this anomaly, I called a point of order, and recommended that the Chair pause

before each vote and ask if the farmers on the Committee had anything to add to the discussion. As an alternative, I recommended that when a vote was taken, if the farmers expressed votes differing from those of the rest of the Committee, before declaring the result of the vote, the Chair should first ask the farmers to articulate their concerns. Then if new information was given, a new vote should be requested.

The principal result of this flexibility in applying standard parliamentary rules of order was that the AC received a clearer understanding of types of project favored or not favored by the farmers, and their rationale for these choices. This information was sometimes translated into modified wording of the Call for Proposals for the following year. This process also gave the farmers the feeling that they had been heard. They were willing to go along with the results of discussion, wherein proposals were rejected on technical grounds, as long as they could make the point that certain types of project should be emphasized in the future.

In the early years of the program, the Western Region began including farmers as members of the Technical Review Committee, to pass judgment on the relevance of the proposals to the needs of farmers. On several occasions, proposals rated very high on technical grounds by the scientists on the Committee were eliminated because of farmer reaction that they lacked relevance.

Reporting

One distinguishing feature of the LISA, SARE, and ACE Programs has been a strong commitment to communicating the results in readily usable form to intended audiences. A large number of refereed journal articles have resulted from projects funded through these Programs. These articles contribute to the various sciences in important ways. While these contributions to science are very important, it is imperative that the findings be translated into terms that can be understood by those who would use them to develop more sustainable site-specific farming methods and systems. This process requires a synthesis of findings from many different disciplines or sources, including indigenous knowledge of the farmers. When the scientific findings are presented in lay language, this synthesis is greatly facilitated. Therefore, as a matter of policy, project proposals are expected to include an explicit indication of how the results will be communicated to the target audiences. This policy does not, however, preclude the publication of findings in scientific journals.

The Sustainable Agriculture Network

The Sustainable Agriculture Network (SAN) was started explicitly to meet the mandate in the enabling legislation of the LISA Program requiring that the findings of all federally funded agricultural research be made readily available to farmers, scientists, educators, and the public. Dixon Hubbard consistently reminded the national and regional leaders of the Program of this

Congressional mandate. Jayne MacLean and I convened a meeting in April 1988 at the National Agricultural Library (NAL), including representatives of NAL, Extension Service, Cooperative State Research Service, and the University of California. The commitment to communication of information, so strong in the tradition of the NAL, was extended and intensified as related to the sustainable agriculture information needs of farmers, Extension personnel, scientists, policy makers and others.

With a planning grant provided by the Western Region, the initial meeting of a group of experts was held in Portland, Oregon during July of 1989, under the direction of Fred Poston (then director of Cooperative Extension at Washington State University, now at Michigan State University). This group met twice in 1989 to further explore strategies for meeting these needs, using a wide variety of information exchange media (hard copy publications, Internet, magnetic media, and other approaches). I appointed a committee composed of individuals representing a diverse array of public and private organizations to refine the ideas set forth in the earlier meetings. Jill Auburn was designated as Chair of this group; she provided superb leadership, and continued in this role until 1993, when Jim Lukens took over these responsibilities, and continued the tradition of excellent leadership. In 1990, the group was called the "Subject Matter Committee." Subsequently it evolved into the SAN Coordinating Committee (Auburn and MacLean, 1993).⁽⁴⁾ The membership of the SAN Committee has changed over the years. The members of the SAN Committee as of 1990 were as follows:

Chair, Jill Auburn, Information Group, Sustainable Agriculture Research and Education program, University of California, Davis (now also Coordinator of the Western Region SARE Chapter 3 Training Program).

John Ahlrichs, AgriSource, CENEX Land O'Lakes, Minneapolis, MN (no longer a member of the SAN Committee).

Mike Brusko, formerly Publisher of The New Farm, Rodale Institute, Emmaus, PA.

F.E. Busby, Winrock International, Morrilton, AR (no longer active in SAN).

Kevin Gamble, Extension Service, formerly Oregon State University (now at North Carolina State University, Raleigh NC).

John Ikerd, Center for Sustainable Agriculture, University of Missouri, Columbia, MO.

Diane Jerkins, formerly with the Agricultural Experiment Station, University of Georgia, Athens, GA (now Director of Regenerative Studies Center at Cal Poly University in Pomona).

Doral Kemper, USDA, Agricultural Research Service, Beltsville, MD (no longer a member of the SAN Committee).

Jim Lukens, Program Manager, ATTRA (Appropriate Technology Transfer for Rural Areas), Fayetteville, AR (currently Chair of SAN and a member of the Southern Region SARE Chapter 3 Training Program Coordinating Group).

Jayne MacLean, USDA, National Agricultural Library, AFSIC (Alternative Farming Systems Information Center), Beltsville, MD (now retired).

Patrick Madden, formerly Associate Director of the national LISA and SARE programs, University of California (currently with the World Sustainable Agriculture Association).

Ed Rajotte, Department of Entomology, Pennsylvania State University, University Park, PA.

Phil Rasmussen, Department of Soil Science & Biometerology, (now, Head, Department of Agricultural Systems Technology and Western Region Coordinator of SARE and ACE Programs), Utah State University, Logan, UT.

Tory Shade, Regional Extension Agent, University of Missouri, Greenville, MO.

The SAN connection with Internet, called SANET-MG, was initially coordinated by Gabriel Hegyes, the first SAN Coordinator. The current SAN coordinator, located at the NAL, is Andy Clark.

From the beginning of SAN, a strong commitment was made to provide long-range planning to discover gaps in the knowledge base and information delivery system, and to highlight ways of meeting these needs. In addition, the SAN Coordinating Committee recognized the need for evaluation of the SARE and ACE Programs and initiated a project headed by Aaron Harp at the University of Idaho to begin this process.

SAN is committed to providing information to a wide variety of audiences in whatever forms are most useful and convenient to the users. Specific products of SAN include the following:

1. A directory of 717 people and organizations with expertise in sustainable agriculture; The current electronic version (on Folio Views Hypertext) lists 932 farmers, ranchers, Extension workers, research scientists, agribusinesses, information providers, policy advocates and government policy administrators (Sustainable Agriculture Network, 1993);

2. An assessment of existing educational materials, including a traveling "showcase" display of selected materials;
3. New publications on topics identified as gaps in the knowledge base, including brochures on weed control and dairy production, plus handbooks on subjects such as cover crops and tillage tools;
4. Systems for collecting and sharing "experiential" information, that is, information that comes from practical experience rather than replicated and randomized experiments; the SAN publication, *The Real Dirt*, is an example of this approach.
5. Electronic documents and discussion groups via wide area computer networks such as Internet, including the World Wide Web; and
6. Local databases searchable by user-friendly, off-the-shelf software such as FolioViews[®]. (Auburn and MacLean, 1993).

Communication Specialists

Early on it became clear that communication of the Program's outcomes was enormously important. It also became clear that the task was far beyond the capability of one person. Therefore, each of the Regions (starting with the North Central) hired a Communications Specialist whose responsibility was to communicate the findings of SARE and ACE projects and other related information to a wide variety of audiences. The regional programs were fortunate to hire excellent professionals: Kristen Kelleher, Beth Holtzman, Lisa Jasa, and Gwen Roland. The Communications Specialists typically attended many of the field days and as many as possible of the project site reviews. They prepare various print media such as newsletters or fact sheets; distribute press releases to appropriate news media; invite television networks to field days and other significant events; and many other activities. For example, Kristen Kelleher succeeded in getting the McNeil-Lehrer television crew to attend a field day in Davis; it was aired on national TV.

Subsequently a national communications specialist was hired, Valerie Burton. These people are making a truly major contribution to the goal of sustainable agriculture. Their reports are very highly respected both in the US and in many foreign countries where I have distributed them.

Annual SARE Program Overview Brochures

The first popularized brochure containing findings of LISA, ACE, and SARE projects was published in May 1992: *Sustainable Agriculture Research and Education Program, 1992 National Overview*. This was a two-color brochure containing brief accounts of the results

obtained by twenty projects. The lead article of this publication was, "What ever happened to LISA?" The answer given was that "The name has changed, but the program and progress are still going strong." This brochure, designed very attractively and published by the Rodale Institute, was the first of a series of annual reports. The second issue was also four pages in length, but it was printed in full color. Results of nine projects were presented, in considerably more detail than the previous year, with very attractive photos.

In January of each year, I collected from the four Regional Communication Specialists their choice of exemplary projects, those having particularly meaningful findings or results. I then discussed these projects with the SAN publisher (initially Rodale Institute) to produce a rather attractive and readable brochure. I worked with the Rodale Institute editorial staff to provide geographic balance and subject matter coverage, and to identify projects with the most meaningful results.

By 1994, the number of projects having really impressive results had grown so that it was very difficult to hold the brochure down to only four pages. In view of the extremely difficult choice of eliminating many worthy projects, I requested and obtained approval to double the size of the brochure to eight pages. The 1994 publication title was changed from "Overview" to "Highlights." This procedure was repeated in 1995, by the SARE director, Alice Jones. Each year, the result was an even more attractive and effective publication than in the earlier years. In 1993 and 1994, these documents were published as the centerpiece of the magazine then published by Rodale Institute, *The New Farm*, as well as in brochure form.

The 1992 and 1993 brochures were included as part of the Annual Report required by Congress. But starting in 1994, it became illegal to submit reports in more than two colors. Therefore the brochures were no longer considered part of the annual report to Congress. Nonetheless, copies of these documents were given to the various lobbyists. Typically, they hand-delivered the documents to key members of Congress.

Compendium Reports

Prior to the publication of these rather attractive and popularized brochures, I prepared a series of annual compendium reports describing all the projects funded. The first of these compendium reports (Madden et al., 1990) contained descriptions of all the projects funded in all four regions in the first two years (1988 and 1989). In subsequent years, I compiled a separate compendium report for each region, presenting results from the annual reports prepared by the project coordinators. By 1993 the size of each region's report had grown to about 200 pages. (Magdoff et al., 1993; Schlegel et al., 1993; Waller et al., 1993; Brown et al., 1993) In 1993, a fifth volume containing only the ACE projects was published. Even though the format of these compendium reports was crude by current standards, they served a very useful

purpose, revealing the scope and diversity of projects funded, and summarizing some of their accomplishments. Hundreds of these reports were sent or given out in response to inquiries.

Through the use of computer software suggested by Phil Rasmussen, known as FolioViews[®], all five of the compendium reports (over 800 pages of text) became available on a diskette, in a readily searchable hypertext format. The practicality of this database system was often and delightfully illustrated. For example, one day an urgent call came in from the staff of a US Senator on the Appropriations Committee. The Senator was scheduled to meet with a group of sheep producers, and he wanted to be able to tell them what research and education on sheep had been funded by the LISA Program -- and he needed the report in two hours! Thanks to the hypertext program and file, a word processor, and a fax machine, the report reached the Senator's office ahead of the deadline.

While the compendium reports seemed to be generally well received and useful, they were not without their problems: accuracy and appearance. Each year, they were assembled between the annual report deadlines (typically in December) and the deadline for submission of the national Program's' Annual Report to Congress on April 1. Because of the very limited time and staff limitations, the editorial quality of the documents left much to be desired. There simply was not enough time for me to edit all the project descriptions for duplication, consistency, obscure language, and general awkwardness. Nor was there time to prepare an attractive document.

By 1992 the regions had hired the Communication Specialists, who were expert in preparing publications of this kind. Because the Communication Specialists were extremely busy with other duties in the regional programs, they expressed a strong preference not to take the time to prepare a compendium report, or to edit a document that I would prepare for their region. Since my tenure as Associate Director was nearing an end, a decision was made to terminate publication of compendium reports.

However, the Region Communication Specialists for the Southern Region (Gwen Roland) and the Western Region (Kristen Kelleher), later prepared truly superb compendium reports, far more attractive and professional than any that I had prepared earlier. The other regions later began producing annual reports that also were very attractive and that effectively communicated the accomplishments of their region's SARE and ACE research and education projects, the producer grants, and more recently, the Chapter 3 Professional Development Program in each Region.

Urgent Special Reports

Essential to continued public and Congressional support for the Program was timely response to urgent requests for reports, letters, or data. For example, on February 7, 1989, O'Connell and Schaller (then the Director of LISA) requested a special report to Congress, to be delivered to Senator Lugar in three days. The request was for a report of approximately ten pages in length, highlighting the projects funded in the first year of the LISA Program. I was asked to emphasize the mixture of projects, including those featuring reduced chemical input and those using chemicals more efficiently; projects showing involvement of public and private institutions from all four regions; and preferably some comments from farmers. Also to be emphasized was the fact that the Program was just getting started, and that our goal was to provide readily useable results and recommendations to farmers on ways to profitably reduce chemical impacts on water quality.

This is an illustration of many such requests prepared on short notice during the early years of the Program. The fact that the Program was able to provide timely and readily understandable responses to these requests was an important asset, engendering favor in strategic places. At present the Program has a full-time professional staff, including a Communications Specialist, to respond to such inquiries.

Another example was the request for a listing of scientists having expertise in specific areas related to sustainable agriculture. An examination of the proposals for all the projects funded yielded a list of scientists with expertise in low-input production of commodities such as corn, sorghum, soybeans, and wheat. This type of *ad hoc* list became the precursor of the SAN report entitled, *Sustainable Agriculture Directory of Expertise*. The first edition was published in 1993; it is updated occasionally.

We often received requests for information on the involvement of farmers in LISA projects. As a result, I prepared a reports listing all the farmers who were major participants in LISA projects, and presenting content analysis of their involvement in the Program. (Madden 1990). This informal directory of LISA farmers was organized according to the state where the farm was located, and contained a brief description of the farm and the roles performed by the farmer as part of the project. Tables summarize the number of farmers in each state and region performing various roles in LISA projects. Specifically the report showed that 27 farmers had served on Technical Review Committees (including 15 in the Southern Region), and eight had served on Regional ACs. A later report to Congress (Madden et al.1994) stated that among the 178 projects active in 1994, a total of 1,489 farmers or ranchers had major roles in the projects. Specifically:

- 1,053 farmers helped generate ideas for projects;
- 465 presented workshops;
- 256 provide land for replicated experiments;
- 497 helped manage the projects

The 1992 GAO Audit

The capacity of the SARE program to respond to specific questions about the Program and its operation became a major asset during a General Accounting Office (GAO) audit in 1992. The resulting GAO report (GAO 1992) became a defining moment in the LISA/SARE history: "Sustainable Agriculture -- Program Management, Accomplishments, and Opportunities". Released in September of 1992, this report gave glowing compliments to the Program for the way it had been managed and its effectiveness in making US agriculture more sustainable. Never in the memory of long-time Washington bureaucrats had a GAO been so complimentary to any program.

Senator Tom Daschle held hearings to announce the release of this GAO report. Several of the people active in supporting or operating the Program gave brief speeches. The Senator began his commentary by heaping praise on the Program. Then, turning to the other side of the room, where sat the administrators of the various USDA agencies responsible for agricultural research and education, the Senator asked a penetrating question. He asked these agency heads to explain why this little Program, which had received only a tiny amount of federal funds (a five year total of \$28.7) had done more to make US agriculture sustainable than these agencies had accomplished with their combined annual appropriation of about \$1.8 billion! Among many penetrating questions, he asked when ARS was going to begin including farmers in the process of determining their research agenda, as the LISA Program had always done, and as the SARE Program was continuing to do. He received the Agency's assurance that this shift would happen, "right away, Senator!" He replied by promising that his staff would follow up to make sure they fulfilled their commitments.

Building Capacity for Special Reports

In an effort to anticipate the informational inquiries that might come from Congress, in February 1991 I asked the Rodale lobbyist, Sandy Schlecker, what kinds of reports on the Program would be interesting and useful on Capital Hill. She recommended that I prepare a series of reports describing what the Program was contributing to the sustainability of agriculture in each State. Since we did not have time or resources to prepare a report for every state, we gave priority to producing reports for those States whose Congressmen and Senators were most likely to request this information. As an initial effort, we selected those States having a member on either the Senate or House agriculture appropriations committee: Arkansas, Georgia, Iowa, Illinois, Indiana, Michigan, Minnesota, Missouri, Mississippi, North

Carolina, North Dakota, Nebraska, New Mexico, New York, Ohio, Oregon, Pennsylvania, South Dakota, Vermont, Washington, and Wisconsin.⁽²⁾ Each State report included a compendium of LISA and ACE projects, in which a resident of that state was a major participant. I gave these reports to Sandy Schlecker to use as she saw fit. She delivered them to the appropriate offices on Capital Hill, as informational material to describe the on-going accomplishments of the Program. The reports were well received. The only negative feedback we received was from the Congressional offices of States for which we did not prepare these reports.

As a follow up to this exercise, we developed the capacity to generate reports for Congressional Districts. Working with Gabriel Hedges, then the Coordinator of the Sustainable Agriculture Network (SAN) at the National Agricultural Library, a process was developed for linking the latest data from the Census of Agriculture with the compendium of LISA and ACE projects funded, keyed to each Congressional District in the US. In this case, we chose not to limit the compendium to projects that included a resident of that District as a major participant. Instead we focused on projects providing more sustainable methods and systems for production of commodities important in that District. Instead, we presented a description of all projects funded that were germane to the important commodities in that Congressional District, according to the latest US Census of Agriculture. Our rationale was that when a research project provides results on improving the sustainability of production of a specific commodity in one location, these findings can often be useful in other locations where that commodity is produced, with adaptation for climate and soils. Therefore, many of the projects funded outside a given Congressional District could be potentially beneficial to the sustainability of agriculture in that District.

The text surrounding the census statistics and project descriptions was drafted by myself and Gabriel Hegyes, and then reviewed by a Washington DC agricultural consultant, Terry Nipp. Thanks to Nipp's advice, each report was a rather succinct and effectively worded letter targeted to the agriculture in a specific Congressional District. Thanks to Hegyes, the reports were rich in data and project results. Again, I gave these letters to Schlecker, who hand-delivered them to the appropriate members of Congress.

Starting the SARE Database System

From the beginning of the Program, questions were frequently asked regarding projects funded --. the number of specific types of project funded, the amount of funding going to specific categories of recipients (such as land-grant universities, non-profit organizations, farmers, etc.), the number of projects featuring extension people as project coordinator, and many other questions. Lacking a database system in the early years of the program, I was frequently obliged to re-read each of the funded project proposals or annual progress reports, and to generate the data necessary to answer the question at hand. This process was extremely time consuming,

awkward, and prone to error when done under a tight time limit. Clearly, the capacity of the Program staff to respond professionally and accurately to these requests required a good database system. An example of the kind of question raised and the data generated is in Table 2.

Table 2. Types of Project Funded by the Sustainable Agriculture Research and Education Program, 1988-1991

Whole Farm System Analysis

Fruit Production 10
Vegetable Production 9
Field Crops 8
Livestock 19

Subtotal 46

Component Research

Fruit Production 5
Vegetable Production 1
Field Crops 5
Tillage/Weeds 9
Disease Control 6
Waste Management 6
Nutrient Management 7

Subtotal 39

Information and Education

Information Systems 8
Education 8
Conferences 5
Demonstration 7

Subtotal 28

Impact Assessment

Economic 4
Environment 5
Subtotal 9

Miscellaneous 5

Grand Total 127

Database Creation and Maintenance

Often the questions coming into the SARE office were urgent, requiring next-day or even same-day response. On more than one occasion, data generated in response to these urgent requests were later found to be incorrect. Often there simply was not enough time for standard quality control checking and verification of the data. This situation was abhorrent to those of us obliged to answer the questions, so naturally we began gradually developing a more systematic database system.

Two kinds of potential questions guided the development of the databases: (1) **reactive**: the types of questions we could anticipate being asked, based on previous years' experience, and (2) **pro-active**: the kinds of questions we felt should be asked, and the kinds of statements we should be able to make about the Program, including statements that could help guide management decisions in the regional and national offices, and could inform appropriations decisions in the Congressional Committees.

Most scientists have very high respect for what they consider "objectivity" and "hard data," and they eschew what they perceive as "subjectivity" and "soft data." Numerical data are generally (and incorrectly) perceived as being purely "objective." Descriptive data are considered "soft," subjective, and inferior to numerical data. This being the case, discussions and arguments buttressed with numerical data are generally given far greater credence than "mere" qualitative statements.

Realizing this tendency in our culture, I hoped to create a data-generating process that would both inform and impress. The irony of the matter is that in this, as in all other "objective" data-generating activities, subjective judgments must be made. Subjective choice is necessary in deciding what is to be measured, in establishing the operational definitions, and in reducing the often messy and ambiguous detail of the real world to the seemingly exact world of numerical data. Such is the nature of all data generation exercises, especially in their formative stages. Once the initial definitions and procedures are established, the collection and interpretation of

the data begin to take on an air of "objectivity." Scratching a bit below the surface, however, the discerning observer can readily see the subjective roots beneath every number. This principle, solidly established in the literature, (Proctor, 1991; Cobb et al., 1995) does not demean the value of quantitative data; but it provides grounds for discernment in their interpretation, and it elevates the respectability of so-called "soft" descriptive data.

In an effort to avoid total reliance on numerical data, we also prepared many verbal and pictorial reports portraying the results of the projects in concrete and meaningful terms. The series of attractive full color brochures (e.g. SARE Highlights) described earlier contain project results in very readable language, for example. This combination of "hard" (i.e. numerical) data plus verbal data and pictures was intended to convey to readers the richness of what the Program was doing.

Many problems were encountered in the creation and maintenance of the SARE Database. First, many discrepancies were found in the financial data, especially the amount of funds granted to each project. Often the amount initially granted by the AC was subsequently revised through negotiations between the Regional Coordinator and the project personnel. Often I discovered these discrepancies at very awkward times, with a major deadline looming. Too often, this situation required me to impose on the already very busy Regional Communication Specialists by telephone, fax, or email to help clear up the discrepancies.

Clearly something had to be done to prevent a perpetuation of this awkwardness. Therefore I created a comprehensive database system calling for all the data I anticipated needing to meet the various reactive and pro-active data requirements.

The value of the database system was established with the 1994 Annual Reports for each of the regions, containing statements regarding the number of projects funded, trends in the various types of project and subject matter coverage of the projects funded, number of projects with farmers or extension agents as major participants, etc. These reports were never published, due to a decision made by the SARE Director at that time (Jones). Nonetheless, the reports did serve to illustrate the kinds of substantive statements that could be made with a properly designed and well maintained database. These results can be impressive to the readers, adding specificity and concreteness to an otherwise qualitative account of the Program, while at the same time providing essential intelligence to guide the management of the Program from year to year.

Regionalizing the Database Effort

In June 1994, the staff of each Regional program assumed responsibility for maintaining their own database. I cautioned that strict adherence to specific procedures and definitions would be

essential to the continued validity and usefulness of the database. It was obvious that if one or more regions began using a different definition or procedure for calculating the data in one or more fields, the national database will become a hash, and meaningful totals, trends, and comparisons would become impossible. Recognizing this risk, the Operations Committee allocated funds for a SARE Database Project. I was asked to do this work through a contract with the Western Region SARE Program, after I resigned the position of associate director in September 1994. I hired a Glendale firm, OM Publishing Consultants, to handle the software, prepare a users manual, and instruct regional staff members in the use of the database system. With this new database system (using Microsoft Access software) the user can answer many questions instantly, and can readily generate reports, tables, and charts. While the regional staff responded very well to this instruction, only time will tell whether the regional and national database system will continue to be useful.

National Initiatives

Experience showed that the regional competitive grants project approval process would not generate certain kinds of activity essential to the Program. Therefore, it became very clear that national initiatives would be required if the Program was to accomplish its goals.

For example, projects dealing with economic analysis of alternative farming methods and systems were always rejected for funding. Recognizing that profitability and environmental soundness are necessary conditions for sustainable agriculture, the Operations Committee allocated funding to initiate development of a sustainable farming systems decision support "tool." This tool was to include computer software and databases necessary to help predict the financial and environmental impacts of changing a specific farm's current farming operation to include more sustainable practices and systems. John Ikerd of the University of Georgia was selected to develop a prototype decision support system for this purpose. Ikerd moved to the University of Missouri to begin this work in 1988. After Ikerd's prototype was successfully developed and field tested, the Operations Committee decided to transplant this project to the University of Minnesota, where it would be further developed and maintained by the well-known Center for Farm Financial Management.

Each year the Operations Committee reviews progress of the previous year, and decides whether to allocate funds to continue this work. Since the scope of the work and its potential for application extends beyond all regional boundaries, this was a clear situation where a National Initiative was needed. The version two of Planetor has been field tested in more than a dozen states.

Since its inception in 1988, SARE has supported the Alternative Farming Systems Information

Center at the National Agricultural Library. The level of annual support was initially \$100,000, with small increases to cover a part of the inflation in costs.

Several smaller National Initiatives have also been funded, including a number of conferences. For example, in 1988, I requested \$5,000 to support an international conference at Ohio State University. O'Connell approved the expenditure, and the conference resulted in one of the first significant reference books in the sustainable agriculture literature (Edwards et al., 1990). Support was also provided for several other conferences, at O'Connell's discretion. Opportunities such as these require discretionary funds at the national level.⁽³⁾

Another major National Initiative was the development and maintenance of the Sustainable Agriculture Network (SAN), described earlier. The initial funding that ultimately led to development of SAN was provided by the Western Region AC as a planning grant of \$25,000 in fiscal year 1989. After the primary concepts were agreed upon and the mission of this effort became somewhat more clear, the Operations Committee began allocating funds for its continuation and full development. In 1995, for example, the allocation for SAN was \$225,000.

The largest single National Initiative was the study conducted by Economic Research Service (ERS) to answer a question of paramount importance: what are the economic and environmental impacts of a possible future widespread adoption of more sustainable farming methods and systems? The project received \$1.2 million through the ACE Program for a 3-year period. Scheduled for completion in 1995, this project was viewed by ERS as a beginning step toward a more comprehensive economic analysis required to answer the underlying question. However, as a matter of Operation Committee policy, the outcome of the ERS project was carefully examined, and further funds were not committed to this effort. Three years after the scheduled completion date, the final report from this project is still not completed. Sadly, it appears that my early predictions of the project's failure may have been vindicated.

Partly as a reaction against the perception that some of the National Initiative projects had gone awry, the Operations Committee adopted the following policy: (1) amounts over \$10,000 may be allocated only after consultation with the Operations Committee and (2) whenever feasible, a competitive bidding process will be used to approve funds for National initiatives, with review by the Operations Committee. Incidentally, this policy was first proposed by the North Central AC.

Strategic Planning to Improve the Program

Efforts to improve the Program began as soon as the first year's grants were awarded. Since then, self-improvement efforts have continued along several lines. Particularly notable are (1) preparation of regional strategic plans, (2) efforts to "level the playing field" by providing

assistance in preparing proposals, (3) conducting site reviews of projects, and (4) efforts to estimate the relevance of research and education projects to the goals for agricultural sustainability.

Preparing Regional Strategic Plans

The motivation for conducting strategic planning conferences stemmed from the frustration expressed by many members of the ACs at the end of their annual meeting to select projects for funding. Typical expressions of discontent indicated a desire for a special time when the AC was not under pressure to make funding decisions, and to focus explicitly on ways to improve the overall Program.

While the North Central was the first Region to prepare and publish a Strategic Plan, each of the Regions (starting with Western) has conducted one or more strategic planning conferences. The purpose of these conferences is to review the accomplishments of the regional program up to the present time, to visualize the kinds of contributions the Program should be making, and to establish strategies for improving the performance of the Program in future years. These strategic planning conferences have typically resulted in documents setting forth the philosophy and strategic plan of each Region's SARE/ACE Program. Improved review procedures and priorities for the annual call for proposals were among the out comes.

Leveling the Playing Field

The strategic need for remedial assistance in preparing proposals became evident early in the Program. For example, during the 1988 review, the Southern Region AC agreed initially on a list of 11 projects to be funded, which exhausted the available funds. In looking down the list of proposals approved by the Technical Review Committee, however, I noticed that project number 12 on their list happened to be from a land-grant university of 1890, a traditionally Black institution. I suggested the AC consider stretching the list to include this proposal, by judiciously reducing the funds allocated to the other 11 proposals, so that the regional portfolio of funded projects could include one from an 1890 institution. The AC agreed with this proposal, and that project was funded. However, the AC felt strongly that it was important not to allow this action to become a precedent. Far better, they reasoned, was an strategy to help the 1890 institutions and private organizations to prepare proposals that would compete effectively with proposals from the larger land-grant institutions of 1862. As a result of this decision, the Southern Region SARE Program sponsored a grant-writing clinic to provide training in preparing proposals. While this approach is highly commendable, I am not aware of any resulting proposals that were actually funded in subsequent years.

Regional Site Reviews of Projects

Each of the regional programs has established policy and procedures regarding site reviews of projects. The procedure of conducting a site review varies from region to region, but typically includes an examination of the project proposal, with emphasis on the objectives; examination of progress reports as related to accomplishment of those objectives; discussion with project personnel regarding the results and anticipated future work; and where appropriate, an examination of the project sites such as farms or experimental plots. The North Central Region's AC made a commitment to visit every producer-initiated grant. However, none of the regional Programs has a policy of reviewing or visiting all of its SARE and ACE projects. That level of review would be unnecessary and a misuse of program funds, particularly as related to short term or small scale projects. However, long-term projects receiving substantial funds typically are reviewed carefully, often including a site review from members of the AC. In some instances, the entire AC visits projects, particularly when the project is located near the site of one of their meetings.

Under the leadership of David Schlegel, the Western Region has been an innovator among the Regions in many ways, including approaches used in conducting project reviews. The Western Region was the first to conduct site reviews; and they were the first to introduce the innovation of an annual conference where project personnel present their findings to an Advisory Committee. The Western Region's Advisory Committee was composed of research and Extension personnel and producers from throughout the region. As many as possible of the members of the Regional AC would attend these annual conferences. Project personnel would typically show slides depicting the experimental plots or other physical and biological features of their projects. They would also show graphs or tables depicting the results including comparison of yields, net returns, or other performance indicators of the alternative farming methods or systems being studied. This project review innovation has proven to be rather cost effective, as compared with financing the travel of AC members to diverse locations around the region. It also economizes on the time of both project personnel and the AC members, and provides valuable interactions among the various project personnel, regional scientists and educators, and the regional AC.

The Relevance Research to Sustainable Agriculture

Since the LISA Program was first started in 1988, people have been asking hard questions about the how much of the research being done by land-grant universities and the USDA Agricultural Research Service (ARS) is relevant to sustainable agriculture. Prior to the emergence of that the question were analogous inquiries regarding the relevance of research to the goal or promoting organic farming.

During 1988, an ARS employee (Doral Kemper) was assigned the task of developing data

showing that a large portion of ARS research was relevant to sustainable agriculture. ARS had a vested interest in making the numbers as large as possible, to deflect Congressional criticism that the Agency was not contributing enough to the sustainability of US agriculture. According to Kemper's criteria, and based on his own reading of the CRIS (Current Research Information System) data on ARS projects, a substantial fraction of ARS research had some degree of relevance to sustainable agriculture, and should be counted. The resulting numbers, over \$100 million a year, were totally lacking in credibility on Capital Hill and in the sustainable agriculture community.

To remedy the chronic lack of credible data, in 1988 Paul O'Connell assigned me to oversee development of relevancy data based on the CRIS data, in conjunction with a survey of principle investigators of ARS and land-grant university research projects. Since the results were needed in the very near future, we decided not to use a procurement and bidding process, but to go with someone we knew could do the work. I recommended some of my colleagues at the Pennsylvania State University (Jim Shortle and Wes Musser) for this contract. The Penn State study was designed under the assumption that the USDA officials working with the CRIS system would fulfill their (oft repeated) promise to deliver the latest CRIS data summaries in time for the Penn State researchers to incorporate them into the analysis. This did not happen, and at the end of the exercise we were virtually no closer than before to having good data on the magnitude of research relevant to sustainable agriculture.

Four years later, while George Bird was Director of SARE, he started an innovative project in combination with Jan Van Schilfgaarde in ARS, to develop a data collection protocol to determine the relevance of individual projects to the goals of sustainable agriculture. Their procedure, which came to be called the "Relevancy Protocol" (RP) was tested at various locations and modified repeatedly. I participated with George and others in one of several "beta tests" of the RP. While I heartily endorsed the goals of this effort, I strongly felt the need for better quality control procedures. In the Appendix is an edited excerpt from my June 6, 1994 letter to the Director of the SARE Program, summarizing my concerns on this matter, and offering a strategy for improvement.

Additional methodological work is needed to perfect the RP. To the extent that the Program administrators anticipate a continuation of questions regarding the amount of sustainable agriculture research being done outside the SARE Program, this methodological work should be given high priority. I have recommended that the RP data be added to the SARE database, but with the provision that appropriate validation and quality control measures be invoked.

It is equally important that the SARE and ACE projects be evaluated as to their relevancy to the

goals of sustainable agriculture. The results of this inquiry could provide the basis for improving the Program in years to come.

1. The members of the SAN Committee as of 1990 were as follows: Chair, Jill Auburn, Information Group, Sustainable Agriculture Research and Education program, University of California, Davis (who later served as Coordinator of the Western Region SARE Chapter 3 Professional Development Program, and currently is Director of the national SARE Program in Washington DC); John Ahlrichs, AgriSource, CENEX Land O'Lakes, Minneapolis, MN; Mike Brusko, formerly Publisher of The New Farm, Rodale Institute, Emmaus, PA; F.E. Busby, Winrock International, Morrilton, AR; Kevin Gamble, Extension Service, formerly Oregon State University (now at North Carolina State University, Raleigh, NC); John Ikerd, Center for Sustainable Agriculture, University of Missouri, Columbia, MO; Diana Jerkins, formerly on the staff of the Agricultural Experiment Station, University of Georgia, Athens, GA. (now Director of Regenerative Studies Center at Cal Poly University in Pomona); Doral Kemper, USDA, Agricultural Research Service, Beltsville, MD; Jim Lukens, Program Manager, ATTRA (Appropriate Technology Transfer for Rural Areas), Fayetteville, AR. (currently Chair of SAN and a member of the Southern Region SARE Chapter 3 Training Program Coordinating Group); Jayne MacLean, USDA, National Agricultural Library, AFSIC (Alternative Farming Systems Information Center), Beltsville, MD (now retired); Patrick Madden, ex officio, as Associate Director of the national LISA, SARE programs; Ed Rajotte, Department of Entomology, Pennsylvania State University, University Park, PA; Phil Rasmussen, Head, of the Department of Agricultural Systems Technology, and (now Western Region Coordinator of SARE and ACE Programs), Utah State University, Logan, UT; Tory Shade, Regional Extension Agent, University of Missouri, Greenville, MO.

2. In each report, as a courtesy I listed the Regional Coordinator as senior author, and referred the reader to their office for more information.

3. In February 1991 I was contacted by staff at the Center for Rural Affairs (Elizabeth Bird and Chuck Hassebrook) regarding a request to co-sponsor a meeting with the USDA National Research Initiative Competitive Grants Program Leadership. Proposed attendees at this meeting were to be approximately 12 leaders of sustainable agriculture Research, primarily from land-grant institutions, but also including farmers and non-profit organizations engaged in sustainable agriculture research. In response, I submitted a proposal to Paul O'Connell requesting \$8,250 of discretionary funds to facilitate travel of persons to be invited to that meeting. O'Connell did approve funds for this purpose, and a meeting was held. However, the NRI people chose not to participate in the meeting. Therefore it was held at Lake Tahoe. The resulting report, entitled "Sustainable Agriculture in the National Research Initiative" was

subsequently published by the Center for Rural Affairs, and was presented to NRI for their consideration. After protracted discussion, the procedures of the NRI were in fact modified to accommodate several of the recommendations developed at the Lake Tahoe Conference. A policy decision made by the Operations Committee that discretionary spending of amounts over \$10,000 required input from the regional programs. This was a wise policy; if it had been in effect earlier, some "losers" might have been avoided.

References

Auburn, Jill S. and Jayne T. MacLean. 1993. Development of an Information Network for Sustainable Agriculture. *Journal of Agricultural & Food Information*, Vol.1(3):25-40.

Benbrook, Charles M. 1996. Growing Doubt: A Primer on Pesticides Identified as Endocrine Disruptors and/or Reproductive Toxicants. Tucson: The National Campaign for Pesticide Policy Reform. 88 pages.

Brown, William H., Diana Jerkins, Jim Gershey, J. Patrick Madden, and Harry W. Wells. 1993. *Southern Region 1993 SARE/ACE Report to Congress*. CSRS, USDA, Washington DC. 222 pages.

Cobb, Clifford, Ted Halstead, and Jonathan Rowe. 1995. "If GDP is Up, Why Is America Down?" .. In February 1991 I was contacted by staff at the Center for Rural Affairs (Elizabeth Bird and Chuck Hassebrook) regarding a request to co-sponsor a meeting with the USDA National Research Initiative Competitive Grants Program Leadership. Proposed attendees at this meeting were to be approximately 12 leaders of sustainable agriculture Research, primarily from land-grant institutions, but also including farmers and non-profit organizations engaged in sustainable agriculture research. In response, I submitted a proposal to Paul O'Connell requesting \$8,250 of discretionary funds to facilitate travel of persons to be invited to that meeting. O'Connell did approve funds for this purpose, and a meeting was held. However, the NRI people chose not to participate in the meeting. Therefore it was held at Lake Tahoe. The resulting report, entitled "Sustainable Agriculture in the National Research Initiative" was subsequently published by the Center for Rural Affairs, and was presented to NRI for their consideration. After protracted discussion, the procedures of the NRI were in fact modified to accommodate several of the recommendations developed at the Lake Tahoe Conference. A policy decision made by the Operations Committee that discretionary spending of amounts over \$10,000 required input from the regional programs. This was a wise policy; if it had been in effect earlier, some "losers" might have been avoided.>Atlantic Monthly, Oct., pp.59-78.

Committee on Government Operations. 1988. Low-Input Farming Systems: Benefits and Barriers. US House of Representatives, Union Calendar No. 641, House Report 100-1097, October 20.

Edwards, Clive A., Rattan Lal, Patrick Madden, Robert H. Miller and Gar House. 1990. *Sustainable Agricultural Systems* (Ankeny IA: Soil and Water Conversation Society)

GAO. 1990. "Alternative Agriculture" Washington DC: General Accounting Office.

- GAO. 1992. "Sustainable Agriculture -- Program Management, Accomplishments, and Opportunities" Washington DC: General Accounting Office.
- Hewitt, Tracy Irwin and Katherine R. Smith. 1995. "Intensive Agriculture and Environmental Quality: Examining the Newest Agricultural Myth." Report from the Henry A. Wallace Institute for Alternative Agriculture, September
- Lockeretz, William and Patrick Madden. 1987 "Midwestern Organic Farming: A Ten-Year Follow-up" *Am. J. of Alternative Agriculture*, vol. 2, no. 2, pp. 57-63 (Spring).
- Madden, Patrick. 1987 "Can Sustainable Agriculture Be Profitable?" *Environment*, vol. 29, no. 4, pp. 19-34, May, 9 pages.
- _____.1988. "LISA 89 Guidelines--Low-Input/ Sustainable Agriculture Research and Education Grants Program". Cooperative State Research Service, USDA, November 2. 13 pages.
- _____.1988. "Low-Input/Sustainable Agriculture Research and Education--Challenges to the Agricultural Economics Profession." Presented at annual meetings of American Agricultural Economics Association, Nashville, TN, August. *American J. of Agri. Econ.*, vol. 70. no. 5, pages 1167-72.
- _____.1988 "A Policy Perspective on the Low-Input/Sustainable Agriculture Program (LISA)." Presented at National Public Policy Education Conference, September 12-14. *Increasing Understanding of Public Problems and Policies - 1988*. Farm Foundation, Oak Brook, IL.
- _____.1988. "Policy Perspective on the Low-Input/ Sustainable Agriculture Program (LISA)" Washington, DC, Economic Research Service, *Policy Research Notes*, Issue 26, Nov.. pages 20-26.
- _____.1989. "Farms that Succeed Using LISA." in *1989 Yearbook of Agriculture*. US Government Printing Office, pages 220-225.
- _____. 1989. "What is alternative agriculture?" *Am. J. of Alternative Agriculture*, vol. 4, no. 1, pages 32-34.
- _____. 1989. "Profitable Farming Without Pesticides" *The World and I*, August, pages 334-9.
- _____. 1990. "Farmers Participating in LISA Projects -- Directory 1988 to 1990." Survey conducted by Madden Associates in Glendale California, USA, Sept. 50 pages.
- _____. 1990. "The Economics of Sustainable Low-Input Farming Systems" in C. Francis, L. King and C. Flora, (eds.) *Sustainable Agriculture in Temperate Zones*, (NY: Wiley). pages 315-341.

____.1992 "Sustainable Agriculture Research and Education Program-- Projects Funded 1988-91," USDA, Washington DC (4 regional volumes, 473 pages total; co-authored with regional coordinators). April.

____.1993. "Overview of the US Sustainable Agriculture Research and Education Program," paper presented at International Workshop on Life Science in Production and Food-Consumption of Agricultural Products, in Tsukuba Center, Tsukuba, Japan, October 24. Co-sponsored by the Japanese Ministry of Agriculture and the USDA, Agricultural Research Service. Published in proceedings volume, Session 2.

____. 1993. "Concepts, Strategies and Actions for Attaining a More Sustainable Agriculture -- A Buddhist Perspective." Keynote address presented during the International Workshop on Sustainable Agriculture Development, organized and hosted by the Asian Institute of Technology in Bangkok, Thailand, December 14-17. 20 pages. In conference proceedings.

____.1994. "Goals and Realities of Attaining a More Sustainable Agriculture." Paper delivered at a conference in Orlando, Florida, April 1994, Second Environmentally Sound Agriculture Conference, sponsored by University of Florida and the American Society of Agricultural Engineers. Published in the May, June, July and August issues of *Terra* magazine in Japan. 18 pages.

____.1994. "Reforming Science and Education in Efforts to Make World Agriculture More Sustainable." Keynote address delivered during the 7th International Congress of the Society for the Advancement of Breeding Researches in Asia and Oceania (SABRAO) and International Symposium of World Sustainable Agriculture Association, November 16-20, 1993 in Taipei, Taiwan. 13 pages. In conference proceedings, *Toward Enhanced and Sustainable Agricultural Productivity in the 2000's: Breeding Research and Biotechnology*, Vol. III, p.705-716.

Madden, J. Patrick and Scott G. Chaplowe. 1997. *For All Generations -- Making World Agriculture More Sustainable*. Glendale CA: OM Publishing. 642 pages.

Madden, James Patrick, James A. DeShazer, Frederick R. Magdoff, Charles W. Laughlin, and David S. Schlegel. 1990. *LISA 88-89: Low-Input Sustainable Agriculture Research and Education Projects Funded in 1988 and 1989*. Washington DC: USDA, Cooperative State Research Service. January, pages 133.

Madden, Patrick and Thomas L. Dobbs. 1990. "The Role of Economics in Achieving Low-Input/Sustainable Farming Systems" in Edwards et al., *Sustainable Agriculture Systems*. *ibid.* pp. 459-77.

Madden, J. Patrick, Alice Jones, A.J. Dye, and Harry W. Wells. 1994. "The 1994 National SARE/ACE Report to Congress." USDA, Cooperative State Research Service, November 1994. 25 pages.

Madden, Patrick and Paul O'Connell. 1988. "Guidelines for Preparing Regional Plans of Work on Low-Input Farming Systems Research and Education." Washington DC: CSRS, US Dept. of Agriculture. Feb. 16. 72 pages.

Madden, Patrick and Paul F. O'Connell. 1990. "LISA Some Early Results," *Journal of Soil and Water*

Conservation Vol. 45(1) 61-67, , Jan.-Feb.

Madden, J. Patrick, Milton N. Schroth, Thomas C. Baker, Harold O. Carter, Donald L. Dahlsten, Howard Ferris, Mary Louise Flint, James M. Lyons, Richard H. McCapes, Michael L. Morrison, Michael K. Rust, Charles E. Turner, Patrick V. Vail, and Frank G. Zalom editors. 1992. *Beyond Pesticides -- Biological Approaches to Pest Management in California*, University of California, ANR Publications Number 21512. 183 pages.

Madden, J. Patrick and Harry Wells. 1992. "Agriculture in Concert with the Environment Annual Report," 9 pages, and "Projects Funded in 1991" (72 pages). Environmental Protection Agency, Pollution Prevention Office. April

Magdoff, Frederick R., Beth Holtzman, Wendy Sue Harper, J. Patrick Madden, and Harry W. Wells. 1993. *Northeast Region 1993 SARE/ACE Report to Congress*. CSRS, USDA, Washington DC. June. 225 pages.

Moses, Marion. 1995. *Designer Poisons*. Pesticide Education Center, PO Box 420870, San Francisco, CA 94142-0870.

National Research Council. 1989. *Alternative Agriculture*. Washington DC: National Academy Press. 448 pages.

Proctor, Robert N. 1991. *Value-Free Science? Purity and Power in Modern Knowledge*. Harvard University Press

Schlegel, David E., Kristen Kelleher, J. Patrick Madden, and Harry W. Wells. 1993. *Western Region 1993 SARE/ACE Report to Congress*. CSRS, USDA, Washington DC. June. 180 pages.

Steimel, D. 1989. "Battle Shaping Up on Use of Pesticides." *Kansas City Star*, June 4, p. F1.

Sustainable Agriculture Network. 1996. *Sustainable Agriculture Directory of Expertise 1993* Sust. Agri. Publ., Hills Bldg. Room 12, University of Vermont, Burlington VT 05405-0082.

USDA. 1980. *Report and Recommendations on Organic Farming*.

USDA. 1988. Alternative Farming Systems. Secretary's Memorandum 9600-1. January 19.

US General Accounting Office 1990. *Alternative Agriculture: Federal Incentives and Farmers' Options* Report Number GAO/PEMD-90-12, February.

Waller Steve, Lisa Jasa, J. Patrick Madden, and Harry W. Wells. 1993. *North Central Region 1993 SARE/ACE Report to Congress*. CSRS, USDA, Washington DC. June. 213 pages.

Wells, Harry W., George Bird, Patrick Madden, Frederick R. Magdoff, David E. Schlegel, Steven S. Waller, and William H. Brown. 1993. *Agriculture in Concert with the Environment -- 1993 Annual Report of the ACE Program*. US Environmental Protection Agency, Washington DC. July. 153 pages.

Youngberg, Garth, Neill Schaller, Kathleen Merrigan. 1993. "The Sustainable Agriculture Policy Agenda in the United States: Politics and Prospects." In Patricia Allen, *Food for the Future: Conditions and Contradictions of Sustainability*, John Wiley & Sons, Inc., pages 295-318.

Glossary

AC Administrative Council of one of the four regions (Northeast, North Central, Southern, and Western).

ACE Agriculture in Concert with the Environment, a sustainable agriculture grants program jointly funded by EPA and USDA. Started officially in 1991, ACE was an addendum to the LISA Program, later re-named SARE.

AFSIC Alternative Farming System Information Center, located at the National Agricultural Library in Beltsville, MD; founded by Jayne MacLean with LISA funds; currently directed by Jane Gates.

Ch. 1 The SARE Program operates under Chapter 1 of the enabling legislation, "Title XVI Research Subtitle B -- Sustainable Agriculture Research and Education," of the 1990 Farm Bill, officially called the Food, Agriculture, Conservation and Trade Act (FACTA) of 1990.

Ch. 2 "Integrated Management Systems," a part of the authorized program never implemented due to lack of appropriated funds. Many of the purposes of Ch.2 are incorporated in Ch. 1, and are being implemented through SARE and ACE projects.

Ch. 3 The Professional Development Program (PDP), also called the Sustainable Agriculture Technology Development and Transfer Program. This program is currently operating in all four regions. Its primary goal is training of Extension personnel in the principles and practices of sustainable agriculture.

CSREES Cooperative State Research, Education, and Extension Service, an agency of USDA; successor to CSRS and ES.

CSRS Cooperative State Research Service, the former name of an agency of USDA in charge of research funded in part by federal appropriation under cooperative agreements with organizations (mostly land-grant universities). CSRS was the agency where the LISA Program was initiated; it is currently called CSREES.

EPA The United States Environmental Protection Agency.

ES The former federal Extension Service of USDA, now part of CSREES.

FACTA The Food, Agriculture, Conservation and Trade Act of 1990; the 1990 Farm Bill, containing the enabling legislation for the SARE Program.

Food Security Act of 1985: The enabling legislation for LISA, in Public Law 99-198.

Land-Grant Institutions of 1862: Universities founded on land granted by the federal government to each state during the Lincoln Administration. In the South, these were historically white institutions.

Land-Grant Institutions of 1890: Universities founded on land granted by the federal government to states, mostly in the South, intended to serve the Black population. These remain predominantly Black institutions, both in student body and faculty.

LIFSRE Low-Input Farming Systems Research and Education, the first title given in January of 1988 to the program later called LISA and now SARE.

LISA Low-Input Sustainable Agriculture, a competitive grants program established in 1988; now called Sustainable Agriculture Research and Education (SARE).

Northeast Region: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and West Virginia.

North Central Region: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

NSAAC National Sustainable Agriculture Advisory Council, created by FACTA (1990) to advise the Secretary of Agriculture regarding implementation of sustainable agriculture programs.

SAN Sustainable Agriculture Network, a collection of public and private organizations formed during the early years of the LISA Program, for the purpose of facilitating a more effective dissemination of research results and other information to various audiences using electronic, print, and other media.

SARE Sustainable Agriculture Research and Education, the name given to the LISA Program following passage of the 1990 Farm Bill.

Southern Region: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North

Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas, Virginia, and the Virgin Islands

USDA United States Department of Agriculture.

Western Region: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, and the Island Protectorates (American Samoa, Guam, and Micronesia).

Appendix I

Autobiographical Notes Pertaining To Sustainable Agriculture.

Historical documents are typically ten percent fact and ninety percent subjective interpretation. Even the author's choice of which facts to include is a subjective matter. Since subjectivity is unavoidable, it seems only fair to give the reader enough background to know where the author is coming from in making those subjective choices. It is this in this spirit that I offer the following autobiographical notes. More details are available in the "Living History" video prepared by Jane Gates at the National Agricultural Library.

I was raised on a moderate size family farm in eastern Oregon, producing potatoes, hay, rye, and cattle. During my childhood I witnessed the astonishing transition from horse-drawn farming technology to tractors, hay balers, sprinkler irrigation, and self-propelled machines for harvesting potatoes or grain. I also witnessed the transition to chemical-intensive agriculture. Ant hills mysteriously disappeared after a field was sprayed with the (now banned) insecticide aldrin. Pheasants, quail, and migratory birds that had richly populated our farm or the surrounding hillsides became a rare and cherished sight. Insects that previously posed no threat to our crops became significant pests. When I sprayed our dairy cows and the barn with DDT, flies became scarce, but I wonder how the DDT residue in my body tissue has affected me and people who consumed the milk and meat from our farm. By the time I left the farm to go to college in 1955, I remained oblivious to the effects of chemical-intensive farming, as did nearly everyone else, until the publication of *Silent Spring* by Rachel Carson in 1962. Even then, I remained dubious that it would be possible to feed the rapidly expanding population of the world without relying on the "miracle chemicals."

With a BS in agricultural economics from Oregon State University (1959) and a Ph.D. in agricultural economics from Iowa State University (1962), I was hired the Economic Research Service of US Department of Agriculture (USDA), to conduct a national study on the future of family farms in the US, with emphasis on economies of farm size. Based in Washington, DC, I visited many universities around the US, and had the privilege of visiting many farms. Farmers provided many insights that added considerable richness and reality to the theoretical framework I brought from my disciplinary training in agricultural economics. The immediate result of this experience was to greatly improve the perceptions and insights in my report, *The Economies of Size in Farming*. The more enduring result is a life-long respect for the synergy of integrating theory with practical field experience.

Meanwhile, as a USDA employee I participated frequently in formation of public policy related to family farms. As a green Ph.D. not yet 28 years old, I was at first in awe of the policy-making

process. I felt honored to be allowed to participate in the formation of public policy for this Nation. A hopeless and incurable romantic, I literally became thrilled at the sight of the Washington monument, the Capital, the Jefferson Memorial every morning for four years during the commute from Virginia. When I learned that major national policies were frequently made capriciously, in the absence of essential information and careful analysis, I was at first offended and horrified. As a life-long co-dependent with a strong history of "fixing" what seemed broken, I committed my career to informing public policy through research and program evaluation, in the hope of somehow making a contribution to my country.

While many of my colleagues became cynical of the entire federal government, I viewed cynicism as counterproductive and destructive of morale. Skepticism, yes. Cynicism, no. A healthy skeptic insists on finding the truth. A cynic denies there is such a thing as truth, and ridicules the sincerity of those dedicated to improving a seriously flawed system. There is little if any socially redeeming value of cynicism, but there is no substitute for healthy skepticism.

During my final year as a federal employee, I was detailed to the Executive Office of the President (Johnson) to serve on the staff of the National Advisory Commission of Rural Poverty. In 1967 we produced a widely acclaimed report, *The People Left Behind*. This year of experience gave me a deeper appreciation for the suffering of the poor, plus an in-depth understanding of the root causes and consequences of poverty. Coupled with earlier policy-making activities, this experience motivated me to take a job at the Pennsylvania State University, where I began what would be a 20-year career, starting with teaching and research on public policy related to improving the plight of the disadvantaged.

After ten years of policy research and program evaluation at Penn State, I decided to make a career change into research on ways to enhance the profitability of a transition from chemical-intensive technology toward more sustainable farming systems. This choice was prompted in part by the illness and ultimate death of my first wife from cancer, and my suspicion that environmental factors such as pesticides may be a factor in countless cancer deaths as well as other human health and ecological impacts throughout the world. The current literature has vindicated that suspicion (Benbrook 1996, Hewitt and Smith 1995, Moses 1995). With funding and staff support provided by the Rodale Institute, and with scientific expertise provided by Dick Harwood, I conducted a survey of organic farms in the United States. Then I visited as many as possible of the most interesting farms during a sabbatical leave from Penn State. At the beginning of this study, I was afflicted with the widespread belief that organic farming technology would work only on labor-intensive, garden-size farms, and that commercial-scale organic farms could not be highly productive and profitable.

I was startled and extremely pleased to discover moderate to large scale farms operating very productively and profitably using organic systems of farming. At a major turning point in my

career, I started writing case studies of several farms I visited during 1982, and continued updating several of them from year to year. I routinely sent copies of each year's updated report on the case studies to Dick Harwood at Rodale Research Center. In 1986 I was approached by Chuck Benbrook, then on the staff of the National Research Council (NRC), National Academy of Sciences in Washington, DC. At the suggestion of Dick Harwood, a member of the NRC Committee on the Role of Alternative Farming Methods in Modern Production Agriculture, Benbrook asked me to update and extend the case study work I had done previously, as input to the NRC study. This assignment gave me the opportunity to re-visit several of the farms, and to significantly deepen my analysis of their operations. The NRC Committee observed that the case studies significantly enhanced their report, adding concreteness and a sense of reality to the scientific information from the several academic disciplines represented on the Committee. I became the editor and principle author of what became part two of the report *Alternative Agriculture*. I also wrote chapter 4, "Economic Evaluation of Alternative Farming Systems" and contributed substantially to the remainder of the book, along with writer Kevin Finneran.

Partly as a result of recommendations made by key members of the NRC Committee, I was selected by Paul O'Connell, then Deputy Administrator of CSRS in USDA. Paul invited me to serve as the founding Director of a new grants program, initially known as LISA, Low-Input Sustainable Agriculture, and later re-named SARE, Sustainable Agriculture Research and Education. He told me the purpose of the program was to support research and education on sustainable agriculture in the US. I accepted Paul's invitation, and served in this capacity during all of 1988. The assignment was done through a cooperative agreement between USDA and the Pennsylvania State University; I did not become a federal employee.

Half way through the year, my new department head at Penn State told me he hoped I would return after completing that one-year assignment. He said, however, that if I chose to return, I would no longer have the freedom to engage so extensively in public service, and would be expected to publish more extensively in the refereed journals of my profession, agricultural economics. By then I had enough experience to know that accumulation of a long list of refereed journal would not necessarily make the world a better place or me a happier person. At the end of 1988, realizing that the LISA Program and the US sustainable agriculture movement remained vulnerable and in need of continuity of leadership, I decided to resign from Penn State and continue working with the administration of the LISA Program. The decision was not entirely altruistic; the Vice President for Agriculture and Natural Resources had committed to establishing a new sustainable agriculture position for me in the administration of the University of California. Unfortunately, a severe budget shortage eliminated the new position before it happened. Paul offered me the full-time federal position as Director of the LISA Program in Washington, DC. I chose not to relocate because of family

considerations, and instead, became the part-time "manager of field operations," under the direction of Paul O'Connell and Neill Schaller, who was the first federal employee to serve as Director of the LISA Program. With a courtesy appointment at the University of California, my position was later redefined as Associate Director of LISA. I continued in this role under a series of directors (Jim Boland, George Bird, and Alice Jones) and served as interim director as necessary while waiting for each new director to arrive.

An unreformed advocate for making agriculture more sustainable, in 1991 I helped to establish an international organization, the World Sustainable Agriculture Association (WSAA). During the early years of WSAA, I was able to devote relatively little time to this organization because my supposedly part-time job as Associate Director of the SARE Program required more than a full time effort. Gradually I increased the percent of time devoted to WSAA, until September 1994 when my contract with the SARE Program expired and WSAA became my sole employer. I remained with WSAA until March 1998, when I resigned from the Board and the presidency due to the takeover of the organization by a Japanese foundation. Working with former staff and Board members and other interested persons in the US and abroad, we are now seeking to establish a new organization to continue and accelerate this important work. The tentative title, to be confirmed by an organizational conference, is "International Partners for Sustainable Agriculture -- Food Security Through Sustainable Food and Farming Systems."

The SARE Program should adopt a policy of reaching to other countries. The need for more sustainable agriculture is universal. The US has very much to offer -- and very much to learn from the research and field experience of other countries.

Appendix II

The Initial USDA Policy Statement on Sustainable Agriculture.

United States Department of Agriculture, Office of the Secretary Washington, DC 20250

January 19, 1988

Secretary's Memorandum 9600-1

ALTERNATIVE FARMING SYSTEMS

1. PURPOSE

The purpose of this memorandum is to state the Department's support for research and education programs and activities concerning "alternative farming systems," which is sometimes referred to as 'sustainable farming systems.'

2. BACKGROUND

Many of the Nation's farmers have experienced financial stress in the 80's due to the downturn in exports of farm products, commodity prices, and land values. The traditional solution of increased production will only further depress commodity prices. Also, farmers are under increased pressure to reduce non-point pollution from fertilizers and pesticides and reduce erosion. Alternative farming systems that decrease or optimize the use of purchased inputs and that can increase net cash returns to the farmer through decreased costs of production may effectively improve the competitive position of the farmer and decrease the potential for adverse environmental impacts.

3. DEFINITION

Alternative farming systems are defined here as alternatives to current farming systems that tend to have a high degree of specialization. The current systems emphasize high yields which are achieved by the use of major inputs of fertilizers, pesticides and other off-farm purchases. Alternative farming systems range from systems with only slightly reduced use of these inputs through the better use of soil tests, integrated pest management, and capital inputs to systems that seek to minimize their use through appropriate rotations, integration of livestock with crops, mechanical/biological weed control, and with less costly buildings and equipment.

4. POLICY

The department encourages research and education programs and activities that provide farmers with a wide choice of cost effective farming systems including systems that minimize or optimize the use of purchased inputs and that minimize environmental hazards. The Department also encourages efforts to expand the use of such systems.

5. RESPONSIBILITIES

The Assistant Secretary for Science and Education is responsible for encouraging and guiding the development of research and extension programs that best meet farmers' needs for facts, information, and guidance concerning alternative farming systems.

Each agency head shall implement the programs for which the agency head is responsible in ways that are consistent with this policy on alternative farming system. Activities involving more than one agency will be coordinated through the Department's Research and Education Committee.

6. TERMINATION

This memorandum shall terminate 1 year from the date hereof.

Richard E. Lyng, SECRETARY OF AGRICULTURE

Appendix III

Suggestions For Validating The Bird - Van Schilfgaarde Relevancy Protocol.

Following is an edited excerpt from my letter to Alice Jones, in response to her request for suggestions on ways to improve the Relevancy Protocol (RP), developed by Bird and Van Schilfgaarde.

This is in response to your request for a statement regarding the need for validation of the Relevancy Protocol (RP). ... The suggestions presented here are based on my understanding of the process used to develop and refine the RP over the past two years. I discussed these concerns with George Bird last year.

Since the RP is an instrument intended to collect/generate data, I will use an allegory of a laboratory instrument, such as a device used to determine the pH of a solution. In general, data collection devices are judged according to at least three criteria: practicality, reliability, and accuracy or validity.

First, the device must be practical, i.e. easy for a qualified person to use. The RP has been demonstrated to be excellent according to this criterion.

Second, the device must be reliable, in that repeated observations of a given case should yield similar data. If a pH meter is used to test the acidity of a solution, then repeated tests on that solution should give roughly the same answer. If the repetitions yield highly variable data, the device is deemed unreliable.

When a diverse group of evaluators employ the RP to assess the relevance of a given project, ideally all evaluators exposed to the same information should give similar RP scores on that project. While I have not seen the individual scores, my impression from discussions with George Bird and Jan van Schilfgaarde has been that the variance is very high, suggesting the RP may have problems regarding reliability.

To unpack the sources of this variability, I recommend multivariate analysis of the RP scores, to test the hypothesis that attributes of the evaluators are correlated to project scores -- attributes such as parent discipline, current occupation (scientist, farmer, bureaucrat, educator) etc.

As scientists, we must inquire into the issue of validity or accuracy -- whether the RP readings do in fact reflect the relevance of the project to attainment of a more sustainable agriculture. For this purpose, a sample of projects receiving high, medium, and low RP scores should be re-evaluated with successively more in-depth information. If the RP data based on rather

superficial examination of the projects turns out to be poorly correlated with data based on more in-depth examinations, then the RP data should be combined the data on the attributes of the evaluators in multivariate analysis of covariance. The null hypothesis is that RP scores are not affected by evaluator attributes or the depth of the information to which they are exposed prior to scoring the project.

An important methodological issue is the impact of the evaluator's depth of exposure to the project. Superficial exposure, such as reading abstracts from CRIS reports, (which I will call Y1), should be correlated with independently related RP scores from successively more in-depth exposure such as

reading full annual reports of the project (Y2),

reading publications or other documents resulting from the project (Y3),

site reviews of the project (Y4), and

longitudinal tracking of the project to ascertain whether it results in widespread adoption of farming practices or systems that lead to observable outcomes, such as reductions in applications of toxic chemicals or environmental impacts (Y5).

Each successively more in-depth measurement (from Y1 toward Y5) requires more time and effort on the part of the evaluator, and consequently higher cost. It would not be feasible to collect Y5 data on all or even a large proportion of the projects to be evaluated. However, a carefully designed sample of projects should be examined to obtain all five readings (Y1 to Y5).

Y5 is the standard for determining the validity of a data collection device. Specifically, it is possible to test the hypothesis that Y1 is correlated to Y5. If the correlation is weak, the validity of Y1 is seriously in doubt. Similar tests should be conducted on each of the measures (Y1, Y2, Y3, and Y4). The higher the correlation to Y5, the greater the degree of validity. Returning to the laboratory allegory, if the pH meter is found to be easy to use and is highly reliable (always giving the same pH readings on a given solution) but if pure water (known to have a neutral pH of 7.0) is found to have a pH of 6.0, then the device passes the practicality and reliability tests, but fails on validity or accuracy.

Unless we initiate a methodological study along the lines outlined here, we run the very real risk of severe embarrassment. Sooner or later someone is going to do a study of the type proposed here. And when the study is done, if it finds Y1 and Y2, for example, are not significantly correlated with Y5, then we will find ourselves in the awkward position of having a large amount of invalid data, which could mislead public policy. This result could also cause widespread

mutiny among the agency and project personnel who have been dutifully generating the data. Clearly this validity study should have been initiated two years ago.

But while it is not feasible to turn back the clock, it is important that further delay be prevented by taking decisive action now. Here are a couple of references that illustrate what I mean by validation. The second is the better of the two.

*"Validity of the 24-hour Dietary Recall with Elderly Subjects" by J. Patrick Madden, S. Jane Goodman and Helen A. Guthrie. **Journal of the American Dietetic Association**, 68(2):143-147, February 1976. (Cited in **Nutrition Reviews**, 34(10):310-311, October 1976.)*

*"Validity of the Dietary Recall and Record for Group Comparison" by Mitchell Gersovitz, J. Patrick Madden, and Helen S. Wright. **Journal of the American Dietetic Association**, 73(1):48-55, July 1978.*