A REVIEW OF A.I.D. EXPERIENCE WITH FARMING SYSTEMS RESEARCH AND EXTENSION PROJECTS

A.I.D. EVALUATION SPECIAL STUDY NO. 67

by

Kerry J. Byrnes, Senior Social Science Analyst
(Center for Development Information and Evaluation, A.I.D.)

Agency for International Development

October 1989

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

LIST OF TABLES

PREFACE

This paper reviews the experience of the Agency for International Development (A.I.D.) with farming systems research and extension (FSR/E) projects that it funded from the mid-1970s to the mid-1980s. This report, based on a case study review of evaluations of 12 A.I.D.-funded FSR/E projects, assesses the impact of these projects on agricultural technology development and transfer and on institutionalization of the farming systems approach in research and extension systems.

The intended audience of the study is those who have a special need for an in-depth understanding of the farming systems concept in relation to agricultural research and extension. This audience includes, but is not limited to, the following:

-- FSR/E practitioners who are implementing agricultural research and extension projects, programs, and systems

-- Technical specialists who are designing or evaluating agricultural research and extension projects involving a farming systems component

-- A.I.D. personnel who manage or provide policy guidance for the design, implementation, or evaluation of agricultural research and extension projects that involve a farming systems component

-- Management and field staff of public sector agencies, private voluntary organizations, and private sector firms that carry out agricultural extension and technology transfer activities and projects

-- Professionals in agricultural universities, regional and international agricultural research centers, and bilateral and multilateral donor agencies that are concerned with strengthening agricultural research and extension capacity in the developing countries

Some readers may find it discomforting that this report does not point to any one A.I.D.-funded FSR/E project as being more successful than another. However, the FSR/E projects reviewed were evaluated while implementation was yet proceeding. Thus, the evaluations could not provide a sound basis for judging that any project was a failure or a success. At the same time, the study takes a critical look at the constraints that hindered implementation and reduced the impact of the FSR/E projects reviewed.

Given the limitations of the study's data source (i.e., project evaluations), this report tends to paint a somewhat negative picture of the impact of FSR/E projects on technology development and transfer and on institutionalization of the farming systems approach. However, recent assessments and field studies of FSR/E projects and programs indicate that the impact of such projects in many countries has gone considerably beyond that evident when the projects reviewed in the present study were evaluated (e.g., Baker and Norman 1988; Breth 1984; Byrnes 1988; Collinson 1988; Frankenberger et al. 1988, 1989; and Merrill-Sands 1988).

Two other FSR/E assessments were being developed at the same time as the present study was conducted: (1) a study of on-farm client-oriented research conducted by the International Service for National Agriculture Research (Merrill-Sands 1988), and (2) the FSR/E Network Steering Committee's "results inventory" of family systems projects and programs (Butler Flora 1988; Frankenberger et al. 1988, 1989). The lessons learned from the projects reviewed in the present study are reinforced by similar conclusions that emerged from these other assessments.

Finally, the author wishes to acknowledge the contributions to this study made by Tim Frankenberger of the FSR/E Network Steering Committee; A.I.D. officials, including Joan Atherton, Roberto Castro, Ron Grosz, Cal Martin, Wendell Morse, Ken Prussner, Emmy Simmons, Gloria Steele, Dennis Weller, Marcus Winter, and Michael Yates; Center for Development Information and Evaluation colleagues, particularly Siew Tuan Chew, Joe Lieberson, Annette Binnendijk, Paula Goddard, Haven North, and Barbara Martin; Francis C. Byrnes of Winrock International; and Professional Management Associates, Inc., editors Patricia Rogers and Farah Ebrahimi.

SUMMARY

Farming systems research and extension (FSR/E) projects funded by the Agency for International Development (A.I.D.) have had a mixed impact on technology development and transfer and on institutionalization of the farming systems approach. These projects have provided research and extension personnel with opportunities for training and field experience in FSR/E, but the concept has yet to be effectively incorporated into technology development and transfer systems to an extent that would permit it to begin to achieve the impact on agricultural production that has been assumed in project designs. Key constraints to FSR/E project implementation and impact have included the lack of the following: a problem-solving approach, effective collaboration across disciplines, links of research with extension, consensus on methodology for FSR/E, stakeholder understanding of FSR/E, agricultural policy and strategy defining FSR/E's role in research and extension, staffing of projects with trained personnel, and government funding to meet recurrent costs. The FSR/E concept often has not been well understood by project implementers or A.I.D. management, but agricultural projects that seek to strengthen technology development and transfer can benefit by using the concept more effectively. The lessons learned from this Center for Development Information and Evaluation review can serve to improve the design, implementation, and evaluation of agricultural projects that have a technology development and transfer component.

Background of the Problem

During the 1970s, the perception grew that the conventional approach to agricultural research and extension did not work well in most developing countries. Typically, commodity or discipline research based at experiment stations followed a top-down technology development and transfer model. Scientists proceeded without considering the actual problems that farmers faced. Lacking knowledge and understanding of the management conditions under which small farmers operate, many researchers erroneously assumed that smallholder farming systems are static, that small farmers reject technologies out of sheer ignorance or traditionalism, that small farmers seek to maximize yield and profit, and that commodity-oriented research can generate broad-based technologies relevant to smallholder farming systems. As a result, researchers developed "improved" technologies that farmers frequently did not adopt.

A.I.D.'s Assistance Approach

A.I.D. responded by committing project funds to FSR/E, a new approach to agricultural research. Since 1975, more than 75 A.I.D. agricultural projects have included some form of FSR/E. FSR/E projects use on-farm research and extension to test, adapt, integrate, and disseminate new technologies for adoption by farmers. Technology development is based on a knowledge of the whole farming system, and technology evaluation takes into account technical criteria (such as yield improvement) as well as the farm family's socioeconomic circumstances. Further, knowledge of farming systems is used to help define on-station and on-farm research agendas, with the expectation of generating productivity- and income-increasing technologies more acceptable to smallholder farmers.

Viewing the farm as a system, FSR/E practitioners focus on farm family attributes--goals, preferences, skills, resources (such as labor), production activities, and management practices; interdependencies among system components that family members control; and interactions of these components with physical, biological, and socioeconomic factors not under the farmers' control.

FSR/E's Core Characteristics

FSR/E entails the blending and sequencing of nine <u>core characteristics</u>:

1. <u>FSR/E is farmer oriented</u>. FSR/E targets small-farm families as the client group for research, identifies technology relevant to this group's management conditions, proposes technological solutions, and adapts technologies to local circumstances and needs.

2. <u>FSR/E involves the client group as participants in the research and extension process</u>. FSR/E practitioners work with client group members to design, implement, and evaluate research and extension activities.

3. <u>FSR/E recognizes the locational specificity of technical and human factors</u>. FSR/E practitioners identify client groups of farmers that are relatively homogeneous in terms of agroclimatic, socioeconomic, and other factors.

4. FSR/E is a problem-solving approach. FSR/E practitioners identify the constraints to increased farm productivity and income. Their primary concern is to help farmers solve problems.

5. FSR/E is systems oriented. FSR/E views the total farm as a system of natural and human components. It evaluates both the potential for introducing improved technology in one or more production subsystems and the impact of this technology on the farming system as a whole.

6. FSR/E is interdisciplinary. Collaboration among agricultural and social scientists facilitates identification of the conditions under which small farmers operate; diagnosis of constraints; and design, conduct, and evaluation of research and extension activities aimed at developing and introducing improved technologies suitable to the client group of farmers.

7. FSR/E complements, not replaces, conventional commodity and discipline research. FSR/E adapts technologies and management strategies from discipline and commodity research to the farmers' agroclimatic environment and socioeconomic circumstances.

8. FSR/E tests technologies in on-farm trials. On-farm collaboration between farmers and FSR/E practitioners provides each with a deeper understanding of the farming system and farmers' decision-making criteria and allows for development of technology under farm-level environmental and management conditions.

9. FSR/E provides feedback for shaping research priorities and agricultural policies. FSR/E, a dynamic and iterative process, provides information on farmers' goals, needs, and priorities and their criteria for evaluating technologies, and feedback on how new technologies perform under farm conditions.

If any of these core characteristics is missing from a technology development and transfer methodology, the methodology is not FSR/E.

Impact

Assessing FSR/E project impact on technology development and transfer is confounded by three factors:

-- The relative contributions of conventional agricultural research and FSR/E are not readily separable; they are complementary.

-- Technology adoption depends on factors not under the control of FSR/E teams, such as physical infrastructure, policy environment, and agricultural support institutions (such as credit).

-- Because FSR/E encompasses technological development and institutional change, significant results may be achievable only in a longer timeframe (such as 15 to 25 years).

Beyond these factors, expectations about how quickly or how much FSR/E alone could increase the productivity of a country's agriculture may have been unrealistic. For example, FSR/E project Logical Frameworks often assumed goals and objectives for farm-level impacts that could not be achieved within the typical A.I.D. project timeframe. Some project designs erroneously assumed that technologies were available for on-farm testing and adaptation to a variable agroecological environment.

Although evaluations and case studies of 12 A.I.D.-funded FSR/E projects provided insufficient data to assess direct beneficiary impact (e.g., changes in farmer income), they indicated some success in training development personnel in FSR/E and providing them with practical opportunities to gain field experience. Participation in FSR/E not only changed researchers' attitudes about small farmers as the clients of research but also influenced how researchers defined research problems, set research priorities, and carried out problem-oriented research on farms. Such changes have increased the likelihood that research and extension will focus on problems that are relevant to farmers.

Despite these indications of success, most FSR/E projects did not have as much of an impact on technology development and transfer or institutionalization of FSR/E as had been assumed in their designs (Logical Frameworks). Life-of-project funding is for 5 years or less, and the total time needed to institutionalize FSR/E is probably 15 to 25 years, or even more.

Findings

The gap between actual and expected impact was caused not by any shortcoming in the FSR/E concept per se but rather by the failure of FSR/E projects to address core, operational, and generic constraints to implementing the concept.

<u>Core Constraints</u>. During the early years of FSR/E projects, the "farming systems" concept was neither well defined nor widely understood. FSR/E project implementers, trained in conventional disciplines, were not well versed in the farming systems concept, lacked field experience with it, and were not accustomed to the interdisciplinary approach to solving agricultural problems that were of concern to farmers.

There were few bona fide FSR/E practitioners; within A.I.D., very few people understood the core characteristics required for technically sound FSR/E. As a result of confusion and uncertainty about what FSR/E is, should be, or could be, many so-called FSR/E projects were not doing FSR/E. The most frequent core constraints, appearing in at least 7 of the 12 projects, were lack of a problem-solving orientation and lack of an interdisciplinary approach.

<u>Operational Constraints</u>. FSR/E projects often did not address operational constraints to implementation. At least 7 of the 12 projects suffered from problems in this area. A major constraint was the lack of consensus among technical assistance, counterpart, and A.I.D. personnel on how to implement FSR/E. Problems also arose in settings where agricultural policy and strategy did not define FSR/E's role relative to research and extension and where FSR/E was perceived as competing for scarce resources. FSR/E also was hampered by failures to ensure that key stakeholders (such as managers of research and extension) understood its benefits and requirements, that FSR/E practitioners could analyze and interpret the data collected, and that extension was effectively linked with research as a source of technology. In short, A.I.D. introduced FSR/E without realizing that FSR/E projects could not make an impact unless they could fulfill a broader set of conditions than those implied by the core characteristics alone.

<u>Generic Constraints</u>. A generic constraint is a problem that can arise in any A.I.D.-funded project, regardless of the project's technical focus. The two most frequent generic constraints, appearing in at least 7 of the 12 FSR/E projects, were lack of trained personnel and lack of government funding to meet recurrent costs (such as fuel for project vehicles). Other areas in which problems were encountered included project management structure, management of training, and management of technical assistance. Technical assistance problems included delays in the arrival of personnel, turnover of personnel, lack of experience

in FSR/E, and allocation of technical assistance time to project administration rather than to FSR/E.

The box below summarizes the constraints most frequently found in the 12 FSR/E projects reviewed and shows how many projects suffered from these constraints.

Constraints Most Frequently Found in 12 FSR/E Projects

Core Constraints

- Problem-solving approach (9 projects)
- Interdisciplinary approach (7 projects)

Operational Constraints

- Links with extension (9 projects)
- Consensus on FSR/E methodology (8 projects)
- Stakeholder understanding of FSR/E (7 projects)
- Research policy/strategy defining FSR/E's role (7 projects)

Generic Constraints

- Staffing with trained personnel (10 projects)
- Government funding to meet recurrent costs (9 projects)
- Management of technical assistance (7 projects)

Lessons Learned

This review of A.I.D.-funded FSR/E projects suggests the following as key lessons learned. Many of these lessons learned are reinforced by similar conclusions that emerged from a recent "results inventory" of FSR/E projects funded by A.I.D.'s Bureau for Science and Technology, Office of Agriculture.

The Farmer in FSR/E. In FSR/E, farmers play a central role in technology development and transfer. They are active collaborators, not just passive observers or receivers. Yet FSR/E practitioners often have had difficulty implementing this concept because highly centralized and vertically structured research and extension systems are geared to respond to top-down lines of authority rather than to needs and priorities identified by farmers.

Farming in FSR/E. FSR/E projects have tended to focus on the food crops raised by subsistence farmers, paying little attention to the other commodities that these farmers produce for sale. Several evaluations raised the issue of whether FSR/E should place greater emphasis on cash crop technologies to help farmers produce and market crops or animals of higher value.

Systems in FSR/E. FSR/E practitioners often have not gone beyond paying lip service to the concept of the farm family household as a system of natural and human components that must be understood if FSR/E is to influence agricultural income. Some FSR/E practitioners spent so much time studying the farm as a "system" that they never got around to testing potential technologies or institutional changes to overcome constraints. Others focused on a single crop (e.g., maize) but failed to examine the crop's interrelationships with other system components (such as livestock).

Research mandates have caused FSR/E practitioners to focus on improving production technology (primarily for crops) as the end rather than a means to an end. Not building increased farm family income into the design of FSR/E increases the chances that FSR/E will not focus on the farm and farm family as a system, with the result that the systems concept, FSR/E's guiding rationale, will be lost.

Research in FSR/E. Because FSR/E emphasizes research aimed at developing technologies to relax production constraints, FSR/E practitioners often have failed to address institutional constraints to adoption of the technologies being developed. Farmers frequently cannot adopt new technologies unless they also have access to such agricultural support services as credit, production inputs, and markets. Farming systems researchers, particularly social scientists, need to give greater attention to identifying means to remove or relax institutional constraints that impede farmers' access to agricultural support services.

Extension in FSR/E. Each FSR/E project reviewed was located in a research organization, thereby raising the problem of how farming systems research would be linked with extension. Many

FSR/E project managers and implementers viewed the "farming systems approach" as a research strategy, not as a strategy to integrate research and extension.

The Research/Extension Link in FSR/E. Although improved agricultural technologies are rarely transferable directly from research to extension, FSR/E teams can play an important role in linking research and extension by working with farmers and extension agents to test and adapt technologies derived from research and with researchers to provide feedback to establish research priorities. However, adequate incentives must be provided if research and extension are to be linked into a productive partnership.

Methodology of FSR/E. A.I.D.-funded FSR/E projects have provided opportunities for field-level development, testing, and adaptation of FSR/E methodologies. However, FSR/E's impact on technology development and transfer will be negligible until research and extension personnel work out a joint strategy to institutionalize farming systems methodology in research and extension programs.

Current Status of FSR/E in A.I.D. Many of FSR/E's core characteristics (such as on-farm trials) are now almost routinely designed into A.I.D.-funded agricultural projects. Further, an A.I.D.-sponsored survey of A.I.D. Missions found that the Missions place a high priority on training in FSR/E, institutionalization of the farming systems approach, and technology transfer. These trends indicate that FSR/E is playing a role in Agency-funded projects aimed at strengthening agricultural research and extension.

There Are No Panaceas. As A.I.D. turns its attention to "new" problems (such as sustainability of natural resources), the Agency should refrain from assuming there are "magic bullets" that will quickly lead to agricultural development of smallholder farmers in developing countries. Smallholder development objectives will be best achieved by systematically addressing the problems of agricultural research and extension on a sustained, long-term basis.

Outstanding Issues

Three outstanding issues merit consideration: sustainability of FSR/E, sustainability of natural resources, and project orientation to FSR/E.

Sustainability of FSR/E. The FSR/E concept cannot be institutionalized unless recurrent costs can be met. However, government research and extension budgets usually leave few resources for carrying out on-farm activities (such as on-farm trials). External support for FSR/E must provide incentives for public and private funding of research and extension and must ensure that host country research and extension organizations develop a capability to assume FSR/E's recurrent costs.

Sustainability of Natural Resources. Those concerned with "new" issues such as sustainability may fail to see the role that FSR/E can play in natural resources, agroforestry, and agricultural projects. If properly implemented, FSR/E could offer an excellent vehicle for addressing the sustainability of the natural resource base. The challenge will be to ensure that sustainability initiatives involving FSR/E's core characteristics are not undermined by the same core, operational, and generic constraints that plagued past FSR/E projects.

Project Orientation to FSR/E. FSR/E would not be where it is today in many countries without the support that A.I.D. and other donors provided FSR/E projects. However, implementation of FSR/E has been hindered by the prevalent assistance mode, the project, that provides support for only 3 to 5 years; indeed, the limited impact of FSR/E projects reviewed was to a certain extent predetermined by these projects' short lifespan. Success in FSR/E, as in all research and institutional development, requires a longer timeframe.

FSR/E is not a substitute for conventional research, but it can accelerate the speed at which technologies are developed and transferred. But this process is not aided by a short-term orientation to agricultural research in general or FSR/E in particular. Support needs to be sustained over the long term (15 to 25 years).

The challenge for future A.I.D.-funded agricultural projects is to address the constraints to FSR/E more effectively. A.I.D. can strengthen the contribution of agricultural research and extension to technology development and transfer by ensuring the following:

-- That FSR/E's nine core characteristics are systematically built into technology development and transfer methodologies

-- That agricultural research and extension projects provide a means to remove or relax the operational constraints that can impede implementation of FSR/E

-- That project assistance to relax core and operational constraints to FSR/E is not undermined by generic constraints

The problems encountered in implementing the farming systems concept did not result from any shortcomings in the concept itself but rather from limited knowledge and understanding of the requirements for implementing this concept. FSR/E, when properly implemented, can strengthen the technology development and transfer capability of agricultural research and extension systems.

The challenge is to integrate FSR/E into technology development and transfer methods and not permit it to be undermined by the same core, operational, and generic constraints that have impeded FSR/E’s implementation and institutionalization in developing country research and extension systems. FSR/E explicitly recognizes the need for links among farmers, extension workers, and researchers and defines the essential conditions (FSR/E’s core characteristics) for increasing the impact of donor, government, and private investment in agricultural research and extension.

However, such impact cannot be fully realized unless development assistance also addresses the various operational constraints that can impede institutionalization of FSR/E. Achieving this goal requires a long-term commitment to institutionalize technology development and transfer systems responsive to the problems faced by smallholder farmers in the developing countries. If A.I.D. has the vision and the means, its continued support for institutionalizing FSR/E can play a crucial role in increasing the productivity and income-earning capability of small farmer agriculture throughout the developing countries.

GLOSSARY

A.I.D.	Agency for International Development
ARP	Agricultural Research Project--Honduras, Malawi
ARPP	Agricultural Research and Planning Project--Nepal, Senegal
ATIP	Agricultural Technology Improvement Project--Botswana
CDIE	Center for Development Information and Evaluation, A.I.D.
CIMMYT	International Center for the Improvement of Maize and Wheat
FPNI	Food Productivity and Nutrition Improvement project--Guatemala
FSA	farming systems analysis
FSAR	farming systems adaptive research
FSBDA	farming systems baseline data analysis
FSCR	farming system component research
FSDP	Farming Systems Development Project--Philippines
FSIP	farming systems approach to infrastructural support and policy
FSR	farming systems research
FSRAD	farming systems research and agricultural development
FSR/E	farming systems research and extension
FSRP	Farming System Research Project--Lesotho, Tanzania
IARC	International Agricultural Research Center
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IITA	International Institute for Tropical Agriculture

MFP	Mixed Farming and Resources Management Project--The Gambia
NFSD	new farming systems development
OFCOR	on-farm client-oriented research
PACD	Project Assistance Completion Date
ROCAP	Regional Office for Central America and Panama, A.I.D.
SFPS	Small Farm Production Systems project--ROCAP
TD&T	technology development and transfer
T&V System	Training and Visit System
ZAMARE	Zambia Agricultural Research and Extension project

1. INTRODUCTION

1.1 Background

This report synthesizes the experience of the Agency for International Development (A.I.D.) with farming systems research and extension (FSR/E) projects it funded between the mid-1970s and the mid-1980s. A.I.D. support for FSR/E has been provided through four channels:

-- Centrally funded, non-earmarked support for the International Agricultural Research Centers (IARCs)--an estimated 15 percent of IARC budgets supports farming systems research programs (Anderson 1985, 225)

-- Centrally funded Bureau for Science and Technology/ Office of Agriculture projects--for example, the Collaborative Research Support projects, the Farming Systems Research and Development Methodology project, and the Farming Systems Support Project

-- A.I.D. regional bureau-funded projects--for example, the Africa Bureau-funded Farming Systems Research project conducted by the International Center for the Improvement of Maize and Wheat (CIMMYT)

- -- Bilaterally funded projects--for example, the USAID/Mali-funded Farming Systems Research and Extension project

A.I.D. funding for the Farming Systems Support project terminated December 31, 1987, thereby ending one of the mechanisms through which the Agency had supported FSR/E over the years. However, with USAID Missions continuing to fund new and ongoing projects that have an FSR/E component, bilaterally funded projects are the main avenue of current A.I.D. support for FSR/E.

The question arises whether the current direction and level of support for bilaterally funded FSR/E projects are appropriate relative to the Agency's mandate. Answering this question is difficult because of the confusion about what FSR/E is, how FSR/E differs from conventional approaches to agricultural research and extension, when FSR/E is appropriate, how to implement FSR/E, and whether and how to institutionalize FSR/E. As Merrill-Sands (1986) observed,

> ambiguity in terminology and conceptualization of FSR...has become more acute as the range of activities encompassed by the term FSR has broadened. If...lack of clarity continues, confusion and misunderstanding about the objectives, products and role of FSR are likely to discredit research executed under the name of FSR and jeopardize donor support. (P. 87)

A second difficulty in assessing A.I.D. involvement in FSR/E is the lack of information on the following:

- -- The factors that have influenced the relative success or failure of donor-supported projects in implementing FSR/E
- -- The role that FSR/E has played in strengthening the technology generation and transfer capacity of national agricultural research and extension systems
- -- The impact that FSR/E has had on rural income, food consumption, and the natural resource base

Another consideration is the issue of what FSR/E can reasonably be expected to accomplish within a given timeframe. Expectations for FSR/E may have been unrealistic; there is also the question of how much time should elapse before assessing whether FSR/E has succeeded or failed and to what degree it has done so.

Finally, where FSR/E projects have been less successful than had been expected or desired, FSR/E could fall into disrepute in the Agency, and assistance professionals could fail to recognize even those elements of the FSR/E approach that are valuable and that should continue to be incorporated into the design of future development assistance projects in agriculture.

These various difficulties restrict the basis on which an informed judgment can be made about the direction and level of support for FSR/E that is appropriate to the Agency's mandate. Yet the Agency has a vested interest in ensuring that experience gained and lessons learned from FSR/E projects are available to assist Agency personnel who are at a crossroads in terms of having to make decisions about the nature and level of support for FSR/E that will best contribute to agricultural development.

1.2 Objective

The objective of this review is to contribute to the ongoing discussion within the Agency about FSR/E. Specifically, this paper describes a range of factors or constraints that have influenced the performance of past and ongoing FSR/E projects. This information, in turn, can be used to identify ways in which the design, implementation, and evaluation of FSR/E projects (or projects including elements of FSR/E) could be improved.

1.3 Methodology

The data for the study were collected through a review of FSR/E literature, key informant interviews, and preparation of case studies of 12 A.I.D.-funded FSR/E projects, including projects that, while not specifically called "Farming Systems Research and Extension" projects, had a significant FSR/E component. The case study for each project was based on a review of the A.I.D.-sponsored evaluation documents for that project; the 13 case studies are available as individual A.I.D. Working Papers. Appendix A provides a detailed description of the study's methodology.

The 12 FSR/E projects reviewed were as follows:

Botswana Agricultural Technology Improvement (ATIP) (633-0221)
The Gambia Mixed Farming and Resources Management (MFP) (635-0203)
Lesotho Farming Systems Research (FSRP) (632-0065)
Malawi Agricultural Research (ARP) (612-0202)
Senegal Agricultural Research and Planning (ARPP) (685-0223)
Tanzania Farming Systems Research (FSRP) (621-0156)
Zambia Agricultural Research and Extension (ZAMARE) (611-0201)

Nepal Agricultural Research and Production (ARPP) (367-0149)
Philippines Farming Systems Development (FSDP) (492-0356)
Guatemala Food Productivity and Nutrition Improvement (FPNI) (520-0232)
Honduras Agricultural Research (ARP) (522-0139)
ROCAP Small Farm Production Systems (SFPS) (596-0083)

Appendix E provides a project description sheet on each project, and Appendix F summarizes A.I.D.'s funding of the projects. These projects, each of which had a major FSR/E component, accounted for more than $80 million of the funds spent by A.I.D. on agricultural research and extension projects between 1975 and 1987.

2. OVERVIEW OF FSR/E

> Some have recommended that the term FSR [farming systems research] no longer be used....The term FSR may have been used incorrectly or...fallen into disrepute because of loose usage, but...it is too important a concept to just abandon. What is important is to recognize that agricultural research should be geared to the needs of farmers, and that to do this will require that research be carried out within a farming systems perspective. This does not mean that all researchers will be FSR specialists, nor does it mean that FSR research will be carried out within a special FSR unit, but it does mean that...scientists will have a means to focus their work on the problems that farmers face. (Plucknett et al. 1986, 5)

While considerable discussion has surrounded the farming systems concept over the past decade, a consensus on FSR/E is now emerging. This section presents an overview of this consensus.

2.1 Origin of FSR/E

The origin of the FSR/E concept lies in pioneering "farming systems" studies that were conducted following the Green Revolution era of the 1970s. FSR/E evolved over time

> through trial-and-error field experience of an initially small group of researchers who developed a better understanding of the constraints faced by small farmers in the developing countries. Among the better known developers and proponents of the approach were

> [Michael] Collinson and [David] Norman in Africa; [Peter] Hildebrand and [Robert D.] Hart in Latin America; and [Richard] Bradfield, [Richard] Harwood, and [Hubert] Zandstra in Asia....Apparently, there was minimal communication among the researchers from different continents and--with the exception of Asia--within continents in the early stages, so several researchers developed similar conclusions and strategies independently during roughly the same period. (Chapman and Castro 1988, 3)

The farming systems approach gained momentum as the perception grew that mainstream agricultural research and extension institutions were following a basically "top-down" approach to technology development that lacked understanding of the management conditions under which small farmers operate. As a result, technology development was guided by a number of erroneous assumptions, as follows (adapted from Merrill-Sands 1986, 88-89):

-- That smallholder farming systems in the tropics and subtropics are static and primitive. We now recognize that these are complex, dynamic systems that evolved in response to particular agroclimatic, ecological, and socioeconomic conditions.

-- That small farmers reject technologies out of sheer ignorance or traditionalism. We now recognize that small farmers are rational decision-makers; but the goals they pursue and the criteria they use for evaluating technologies are often different from those agricultural scientists use.

-- That small farmers seek to maximize yield and profit in the production and sale of a crop. We now recognize that small-farm households formulate management strategies and make decisions within the context of the household's whole economic system, including cropping, livestock, and off-farm enterprises. It cannot be assumed that the maximization of either yield or profit is the appropriate criterion for assessing the potential utility and acceptability of a new technology under the conditions prevailing in smallholder farming systems.

-- That research programs can be effective in generating broad-based technologies relevant to smallholder farming systems. We now recognize that many broad-based technologies were inappropriate to the diverse physical and socioeconomic conditions under which small farmers operate. We further recognize that if broad-based technologies are to be transferred successfully to small farmers, more adaptive research is necessary.

In short, all too frequently, research programs guided by the old assumptions failed to provide farmers with any incentive to adopt the so-called "improved" technologies, given the management conditions under which they operated.

Responding to this situation, a growing number of farming systems practitioners argued that development of improved technology for small farmers must be grounded in a knowledge of the existing farming system and that technology must be evaluated not only in terms of technical criteria but also in terms of the socioeconomic circumstances of the farming system. Farming systems research (FSR) projects initiated at various locations began to provide evidence that multidisciplinary teams composed of natural and social scientists could identify opportunities for appropriate technology change among farmers.

Both the early work of farming systems pioneers and research programs initiated by the IARCs played a formative role in the origin and evolution of farming systems research. During the late 1970s and early 1980s, the number of farming systems projects increased rapidly. But, as Chapman and Castro (1988) point out,

> the supply of qualified technical assistance providers could not keep up with the demand. There were few well-trained professionals with real field experience who were capable and available to provide the quantity and quality of technical assistance necessary to establish and facilitate the integration of farming systems research methodology into [developing country] research and extension systems. Given the short supply of experienced practitioners, the quality of technical assistance provided to projects has been variable at best. Poor project implementation performance on a number of projects has contributed to a downgrading of the approach in the eyes of many development professionals and A.I.D. project managers.
>
> Given the...events that...occurred, it became clear why donor support for farming systems work has fallen off. Initially, high expectations were stimulated because farming systems appeared to be something new, it involved potential changes which would benefit everybody or at least hurt nobody, and it focused on directly helping the poorer segments of the rural population. At the same time, there was a general misconception regarding the level of development of the state of the

> art in farming systems implementation, as well as a misunderstanding regarding the length of time required to institutionalize the approach and begin to develop technologies appropriate for adoption by limited resource farmers. (Pp. 4-5)

Thus, as Chapman and Castro (1988) conclude, it is inappropriate at this time

> to pass judgement on the overall effectiveness of farming systems work..., since many of the projects are ongoing and, indeed, some are just beginning. What does seem clear is the realization that significant progress in technology development and transfer requires a longer time frame than is usually conceded in a project-type framework. Thus, farming systems projects tend to be downgraded because tangible results in terms of increased productivity and incomes may not be evident two or even four years into the life of a project. What farming systems does offer is a process that is philosophically and logically appealing, but with no guarantees of the end result--which often depends largely upon factors beyond the control of farming systems practitioners. (P. 6)

2.2 Defining FSR/E and "Farming System"

Since the first work of the farming systems pioneers, the FSR concept has continued to evolve with implementation and practical experience. One sign of this evolution was growing awareness that crop-based approaches to FSR (e.g., rice-based cropping systems research) risk neglecting important, interrelated components (e.g., livestock) of a farming system. Another sign was growing recognition that the agricultural productivity and resource use efficiency in a farming system should be measured in terms of various limiting constraints on the system (such as land, labor, and time).

Yet another sign of the continuing evolution of the FSR concept was the broadening of the concept to include an explicit link with extension. Farming systems research often was narrowly defined as "an approach to research" and a "normal part of the agricultural research process" (Plucknett 1987). While the farming systems approach is certainly not a new science or discipline, it is certainly more than simply "an approach to research" or a "normal part of the agricultural research process." FSR practitioners have sought not only to conduct research on and increase knowledge of farming systems but also to use this knowledge as a basis for bringing about productivity- and income-increasing change in the farming systems studied. Viewed in this light, FSR is an integral part of the overall agricultural innovation and technology management process. For this process to be effective, FSR must be linked not only with extension but also with the full range of agricultural support institutions that govern the speed with which improved technology is generated, tested, evaluated, adapted, disseminated, adopted, and diffused in an agricultural system.

While numerous terms and acronyms have been used to refer to the farming systems approach, FSR/E is used here because it explicitly addresses the need for links among farmers, extension workers, and researchers (Poats et al. 1986). Thus, FSR/E seeks, through on-farm research and associated extension activities, to test, adapt, integrate, and disseminate new technologies for adoption by resource-poor farmers. A "farming system" itself may be defined as follows:

> A unique and reasonably stable arrangement of farming enterprises that the household manages according to well-defined practices in response to physical, biological, and socioeconomic environments and in accordance with the household's goals, preferences, and resources. These factors combine to influence the output and production methods. More commonality is found within the system than between systems. The farming system is part of larger systems, e.g. the local community, and can be divided into subsystems, e.g. cropping systems. (Shaner, Philipp, and Schmehl 1982a, 214)

In conducting research on a farm as a system, FSR/E focuses on the following factors (adapted from Shaner, Philipp, and Schmehl 1982a, 13):

-- The farm family's attributes (e.g., goals, preferences, skills, access to resources, choice of productive activities, and management practices)

-- The interdependencies among system components that farm family household members are able to control

-- The interaction of these components with the physical, biological, and socioeconomic factors not under the household's control

In scope, FSR/E tends to be more limited than integrated rural development, which focuses on a broad set of development problems. FSR/E focuses on a more narrowly defined problem--

developing improved agricultural technologies and disseminating them for adoption by farmers. FSR/E also may be distinguished from what has been called the farming systems approach to infrastructural support and policy (FSIP). Productivity may be improved not only by developing and disseminating relevant technology, as in FSR/E, but also by implementing appropriate policy and support systems, as in FSIP. FSR/E is a strategy aimed at developing and disseminating improved agricultural technologies at the farm level; its principal product is technology and its primary clients are limited-resource farmers. FSIP operates at a more macro level than FSR/E and attempts to analyze and influence policy and the progress of institutions that may affect small farmers. The principal product of FSIP is information, and the primary clients are policymakers and managers of services and infrastructure (Hildebrand and Waugh 1983).

2.3 Goals of FSR/E

More than a decade ago, the Technical Advisory Committee to the Consultative Group on International Agricultural Research commissioned a review team to analyze the FSR programs at the IARCs. In the view of the review team, the overall goal of farming systems research is "to contribute to the improvement of human welfare through sustainable increased agricultural productivity" (Dillon, Plucknett, and Vallaeys 1978, 17). The specific goals of FSR/E may be stated as follows (adapted from Dillon, Plucknett, and Vallaeys 1978, 17; and Plucknett 1987):

- To understand better the problems and needs of farmers, especially farmers with small amounts of land or land located in marginal environments

- To improve the efficiency of the agricultural research process by focusing research on the problems and needs of farmers and by developing improved technology

- To assess the interaction among technologies and between technologies and the environment, thereby improving the appropriateness and relevance of new technologies

- To ensure that new technologies contribute to the long-term maintenance and enhancement of agricultural productive capacity

- To facilitate communication among farmers, researchers, extension agents, and representatives of other agricultural support institutions

-- To assist in the formulation of development policies and methods that effectively address the problems of farmers

2.4 Objectives of FSR/E

The Technical Advisory Committee's review team proposed that a well-structured FSR program should aim at meeting a number of objectives that are also relevant to this paper's more broadly defined concept of FSR/E. These objectives (adapted from Dillon, Plucknett, and Vallaeys 1978; Plucknett 1987; and Plucknett, Dillon, and Vallaeys 1986) are as follows:

-- To understand the physical (land and climate) and socioeconomic environment within which agricultural production takes place

-- To identify and evaluate existing important farming systems in specific physical and socioeconomic environments, and in particular, the practice and performance of these systems; and to improve our understanding of the farmer's skills, preferences, and aspirations

-- To improve problem identification (target areas, constraints, and so on) and opportunities for change in existing farming systems and thereby to assist in focusing research on key constraints that limit production and farm income and their sustainability

-- To enhance the capacity of research organizations to conduct research on priority farming systems problems and to design improved production systems

-- To conduct research on potentially improved practices, principles, system components, or subsystems, and to evaluate them for possible testing on farms

-- To evaluate potentially improved systems, or system components, on farms in major production areas under normal farm conditions

-- To assist in extending, monitoring the adoption of, and assessing the impact and benefits of improved farming systems

These objectives imply an active FSR/E program, but it is not likely that all would receive full or equal treatment in a given FSR/E program.

2.5 Core Characteristics of FSR/E

FSR/E has nine core characteristics, each of which is a necessary but not a sufficient condition for technically sound FSR/E. These characteristics (adapted from Farrington and Martin 1987; Hildebrand 1985; Merrill-Sands 1985, 1986; and Wiese 1985) are as follows:

1. FSR/E is farmer oriented. FSR/E practitioners target small-farm families as the client group for agricultural research. They identify the management conditions of this client group, propose technological solutions relevant to these conditions, and adapt technologies to local circumstances and needs.

2. FSR/E involves the client group as participants in the research and extension process. FSR/E practitioners work with client group members in designing, implementing, and evaluating research and extension activities.

3. FSR/E recognizes the locational specificity of technical and human factors. FSR/E practitioners identify "recommendation domains," or groupings of farmers that are relatively homogeneous in terms of agroclimatic, socioeconomic, and other factors. The criteria used to classify farmers into a domain depend on the practitioner’s objectives. A practitioner working at an International Agricultural Research Center (IARC) may develop categories of farms grouped largely according to agroclimatic criteria, while a practitioner in a national agricultural research system, working in a specific region, may categorize farms according to a set of much more specific criteria such as product mix, presence of draft power, and household socioeconomic status.

4. FSR/E is a problem-solving approach. Once relatively homogeneous groups of farmers have been identified, an FSR/E practitioner identifies the technical, biological, and socioeconomic constraints to improved farm productivity and farm family income and then identifies technologies that may be effective in removing or relaxing the constraints and that are feasible for the client group of farming households to adopt. Thus, the primary concern of FSR/E is helping farmers to solve problems.

5. FSR/E is systems oriented. Viewing the total farm as a system of natural and human components, the FSR/E practitioner focuses on specific subsystems to evaluate interactions among those subsystems, the farm as a total system, and the environment beyond the farm. FSR/E seeks to identify the potential for introducing a change in the technology of a specific subsystem and to evaluate the impact of such a change.

6. FSR/E is interdisciplinary. Collaboration among agricultural and social scientists facilitates identification of the conditions under which small farmers operate; diagnosis of constraints; and design, conduct, and evaluation of research and extension activities aimed at developing and introducing improved technologies suitable to the client group of farmers.

7. FSR/E complements, not replaces, conventional commodity and discipline research. FSR/E draws on technologies and management strategies generated by conventional discipline and commodity research and adapts this knowledge to the agroclimatic environment and socioeconomic circumstances of a relatively homogeneous target group of farmers.

8. FSR/E tests technologies in on-farm trials. On-farm collaboration between farmers and FSR/E practitioners provides each with a deeper understanding of the farming system and the farmer’s decision-making criteria, and allows for potentially improved technology to be evaluated under the environmental and management conditions in which it will be used.

9. FSR/E provides feedback for shaping research priorities and agricultural policies. FSR/E provides information on farmers’ goals, needs, priorities, and criteria for evaluating technologies, and feedback on how new technologies perform under farm-level conditions. Results of one season’s trials generate hypotheses for testing in the next. Further, trial results may be used to set on-station research priorities and to formulate regional- and national-level policy.

Each of the nine characteristics must be present for a technology development and transfer methodology to provide a technically sound approach to doing FSR/E. If one or more of the characteristics is missing or weak, the methodology really does not constitute technically sound FSR/E. For example, a methodology that emphasizes "technology testing in on-farm trials" can easily fail to give adequate attention to the other core characteristics of FSR/E. Thus, FSR/E practitioners need to be careful not to neglect any of the core characteristics or overemphasize one characteristic to the detriment of the others.

2.6 Stages of FSR/E

FSR/E entails five stages (adapted from Merrill-Sands 1986, 94-96; and Norman and Collinson 1985): (1) diagnosis or description, (2) design or planning, (3) testing or experimentation, (4) extension or recommendation and dissemination, and (5) monitoring and evaluation. In practice, boundaries between stages overlap because of FSR/E's dynamic and iterative nature.

2.6.1 Diagnosis or Description

During the diagnosis stage, the farming systems of a region are examined in relation to the total environment, the constraints farmers face, and the potential for change in the systems. Four steps are followed: (1) secondary sources for basic data and descriptive information on the target region are reviewed, (2) recommendation domains or target groups of farmers are identified, (3) an exploratory survey or reconnaissance of the region is conducted, and (4) a formal verification survey is conducted.

2.6.2 Design or Planning

During the design stage, potential strategies are formulated to deal with the constraints identified in the descriptive or diagnostic stage. Here the body of knowledge of past research (e.g., experiment station trials) and farmers' knowledge play an important role. Also important at this stage is to assess a technology or practice with regard to its technical feasibility, economic viability, and social acceptability for the target region.

2.6.3 Testing or Experimentation

During the testing stage, technologies identified in the design stage are tested under farm conditions to determine, as Merrill-Sands (1986) describes,

> the step-wise modifications...which...will allow farmers to exploit the available biological resources more efficiently, and which...are both feasible and attractive for farmers to adopt....On-farm experiments test the proposed technologies and adapt them to local conditions. They...fine-tune the...technology to farmers' needs and circumstances in a two to three year experimental process. Early trials are usually managed by researchers with farmers' cooperation. As the technology becomes more refined, it is tested and evaluated in farmer-managed trials. (P. 95)

Farm family participation in on-farm trials is critical. Farmers evaluate new technologies under their own management conditions. These evaluations are channeled to the research station to help scientists formulate more realistic and relevant research priorities. Concurrently, FSR/E practitioners gain knowledge and insight on the farming system, farmers' knowledge of their environment, and farmers' management strategies and resource allocation priorities and decisions.

2.6.4 Extension or Recommendation and Dissemination

During the extension stage, adapted technologies are disseminated to other farmers within the recommendation domain. Where extension personnel have been actively involved in the earlier FSR/E stages, they will know how to use the technology, for which farming systems the technology is relevant, how farmers respond to the technology, and how to introduce the technology to farmers most effectively.

2.6.5 Monitoring and Evaluation

During the evaluation stage, which continues throughout the FSR/E process, the pattern of farmer adoption of technology is monitored as a check on the technology's relevance and utility. The FSR/E practitioner obtains data on the technology's impact (e.g., impact on the pattern of demand for labor at the household, community, and regional levels). This information is used to help set priorities for future agricultural research as well as for agricultural policy and other agricultural support institutions serving small farmers.

2.7 Are FSR/E and Adaptive Research Equivalent?

A question is often raised about whether FSR/E is equivalent to adaptive research. Michael Yates, formerly of CIMMYT's Farming Systems Program in Haiti, notes in a personal communication that the two may be considered the same <u>if</u> FSR/E is defined essentially as the process of screening station-developed technologies in farmer fields and providing feedback to help station researchers modify those technologies to make them more appropriate. FSR/E can do this, but, says Yates, "this is still a very top-down approach, and in that sense is exactly what FSR/E is <u>not</u> supposed to be." In Yates's view, FSR/E "<u>develops</u> (not simply tests) technologies in farmers' fields, working alongside farmers." Technologies developed by an FSR/E program can be very different from shelf technologies developed at a research experiment station. As Yates points out, an FSR/E program that used, as its principal point of departure, "shelf technologies, developed under classically unrepresentative conditions and often addressing problems of low farmer priority, would...be running a very high risk of failure."

However, the temptation to go to the shelf is strong, especially where FSR/E practitioners began their careers as traditional experiment station researchers. They may see a new and funded activity such as FSR/E as a great way to get those technologies off the shelf and into the farmer's field and thus to demonstrate a return for the investments made in existing research stations. But, as Yates asks, who needs FSR/E if shelf technologies are basically sound, in need of only minor modification? Why not put the emphasis instead on improving links between traditional research and extension? Yates answers that, while FSR/E practitioners should play a role in adapting station technologies, the ideal is to have them adapt station technologies that have been developed with input from FSR/E from the beginning, since the latter technologies are likely to be more appropriate and more quickly adopted by farmers.

Yates's observations help to clarify FSR/E's role with respect to the capability of commodity-oriented research to generate broad-based technologies relevant to smallholder farming systems. As he notes (personal communication),

> one could argue that [commodity-oriented research] can play a key role in the <u>success</u> of FSR/E, <u>if done properly</u> (i.e., taking into account critical interactions between the target commodity and the broader farming system)....Concentrating on the key crop in a farming system can give FSR the focus it needs, and increases probabilities of seeing some adoption in the near term --which, in turn, greatly enhances chances of developing "stakeholder" understanding and support for FSR, including institutionalization....The key point is that a crop focus can be an excellent way to focus scarce research resources onto a manageable problem, and help integrate the FSR activity into the broader research program.

Thus, FSR/E is not a substitute for conventional agricultural research and extension, nor is it adaptive research in the sense of simply carrying out on-farm testing of technologies that were developed at an experiment station. On the one hand, FSR/E can develop information about problems that are relevant to farmers and help conventional research to set research priorities that are more in tune with the technological and institutional requirements for increasing farm productivity and farmer income. This involvement enhances the likelihood that conventional research will develop technologies relevant to farm-level problems and constraints. On the other hand, knowing farm-level problems and constraints, FSR/E practitioners are in a position to look for shelf technologies that may be effective in relaxing the identified constraints but that still need to be evaluated through on-farm testing. This involvement enhances the likelihood that appropriate technologies will be available for conventional extension services to transfer to farmers.

Other aspects of FSR/E--types of FSR/E and emerging trends in FSR/E--are discussed in Appendixes B and C, respectively.

3. SUMMARY OF FSR/E PROJECT EXPERIENCE

3.1 Impact of FSR/E Projects

The confusion that has surrounded the FSR/E concept over the years has not made the task of assessing FSR/E's impact and benefits any easier. Yet FSR/E personnel, as Anderson (1985) notes,

> if they indeed [practice] what they preach, are never far from assessing their impact. Whether it is in the early diagnostic phase of identifying problems, later stages of testing changes, or endloop stages of measuring the exploitation of modified farming techniques, the close association with the human elements of [farming systems] provides, in principle, a continuous harvest of impact information. (P. 226)

Ideally, impact and benefit assessment of FSR/E takes into account the extent to which FSR/E has developed farming systems that enable farmers more effectively to achieve their goals as well as broader social goals defined in terms of such criteria as sustainability and effects on landless laborers. But a number of conceptual and data problems are involved in properly assessing the impact of FSR/E in these two areas. Anderson (1985) concluded that several problems make either ex post or ex ante assessment difficult, if not impossible. Assessment of FSR/E impact and benefits, he concluded, is only possible in terms of (1) simple criteria such as the speed and extent of adoption of recommended changes by farmers and (2) intuitive assessments of social desirability, guided where possible by empirical data on such effects as extent of soil loss, employment levels, and so on.

Assessment of FSR/E impact and benefits should also take into account the extent to which the farming systems concept has been institutionalized in agricultural research and extension systems. This factor plays an important role in determining how quickly innovations in biotechnology can be transformed into agricultural technology adapted to farming systems. Baker and Norman (1988, 12) point out several problems that are involved in assessing the impact of FSR/E on technology development and transfer:

-- The relative contributions of conventional agricultural research and FSR/E are not readily separable--they are complementary.

-- Adoption depends on numerous factors not under the control of FSR/E teams--infrastructure, policies, agricultural support institutions (credit, inputs, markets).[1]

-- Because FSR/E encompasses technological development and institutional change, significant results may only be achievable in a longer timeframe (e.g., 10-25 years).[2]

Beyond these factors, there may have been unrealistic expectations about how quickly or how much FSR/E alone could increase a country's agricultural productivity. FSR/E project Logical Frameworks often assumed unrealistic goals and objectives for farm-level impact that could not be achieved within the typical A.I.D. project timeframe. Some project designs erroneously assumed that technologies were available for on-farm testing and adaptation to a variable agroecological environment (Baker and Norman 1988, 28).

---

[1]If FSR/E is based on a good understanding of <u>present</u> farmer circumstances, some would argue that this factor would account for lack of adoption only in limited circumstances. "If credit, production inputs and markets are key constraints, then the FSR team should have been focused on developing technologies that would be less sensitive to those constraints" (Michael Yates, personal communication).

[2]Some would argue that this depends on one's definition of results. One observer noted: "Improved technologies can often be developed in 3-5 years, if the FSR program has a clear focus and is allowed to concentrate on the key components of the farming system. But the French have a saying which basically translates into 'He who tries to pick up too much, drops everything.' And that, I think, explains many of the disappointing results with FSR/E as carried out" (Michael Yates, personal communication).

The problem of unrealistic expectations is particularly acute in marginal areas, to which FSR/E teams often have been assigned. Research payoffs under such conditions take considerable time to develop and, in the short run, are limited. Fewer successful interventions are available for harsh agro-ecological zones than for favorable environments; and even marginal improvement may require substantial modifications of existing farming systems. While it is not reasonable to assume that viable results can be achieved in the same timeframe for both types of environment, unfair comparisons may have reinforced the impression that FSR/E did not live up to expectations. A "tendency to ask FSR teams to do more than they should, rather than only investing in FSR when the conditions were appropriate, has substantially contributed to the impression that the [farming systems] approach has not lived up to expectations" (Baker and Norman 1988, 28).

What should have been clear from the start is that FSR/E cannot by itself be expected to make a major impact. Because of the nature of the activity's research component, progress requires time and coordination with other agricultural support institutions. Thus, donors will need to take a long-term view and set more realistic objectives.[3]

The evaluations of the 12 FSR/E projects reviewed did not provide sufficient data to assess project impact on the ultimate goals of raising farm productivity and farmer income during the life of a project, or to assess the likely impact of a project beyond its termination date. However, the evaluations did provide evidence that the A.I.D.-funded FSR/E projects reviewed had contributed to technology development and transfer and to institutionalization of FSR/E in the countries in which these projects were implemented. Generally, the evaluations indicated that A.I.D.-funded FSR/E projects achieved mixed impacts.

On the positive side, that FSR/E contributed to technology development and transfer is illustrated by farmers' adoption of Kito maize in Tanzania. In terms of institutionalizing FSR/E, significant progress was evident in several projects--for example, the Food Productivity and Nutritional Improvement project in Guatemala and the Agricultural Research and Extension project in Zambia. More generally, FSR/E projects provided opportunities for developing country professionals to acquire training as well

---

[3]Readers interested in guidelines for evaluating FSR/E projects may refer to Farming Systems Support Project (1986); Lichte (1987); Ranaweera and Gonzaga (1988); and Zimet, French, and Andrew (1988).

as practical field experience in FSR/E. Participation in FSR/E projects not only changed the attitudes of researchers about small farmers as the clients of agricultural research but also influenced the way in which agricultural researchers defined research problems, set research priorities, and carried out problem-oriented research at the farm level. In the long run, such changes likely will have a much greater impact on institutionalizing FSR/E than will some of the original project design objectives (e.g., establishing a farming systems research unit within a research organization).

On the negative side, technology development and transfer in A.I.D.-funded FSR/E projects and institutionalization of the farming systems approach in research and extension systems proceeded at a much slower pace than had been envisioned in project designs. At least half of the 12 FSR/E projects reviewed (see vignettes in Appendix D) experienced significant delays in these areas. Further, given this limited impact, one would not expect higher level impacts--that is, on farm productivity and farmer income.

This finding is significant, given the expectations that FSR/E could dramatically accelerate technology development and transfer in agroclimatic and socioeconomic environments that were less favorable than those where farmers rapidly adopted Green Revolution technologies. Indeed, FSR/E projects typically encountered pressure to establish credibility in the face of expectations of quick results. For example, the second Lesotho project evaluation recommended that the technical assistance team should identify and disseminate "a few proven technologies as soon as possible to give the farming systems approach more credibility" (Martin et al. 1981, 58-59). In the Botswana project, the problem of quickly establishing credibility also was recognized:

> Poor credibility can be partially attributed to the difficulty of achieving quick...results in the harsh unstable climate of the country. Lack of credibility has limited the support for institutionalization in the...Ministry. (Cited in A.I.D. 1986, Appendix J, J-2)

Indeed, as this Botswana project evaluation noted, "pressures from donor agencies and government officials for 'quick results,' whether real or imagined, result in frustrations for [farming systems] teams" (A.I.D. 1986, Appendix J, J-2). Such considerations led the first evaluation of the Botswana project to proffer the following:

> There is...a general concern about the relevance of FSR evaluations. FSR projects...are part of overall programs, or strategies, for modifying agricultural research paradigms. Such modifications themselves are long-term in nature. Results--tangible results--from such paradigm shifts are even longer term. (Francis et al. 1984, 12)

The A.I.D.-funded FSR/E projects reviewed, like most A.I.D.-funded projects, were authorized for 5 years or less.[4] However, as was noted in the evaluation of one FSR/E project, it is "extremely awkward to evaluate a project, or research strategy, which everyone implicitly acknowledges to be 10-20 years in length, in an explicit, 5-year timeframe" (Francis et al. 1984, 12). Most FSR/E projects, with a life-of-project funding of 5 years or less, should not have been expected to achieve the impact on technology development and transfer or institutionalization of FSR/E that was assumed in the project designs.

Further, the FSR/E projects reviewed were still being implemented at the time that they were evaluated. If significant results may only be achievable in a longer timeframe (15 to 25 years), then the typical 3- to 5-year timeframe of the projects reviewed was not long enough for improved technologies to be developed and transferred to small farmers on any significant scale. While an FSR/E project may have begun to make an impact on technology development and transfer, this impact may not begin to be significant until some time after a project has been evaluated or even some point long after the project has ended. Indeed, recent field studies have found that the positive impact of FSR/E projects on technology development and transfer and institutionalization of FSR/E has been much greater in the long run than was evident when the projects reviewed were evaluated (see Butler Flora, 1988; Frankenberger et al. 1988, 1989; and Merrill-Sands 1988).

3.2 Constraints to FSR/E Project Impact

The picture that emerged from the FSR/E projects reviewed, projects that were failing to live up to the early expectations held for them, prompts one to ask why these projects were not more successful. Was it a failure of the FSR/E concept per se or a failure in designing and implementing FSR/E projects? Stated somewhat differently, what factors or constraints kept A.I.D.-funded FSR/E projects from having a greater impact on technology development and transfer and on institutionalization of FSR/E?

---

[4]A.I.D. Handbook policy permits project designs up to 10 years.

Analysis of case studies of 12 A.I.D.-funded FSR/E projects indicated that implementation and impact were impeded by a series of constraints that could be classified in three categories: core, operational, and generic (see Appendix E).[5] It was decided that a threshold of 7 projects (more than half of the 12 projects reviewed) evidencing the presence of a specific constraint would signal a significant problem. It is important to point out that projects that had problems in one constraint were not necessarily the same projects that had problems in another constraint.

Core Constraints. A core constraint is present when a project's concept of and approach to FSR/E lacks or is weak in one or more of FSR/E's nine core characteristics, as follows:

1. Farmer orientation
2. Farmer participation
3. Locational specificity of technical and human factors
4. Problem-solving approach
5. Systems orientation
6. Interdisciplinary approach
7. Complementarity with commodity and discipline research
8. Technology testing in on-farm trials
9. Feedback to shape agricultural research priorities and agricultural policies

As Table 1 shows, in at least 7 of the 12 FSR/E projects reviewed, the approach to FSR/E was weak or lacking in two core characteristics--problem-solving approach or interdisciplinary approach. Two other core constraints--lack of feedback to shape agricultural research priorities and policy and lack of locational specificity of technical and human factors--appeared in at least five projects.

During the early years of FSR/E projects, there was confusion and uncertainty about what FSR/E is, should be, or could be. As a result, many projects were not doing FSR/E because their approaches lacked or were weak in FSR/E's core characteristics. For example, some project designers thought that doing on-farm trials was synonymous with doing FSR/E, failing to recognize

---

[5]Readers interested in the empirical data on which this finding is based may refer to the 12 individual FSR/E case studies, available as CDIE Working Paper No. 112--Case Studies Nos. 1 to 12. CDIE Working Paper No. 112--Case Study No. 13 illustrates, through a series of vignettes drawn from the 12 case studies, how the core, operational, and generic constraints in these projects operated as brakes on technology development and transfer and on institutionalization of FSR/E.

that FSR/E’s other core characteristics also need to be present for sound FSR/E to occur.

Table 1

The farming systems concept evolved as practitioners sought to apply it, but it was neither well defined nor widely understood during FSR/E's early years. Demand for experienced FSR/E practitioners, who were few and far between, outstripped supply. Often the university personnel or consultants recruited to staff technical assistance teams did not understand the requirements for technically sound FSR/E. Indeed, simply forming a multidisciplinary team did not guarantee that the team would take an interdisciplinary, problem-solving approach to problems that were relevant to farmers. As a result, some of the core characteristics of FSR/E frequently were weak or missing in the various project approaches to FSR/E, and the quality of FSR/E accordingly suffered. Even within A.I.D., few people understood the core characteristics required in FSR/E, and creating an FSR/E unit within a research organization was no guarantee that technically sound FSR/E would result.

Operational Constraints. An operational constraint is present when a practitioner's efforts to implement the FSR/E concept are impeded by problems in any of the following areas:

1. Stakeholder understanding of FSR/E
2. Agricultural research policy or strategy defining role of FSR/E
3. Long-term commitment of resources
4. Existing research capability and shelf technology
5. Consensus on FSR/E methodology
6. Capability to process farming systems data
7. Consensus on criteria for evaluating FSR/E
8. Links with extension
9. Links with agricultural support services
10. Links with farmer organizations

Four operational constraints--lack of stakeholder understanding of FSR/E, lack of agricultural research policy or strategy defining FSR/E's role, lack of consensus on FSR/E methodology, and lack of links with extension--appeared in at least 7 of the 12 projects (Table 2). Three constraints--lack of long-term commitment of resources, lack of existing research capability and shelf technology, and lack of links with agricultural support services--appeared in at least five projects.

FSR/E project designers and implementers often did not address the operational constraints that impeded implementation of the projects. Moreover, A.I.D. had sought to introduce FSR/E without realizing that a broader set of conditions than just the core characteristics is also necessary for FSR/E to make an impact. Problems in many of these areas had long plagued efforts to increase the impact of agricultural research in developing countries. To aggravate the situation, conventional research and

Table 2

extension personnel often saw FSR/E as competing for scarce resources.

Generic Constraints. A generic constraint is a problem that can arise in any A.I.D.-funded project, regardless of the project's technical focus. Potential problem areas include:

1. Project management structure
2. Government funding to meet recurrent costs
3. Staffing with trained personnel
4. Management of training
5. Management of technical assistance
6. Factors beyond a project's control

Problems in three constraint areas--staffing with trained personnel, government funding to meet recurrent costs, and management of technical assistance--were encountered in at least 7 of the 12 projects (see Table 3). At least five projects experienced problems in three of the remaining generic constraint areas--project management structure, management of training, and management of technical assistance.

Box 1 summarizes the constraints most frequently found in the 12 FSR/E projects reviewed and shows how many projects suffered from these constraints.

Box 1. Summary of Constraints

Core Constraints

-- Problem-solving approach (9 projects)
-- Interdisciplinary approach (7 projects)

Operational Constraints

-- Links with extension (9 projects)
-- Consensus on FSR/E methodology (8 projects)
-- Stakeholder understanding of FSR/E (7 projects)
-- Research policy/strategy defining FSR/E's role (7 projects)

Generic Constraints

-- Staffing with trained personnel (10 projects)
-- Government funding to meet recurrent costs (9 projects)

Table 3

Interpretation of Constraints. Table 4 summarizes the frequency of constraints across 12 projects. Any one constraint can impede implementation and reduce the impact of a given FSR/E project, and any one constraint may be more important in one project than another. Yet, as Box 1 shows, some constraints appeared more frequently across projects than other constraints. What does this mix or pattern of constraints mean?

In terms of core constraints, FSR/E project implementers, trained in specialized disciplines (agronomy, economics, and so on) and not well versed in FSR/E, were not accustomed to working together in an interdisciplinary manner to solve problems relevant to farmers. Often they did not understand the FSR/E concept or the requirements to put it into operation. Few technical assistance team members had had any previous field experience in FSR/E. At least a third of the projects experienced problems in establishing a systems orientation, gaining farmer participation, or testing technology in on-farm trials. In short, many technical assistance teams were not prepared to provide sound technical assistance in FSR/E.

In terms of operational constraints, many projects ran into problems in establishing a consensus on the methodology for doing FSR/E. Technology development and transfer were further hampered by failures to establish links with extension and to ensure that stakeholders (farmers and managers of research and extension) understood FSR/E's requirements and benefits. Also, FSR/E projects often were implemented in settings where agricultural research policy and strategy did not define the role of farming systems approach relative to conventional agricultural research and extension. Thus, FSR/E often was not perceived as complementing traditional research and extension but rather as competing for scarce resources. Finally, carrying out FSR/E was impeded in at least five projects by limited research capability (e.g., lack of shelf technology) or a failure to establish links with the agricultural support services that farmers need to adopt the technologies developed by FSR/E practitioners.

In terms of generic constraints to implementation of FSR/E projects, two of the most frequently occurring were lack of staffing with trained personnel and lack of government funding to meet recurrent costs. Both reflect the more general problem of the level of resources available to support research and extension. In short, if the presence of core and operational constraints did not make implementing FSR/E projects difficult enough, the problem was aggravated by the presence in these projects of the same generic constraints typically found in A.I.D. projects, regardless of their technical content.

Table 4

4. LESSONS LEARNED FROM THE FSR/E PROJECTS REVIEWED

This review of A.I.D.-funded FSR/E projects suggests several lessons learned; many are reinforced by similar conclusions that emerged from a recent "results inventory" of FSR/E projects (Frankenberger et al. 1988, 1989) funded by A.I.D.'s Bureau for Science and Technology, Office of Agriculture.

Farmers in FSR/E. In FSR/E, farmers play a central role in the technology development and transfer process--they are active collaborators, not just passive observers or receivers. Yet FSR/E practitioners often have had difficulty implementing this concept because highly centralized and vertically structured research and extension organizations are geared to respond to top-down lines of authority rather than to needs and priorities identified by farmers (Frankenberger et al. 1988). The ideal of farmer participation would probably be more readily implemented if farmers had greater control over how resources are allocated to support agricultural research and extension systems. Few FSR/E projects attempted to work through and effectively involve farmer organizations as one potential avenue for enhancing farmer participation in, control over, and support of agricultural research and extension.

Farming in FSR/E. FSR/E projects have tended to focus on the food crops raised by subsistence farmers, giving little or no attention to other commodities that many subsistence farmers produce for sale. Several evaluations asked whether FSR/E should place greater emphasis on cash crop technologies to assist small commercial and subsistence farmers to raise crops or animals of higher value. Subsistence farmers, as the evaluations noted, have little interest in increasing food production beyond the quantity needed for family subsistence, if increased production of a crop leads to a fall in the market price of that crop.

Systems in FSR/E. FSR/E projects have struggled with achieving a balance between doing systems analysis and developing improved technologies. Some FSR/E practitioners spent so much time studying the farm as a system that they never got around to testing potential technologies or institutional changes to overcome identified constraints; others focused on a crop (e.g., maize) but failed to examine the crop's interrelationships with the farm family and other components (e.g., livestock) of the farming system. In general, system components such as livestock, agroforestry, gender (Poats, Gearing, and Russo 1989), and consumption often were neglected in the projects reviewed.

A central issue in explaining the limited impact of FSR/E lies in how farming systems practitioners perceive the objective of FSR/E. While a systems orientation is a core characteristic of FSR/E, practitioners often have not gone beyond paying lip service to the concept of the farm family household as a system of natural and human components that must be understood if FSR/E is to make an impact on agricultural income. Maintaining a focus on the farm and the farm family as a system is important because resource-poor farmers formulate strategies and make decisions within the context of the mix of crop, livestock, and off-farm enterprises that constitute the household's whole economic system. Thus, it cannot be assumed that maximization of either yield or profit is an appropriate criterion for assessing the potential utility and acceptability of a new technology in such farming systems.

However, given their research mandates, FSR/E practitioners often have focused on improving production technology, primarily for crops, as the end rather than a means to an end, thereby failing to address the larger objective of providing the small-farm family with technology options to facilitate its climb up the economic ladder. Not building the larger objective of increasing farm family income into the design of FSR/E activities increases the likelihood that the approach will not focus on the farm and farm family household as a system, with the result that the systems concept, FSR/E's guiding rationale, will be lost.

Except where crops are the sole or main source of cash income, the relative importance of crops as an income source must be weighed against other potential income sources; indeed, some crops (e.g., subsistence crops) become less and less important to the extent that the farm family's management strategy includes a mix of crop, livestock, and off-farm enterprises. In conducting FSR/E activities at the farm level, FSR/E practitioners need to take care not to focus so much on crops that they ignore other economic enterprises affecting farm management decision-making.

The failure to implement a systems approach in FSR/E projects often may have been the result of staffing these projects with technical assistance personnel who had had little or no prior experience in FSR/E; they may have been experts in their disciplines or university departments, but they were not accustomed to working together on an interdisciplinary team to solve farmers' problems in a systems context. Clearly there is a certain dysfunctionality in training professionals to the level of highly specialized advanced degrees and then expecting that they will be able to work together and apply a systems approach to problem solving.

A second systems problem has been that on-station and on-farm technology testing have different emphases. On-station trials aim to establish cause-and-effect relationships and are highly controlled; on-farm trials are less controlled (Frankenberger et al. 1988). Statistical analysis is crucial to the interpretation of on-station trials, while farmer evaluation plays an important role in assessing and validating the results of on-farm trials. The challenge for FSR/E practitioners is to work with farmers to diagnose problems quickly and move potential solutions to the on-farm testing stage so that farmers can assess technological options.

Research in FSR/E. FSR/E's emphasis on research aimed at developing technologies to relax production constraints often has resulted in practitioners' failing to address institutional constraints to adoption of the new technologies. Farmers frequently cannot adopt such technologies unless they also have access to such agricultural support services as credit, production inputs, and markets. Yet the institutions providing such services are characteristically weak in developing countries.

Social scientists can play an important role in developing research on institutional issues, characterizing farming systems, diagnosing socioeconomic constraints, and monitoring and evaluating projects. However, few social scientists are brought into FSR/E programs, partly because adequately trained social scientists are in short supply and partly because of agricultural scientists' perceptions of them (Frankenberger et al. 1988). Nevertheless, research on improved technologies needs to be coordinated with research on the institutions that provide the support services farmers need if they are to adopt improved technologies. Farming systems researchers, particularly social scientists, need to give greater attention to identifying means to remove or relax institutional constraints that impede farmer access to agricultural support services.

Extension in FSR/E. Each FSR/E project reviewed was located in an agricultural research organization, thereby raising the problem of how farming systems research was to be linked with extension. This problem is the obverse of that encountered by the World Bank in many countries where it sought to institutionalize the Training and Visit (T&V) System as an agricultural extension methodology. While the Bank had some success in establishing the T&V System in national extension organizations, this approach to extension quickly ran up against the problem of gaining access to improved technologies that were ready for transfer to farmers. This situation led to a greater recognition of the need for extension personnel to be linked into site-specific adaptive research as an important means of accessing improved technologies for dissemination through the T&V System.

Some FSR/E projects attempted to link research and extension through a research extension liaison officer, but most FSR/E projects tended to view the farming systems approach as a research strategy, not as a strategy to integrate research and extension. When FSR/E is viewed as a research strategy, it is based on the assumption that researchers can develop improved technologies and then turn them over to extension for dissemination to farmers. This view fails to recognize that extension's participation in on-farm research can enhance the responsiveness of a technology development and transfer (TD&T) system to farmers' needs.

In developing countries, a TD&T system resembles a chain with many weak links. FSR/E focuses on some of the weak links in the agricultural research and extension subsystem of a country's TD&T system. The problem is not to provide new links but rather to strengthen existing links. Thus, the need is not to develop new FSR/E projects but to strengthen the farming systems approach as an integral part of the existing research and extension system. Generally, the FSR/E projects reviewed provided little or no support for developing extension as an integral part of the TD&T system. In many of these projects, the extension agent was not recognized as a partner in FSR/E (e.g., as someone who could provide researchers with feedback on farm-level conditions to be considered in setting priorities for station-based experiments). Rather, the extension agent was seen only as a helper (e.g., someone who could locate farmers willing to provide land for the researcher's on-farm trials).

Linking Research and Extension in Farming Systems Work. Improved agricultural technologies are rarely transferable directly from research to extension. But FSR/E teams can play an important role in linking research and extension: working with farmers and extension personnel, they test technologies from research; and working with researchers, they provide feedback from farmers to establish research priorities (Frankenberger et al. 1988). In other words, farming systems practitioners can form the core of an FSR/E program by integrating research and extension personnel in individual ecological zones.

Placing an FSR/E program administratively under research can facilitate access to research results and shelf technology and enhance FSR/E's influence on on-station research priorities (Frankenberger et al. 1988). At the regional or zone level, extension personnel must be able to link with and participate in FSR/E teams in program planning, execution, and evaluation. However, effectively linking research and extension continues to be a major challenge in implementing an FSR/E program that can affect technology development and transfer.

The challenge is not made any less difficult by the fact that there are few professional rewards for interdisciplinary and interinstitutional collaboration on FSR/E. Without adequate incentives it will be difficult for research and extension personnel to work together in a productive partnership. As long as career development is contingent on advancement in a centralized research or extension organization, it will be impossible to retain trained FSR/E personnel where they are most needed--working collaboratively with farmers at the farm level (Frankenberger et al. 1988).

Methodology of FSR/E. A.I.D.-funded FSR/E projects have provided opportunities for field-level development, testing, and adaptation of FSR/E methodologies. However, methodological development, like agricultural research itself, is an ongoing process that does not necessarily reap immediately tangible results. Experience suggests that, while much progress has been made to date, there is yet room to develop consensus on the "how to" of FSR/E. Areas in which improvements can be made include diagnosis and analysis of system components, establishment of models for farmer participation, design of on-farm trials, statistical analysis of trial results in conjunction with farmer evaluation and validation of trial results, and more effective linking of research with agricultural support services such as extension, credit, production inputs, markets, and policy.

However, FSR/E's impact on technology development and transfer will be negligible until research and extension personnel work out a joint strategy for institutionalizing farming systems methodologies in research and extension programs. An effective strategy would outline the process of technology development and transfer, specify responsibilities of research and extension personnel, and establish the necessary feedback, resource, and accountability channels (Frankenberger et al. 1988). Such established strategy would also be useful in training new FSR/E practitioners entering a country's research and extension system. (The Farming Systems Support Project developed FSR/E training materials that can play an important role in this process.)[6]

There Are No Panaceas. The projects reviewed were implemented during a time in which FSR/E theory and practice were still evolving. FSR/E often proceeded by trial and error rather than being guided by any proven theory or methodology. Under

[6]A four-volume set of materials developed by the Farming Systems Support Project for training professionals in farming systems research and extension is available for $175 from Media Marketing, P.O. Box 926, Gainesville, Florida 32602. This set includes volumes on diagnosis in farming systems research, design techniques for on-farm experimentation, and analysis and interpretation of on-farm experimentation, and a trainer's manual.

APPENDIX B

TYPES OF FARMING SYSTEMS RESEARCH AND EXTENSION

While farming systems research and extension (FSR/E) initiatives may vary in terms of the specific combination of data sources used in research on farming systems, they also may vary in terms of the specific type of problem the initiative aims to solve. Thus, the relative emphasis placed on research or extension varies from one type of FSR/E to the next. For example, farming system component research places little or no emphasis on extension. Yet component research may be an important step in developing technologies that are subsequently tested by extension workers in on-farm trials, a central activity of another type of FSR/E, namely, farming systems adaptive research.

Merrill-Sands (1986) identified six types of FSR/E: farming systems analysis, farming systems adaptive research, farming system component research, farming systems baseline data analysis, new farming systems development, and farming systems research and agricultural development.

1. FARMING SYSTEMS ANALYSIS

Farming systems analysis (FSA) aims at in-depth, quantitative description of the structure and functioning of existing farming systems, in order to quantify stocks and flows and understand the structure of system interactions. Key data sources include on-farm studies and base data studies. The typical product of FSA is a model of the system. FSA is basically what Simmonds (1985) called "Farming Systems Research *sensu stricto*." (see also Cernea and Guggenheim, 1985).

2. FARMING SYSTEMS ADAPTIVE RESEARCH

Farming systems adaptive research (FSAR) aims at increasing the farming system's productivity by developing technology adapted to farmers' circumstances. While FSAR takes the farming system as the unit of analysis in the descriptive stage, the design and testing stages more likely focus on a particular subsystem as a potential point of leverage. Key data sources in FSAR include on-farm studies and research station studies, supplemented or guided by farming systems analysis and farming system component research (described below). On-farm studies (e.g., trials) provide input for the design of research station studies (e.g., experiments).

FSAR is another name for what Simmonds (1985) and the International Center for the Improvement of Maize and Wheat (CIMMYT) (Byerlee et al. 1982; Collinson 1982) called "On-Farm Research with a Farming Systems Perspective." This is the type of FSR/E most frequently conducted under the name of FSR, particularly by scientists in national agricultural research systems.

3. FARMING SYSTEM COMPONENT RESEARCH

Farming system component research (FSCR) refers to station-based applied and adaptive research on farm subsystems or components. Compared with FSAR's focus on the farming system, FSCR focuses on a specific subsystem or the management of a specific resource, with the unit of analysis being the field or plot, not the farming system. Examples of FSCR would include research on typical small-farm cropping patterns such as intercropping, mixed cropping, or relay cropping; crop-animal interactions; or stable-yielding varieties requiring minimal inputs.

FSCR's research agenda is defined either by a station-based scientist's diagnosis of a constraint affecting the majority of farmers in a region or by feedback from a FSAR program. Data generated by FSAR on the management conditions of farming systems in a region are used by station-based scientists to isolate specific problems for more in-depth research and to establish more relevant research priorities. The product of FSCR is prototype technology that becomes part of the "body of knowledge" upon which FSAR can draw.

Many farming systems research initiatives of the International Agricultural Research Centers (IARCs) may be classified as FSCR. A good example is the Bean Program at the International Center for Tropical Agriculture, where the typical Latin American small farmer's practice of intercropping maize and climbing beans is taken as a parameter in on-station experiments aimed at selecting improved bean varieties.

Another example is the rice-based Cropping Systems Program of the International Rice Research Institution and the Asian Cropping Systems Network. This program combines FSCR and FSAR in a process called Cropping Systems Research. Having identified land scarcity as a major constraint limiting rice production in south and southeast Asia, the Cropping Systems Program focuses on developing technologies to increase cropping intensity. Component technologies (short-duration rice varieties and planting techniques that permit double or relay cropping) generated through FSCR are tested by national research systems in FSAR programs aimed at fine-tuning the technologies to the specific environment and circumstances of a target group of farming systems.

3. FARMING SYSTEMS BASELINE DATA ANALYSIS

Farming systems baseline data analysis (FSBDA) aims at developing a classification of major types of farming systems in an agroclimatic zone and diagnosing the major constraints in those systems. The objective is to learn as much as possible about the resources of a region (zone) and to determine how variations in climatic factors and resources affect agricultural production. Socioeconomic factors (e.g., population density or land tenure) may also be analyzed. Key data sources include base data studies and large-scale surveys.

Typical FSBDA products are physical resource, climate, and land-use maps that are useful in classifying the major types of farming systems in a region. The information may be used by agricultural scientists to tailor technology development more closely to the management conditions of a region’s farming systems, and by planners to set general research priorities and to select sites for more focused FSCR and FSAR.

FSBDA is an in-depth version of the diagnostic or descriptive stage of FSR/E. However, FSBDA (which focuses on an agroclimatic zone) is executed on a larger scale than FSAR (which focuses on the farming systems within an agroclimatic zone). The focus of analysis is the environment and the general configuration of farming systems rather than the internal organization of a specific type of farming systems. Greater emphasis is placed on biological and physical than on socioeconomic variables.

IARCs having regional mandates--for example, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the International Institute for Tropical Agriculture (IITA)--have used FSBDA extensively.

4. NEW FARMING SYSTEMS DEVELOPMENT

New farming systems development (NFSD) aims to generate a broad-based technology designed to overcome major constraints in a large agroclimatic zone. In contrast to FSAR (which seeks to develop technology suitable for stepwise modification of existing farming systems), NFSD seeks to bring about revolutionary change in the farming systems of a region. Farming systems are defined primarily in physical and biological terms, with socioeconomic factors largely being left out of the technology design process. It is assumed that socioeconomic circumstances will have to be subsequently adapted, most likely through government intervention. Research station studies (e.g., on-station experiments) provide the key data source, although FSA, FSCR, and FSBDA may provide supplementary data.

IITA's program to develop a more stable and productive agricultural system to replace shifting cultivation in the humid and subhumid tropics provides a good example of NFSD. This research, involving minimal on-farm research, is primarily station-based strategic and applied component research.

ICRISAT's program to develop watershed management units for the semiarid tropics is a second example of NFSD. Technologies have been developed that improve drainage and enable double cropping on deep Vertisol soils. While the technology has produced good results in on-station trials and potentially has widespread application, on-farm trials have revealed major problems with its acceptability to farmers. This development is not surprising, given NFSD's lack of attention to socioeconomic factors during the technology design stage. The research program defined the watershed management units in physical and biological terms, but establishment of these units requires that dispersed, individually owned landholdings be consolidated into a single resource management unit. The feasibility of such a radical socioeconomic reorganization within the farming community was not considered during the technology design stage. Social scientists only became actively involved in the research at the on-farm testing stage. Design and development of the watershed management units could have been facilitated and resources probably used more effectively if socioeconomic factors and farmers' perceptions of their needs had been incorporated into the research from the beginning.

5. FARMING SYSTEMS RESEARCH AND AGRICULTURAL DEVELOPMENT

Farming systems research and agricultural development (FSRAD) aims to implement farming systems research as an integral component of a long-term agricultural development strategy and program for a target region. Although the farming system (with its own physical, biological, and socioeconomic interactions) is the primary unit of analysis, the system's links with the social, economic, and political environment also are scrutinized to identify potential leverage points for improved productivity.
Thus, FSRAD includes technological development for major farming systems as well as reform of agricultural support institutions in the region. The approach combines research (including mainstream

agricultural research, FSCR, FSAR, and sometimes NFSD) and development (or modification) of agricultural support institutions, with the objective of increasing overall agricultural productivity in the region.

In short, FSRAD addresses the common problem encountered in agricultural development, namely, that even a high-productivity technology may be useless if agricultural support institutions are lacking. Rather than treating such institutions as given or fixed, as FSAR usually does, FSRAD treats them as variables. Examples of FSRAD include the Puebla Project in Mexico, the Caqueza Project in Colombia, and the so-called Francophone approach to FSR in Africa. FSRAD would appear to be the same as the so-called farming systems approach to infrastructural support and policy (FSIP).

APPENDIX C

EMERGING TRENDS IN FARMING SYSTEMS RESEARCH AND EXTENSION

Donor interest in farming systems research and extension (FSR/E) has not been restricted to the Agency for International Development (A.I.D.). For example, as Andrew Ker of the International Development Research Centre has stated, that institution "has been very strongly committed to FSR for the past 15 years....it will stay committed for the next 50" (Poats et al. 1986, 76). While the World Bank has supported the Training & Visit (T&V) System as an extension model in many countries, in recent years it has begun to take a greater interest in farming systems research (Simmonds 1985). It may be expected that future World Bank experience with FSR, building on T&V System experience, will lead to additional refinement in and improved practical application of the FSR/E concept.

While there is much to be learned from a consideration of the performance of past FSR/E projects, it may also be helpful to anticipate what appear to be some of the future trends in FSR/E.

1. CLIENT-ORIENTED FSR/E

Evidence of the continually evolving nature of the FSR/E concept may be seen in the emerging emphasis on the role of resource-poor farmers and farmer participatory research in the agricultural innovation and technology management process. As Farrington and Martin (1987) have observed,

> there has emerged a growing concern to understand the diverse and complex environments in which [resource-poor farmers] operate so that...technology can be tailored to suit their circumstances and, more recently, so that farmers' indigenous technical knowledge...can be fed into technology development. It is from these areas of concern...that the concept of farmers' direct participation in research...has arisen. (P. 1)

The seeds for the emerging emphasis on farmer participatory research were planted in earlier studies. For example, an important variable in implementing FSR/E is the nature of farmer participation in "on-farm" activities. In a study of farmer participation in on-farm testing of new phosphate fertilization technologies in Colombia, Ashby (1984) found differences in research outcome depending on the farmer's participatory role (nominal vs. consultative vs. decision-making).

Scientists working in an FSR/E mode have formulated what are, in effect, models of farmer participatory research. Harwood (1979, 33) proposed a method of small farm development in which "the major emphasis is on production research, planned and carried out by and with the farmers on their own fields." Another example is provided by the "farmer-back-to-farmer" model developed at the International Potato Center (Rhoades and Booth 1982). A third example is the "farmer-first-and-last" model (Chambers and Jiggins 1986; Chambers, Pacey, and Thrupp 1989). Common to all of these models is the recognition of the need to orient research to the farmer as the client. Thus, the term "on-farm client-oriented research" (OFCOR) was used in a study of national agricultural research systems conducted by the International Service for National Agricultural Research (Biggs 1989; Consultative Group on International Agricultural Research 1987, 42; Ewell 1988; Merrill-Sands 1988; and Merrill-Sands and McAllister 1988). This emphasis on farmers' role in research suggests a variant of FSR/E that may be called "client-oriented FSR/E."

2. MARKET-DRIVEN FSR/E

The emergence of the "client-oriented FSR/E" concept opens the door to finding new ways to direct, manage, and fund agricultural research and extension. In several countries, A.I.D is exploring ways to cultivate not only greater private-sector participation in but also private sector support and management of agricultural research and technology transfer. For example, in Honduras, A.I.D. is assisting the Honduran Agricultural Research Foundation, a private sector organization that conducts research aimed at developing Honduras' potential to compete in nontraditional agricultural export markets. In the Dominican Republic, A.I.D. is assisting the newly created Agricultural Development

Foundation to build its endowment, the income from which will be used to fund agricultural research on nontraditional agricultural export crops.

The growing emphasis on stimulating private sector participation in agricultural research and technology transfer helps point up the fact that FSR/E could play a more active role in assisting farmers to identify market opportunities to grow new nontraditional market and export crops. The evolution of the FSR/E concept in this direction may be termed "market-driven FSR/E."

3. CLIENT-DIRECTED FSR/E

The emergence of the concepts of "on-farm client-oriented research" and "market-driven FSR/E" may give rise to yet a third kind of change in our understanding of what FSR/E is, could be, or should be. Resource limitations and efficiency considerations will likely create pressure to find ways, across heterogeneous agroclimatic zones, to more effectively involve homogeneous groups of resource-poor farmers in designing, implementing, and evaluating FSR/E. As FSR/E practitioners gain experience working with farmers and farmer groups, there will be increased pressure and opportunity for farmer groups or organizations to play a more active role in funding, designing, managing, participating in, and reaping the benefits of FSR/E in particular and agricultural research and extension in general. Innovative approaches to such farmer involvement will likely be explored, especially where progress has been or could be made by providing assistance to strengthen private sector farmer groups and organizations (e.g., USAID/Bolivia's Private Agricultural Producer Organization project). Where farmer organizations begin to play a more active role in agricultural research and extension, not only participating in agricultural research but also setting the direction and priorities of such research, the FSR/E concept will evolve in the direction of what may be termed "client-directed FSR/E."

As the FSR/E concept evolves along these three "new" lines, with increased attention being given to specific issues (gender, livestock, income, food consumption, sustainability, natural resource management, policy linkages, methodology development, and so on), it is likely that A.I.D.-funded projects involving an FSR/E component will continue to face "old" constraints to implementation and impact. No form of FSR/E will be able to make the impact it potentially can unless these core, operational, and generic constraints are addressed.

Additional perspectives on trends in FSR/E are presented in Baker and Norman (1988) and Collinson (1988).

APPENDIX D

IMPACT OF FARMING SYSTEMS RESEARCH AND EXTENSION PROJECTS ON TECHNOLOGY DEVELOPMENT AND TRANSFER AND INSTITUTIONALIZATION OF THE FARMING SYSTEMS APPROACH

The following vignettes from evaluations of the 12 Agency for International Development (A.I.D.)-funded farming systems research and extension (FSR/E) projects reviewed indicate that at least half of the projects encountered major difficulties with technology development and transfer, institutionalization of the farming systems concept in agricultural research and extension systems, or both.

1. TECHNOLOGY DEVELOPMENT AND TRANSFER

1.1 Botswana Agricultural Technology Improvement Project

The second evaluation of the Botswana project found that, by the project's fourth year, several technologies from station-based research had been tested in "maximum yield" plots. But there was "no consistency to performance nor general application of technology" (A.I.D. 1986, 22). The evaluation concluded that "few interventions had been sufficiently tested and proven...to move forward to the dissemination stage" (A.I.D. 1986, 5).

1.2 Lesotho Farming Systems Research Project

By the time of the second evaluation of the Lesotho project, technical assistance had been provided for nearly 2 years (Martin et al. 1981). However, there was no evidence that farmers were adopting the improved agricultural practices developed by the project. The evaluation concluded that the research under way would

> need to be carried on for a number of years before a proven technology exists which can be disseminated on a broad basis to the farming community. Accordingly, it is uncertain whether or not the Project will reach the stated objective of reaching five percent of the households in the project area with enterprise mixes. (Martin et al. 1981, 25)

In the evaluators' view, "the normal start-up period of settling in and getting organized to do agricultural research work" had impeded achievement of project outputs. Thus, it was too early to determine how farmers would accept new practices or technologies (Martin et al. 1981, 21). During the 2 years following the second evaluation, the project made progress with on-farm trials. But the third evaluation cautioned that "significant adoption probably cannot be expected to occur before the 1984-85 or the 1985-86 cropping seasons....Verification and demonstration must occur before adoption can be expected" (Dunn 1983, 36).

1.3 Senegal Agricultural Research and Planning Project

The midterm evaluation of the Senegal project highlighted the difficulty of evaluating a project that is a part of a longer term effort to strengthen the research capacity of a national agricultural research institute. When the Senegal project was initiated, there was a recognition that some of its components might be difficult to evaluate during the project's early years. Given

> the long...time (10 to 15 years) necessary to improve agricultural research systems in Senegal (as in most developing countries), the implementers recognized that progress toward this objective might not be clearly measurable in the first phase of the project. (St. Louis, Casey, and Pham 1985, 2)

Overall, the evaluation noted dissatisfaction over the "lack of results" of production systems research. But the evaluation also noted a dilemma centering

> around trying to improve farmer production systems as soon as possible while being fairly certain that...recommendations are solid. [Production systems research] tries to account for the complexity of a...system and how changes can be expected to influence it. This... puts [production systems reasearch] into an extensive timeframe, but...increases...certainty that recommendations can and will be adopted by farmers with a high probability of success....Compared to the potential costs in both financial terms and in farmer morale due to rapid dissemination of "inappropriate technology," the longer term payoff of the current data collection and analysis methods...could very well justify the delay. (St. Louis, Casey, and Pham 1985, 61)

1.4 Tanzania Farming System Research Project

The Tanzania project provides an example of the negative impact on technology development that results when A.I.D. support for an FSR/E project is provided for only a short time and is then cut off. This project sought to introduce farming systems research in the Tanzanian Agricultural Research Organization. Despite the project's early success with "Kito" maize, implementation was curtailed when application of the Brooke amendment required USAID/Tanzania to reduce funding to its projects. The Project Completion Report found that the project had fallen short of its targets: farming systems research had been introduced "on too limited a scale and conducted for too short a time to have had any significant impact" (Faught 1986, 15).

1.5 Philippines Farming Systems Development Project

The first evaluation found that the Philippines project had, during its first 2 years, "brought about the beginning of an understanding of the dynamics of farming systems and the practices and concepts of farming systems research" (Mazo et al. 1983, Foreword). While the project made progress during the next 2 years in introducing new technologies in the form of improved crop varieties and management practices, the second evaluation was "unable to identify technologies completely ready for broad extension" (Sajise et al. 1985, 27).

1.6 Regional Office for Central America and Panama (ROCAP) Small Famer Production Systems

The first evaluation of this project found the project's staff troubled by the requirement to develop technology packages for mixed farming systems, and it noted that the the project's success "depends primarily upon successfully achieving other outputs--development of methodologies, institutionalization of the methodologies, and training of country personnel--rather than on development of technology alone" (Mann et al. 1981, 8). Of course, training nationals in FSR/E, developing farming systems methodologies, and institutionalizing the farming systems approach required a longer timeframe than the project provided.

2. INSTITUTIONALIZATION OF FSR/E

2.1 Botswana Agricultural Technology Improvement Project

The second Botswana project evaluation found that the project's Logical Framework had been revised when it became

> apparent that the original [Logical Framework] was overly optimistic and unrealistic. While [the project] is already identifying technical changes which will work under specific conditions, it is not likely that these will increase grain production by 10 percent or increase per capita income by 10 percent (as stated in the original [Logical Framework]). (A.I.D. 1986, 6)

Changes of such a magnitude, the evaluation noted, could only come about with favorable weather and a longer term FSR/E effort.

Accordingly, USAID/Botswana's revised Logical Framework for the project identified institutionalization of the farming systems approach as a key project output. Indeed, one project output read: "Institutionalization of FSR, with corresponding organizational structures and systems, will be in place and operating effectively" (A.I.D. 1986, 8). By the second evaluation, however, institutionalization was no longer expected to take place

> before the end of the present [technical assistance] contract. Rather, ...the project will have provided sufficient experience and empirical evidence by the [Project Assistance Completion Date] to demonstrate whether...the FSR approach should be institutionalized. (A.I.D. 1986, 6)

The Project Assistance Completion Date (PACD) was extended to provide an additional year in which to test the FSR approach. The evaluation concluded that Botswana's severe agroclimatic conditions had not given the project "an opportunity to fully test the effectiveness of an FSR approach or develop technologies appropriate to varying rainfall conditions" (A.I.D. 1986, 5). Extending the PACD would provide the added time and level of effort needed to draw conclusions about the appropriateness of FSR in Botswana, and would provide the Ministry of Agriculture "time to solidify [its] views on the appropriateness of institutionalizing the FSR approach on a national scale" (A.I.D. 1986, 6).

2.2 Lesotho Farming Systems Research Project

One objective of the Lesotho project was to develop an FSR Unit, but the second evaluation concluded that the project's designers had been unrealistic in thinking that an FSR Unit could be established as a separate unit within a newly created Research Division. Further, the evaluation found "a divergence [of] thought on the...extent to which a Farming Systems Research Unit is being or should be established within the Research Division" (Martin et al. 1981, 8). Many Research Division professionals felt that the technical assistance team should support the building of the entire division. The evaluation recommended that the project reduce "its visibility as a Farming Systems Project," that the the FSR Unit not be established, and that the project identify more closely with the Research Division, focusing its resources on institutionalizing an effective research and extension capacity in the Ministry of Agriculture by orienting the project "to the development of the Research Division as a National Institution" (Martin et al. 1981, 23).

While the objective of establishing an FSR Unit had not been officially changed by the time of the third evaluation, all parties (Government of Lesotho, the technical assistance team, and USAID/Lesotho) agreed that the project should strengthen the overall Research Division program rather than establish an FSR Unit. With the technical assistance team's departure, the final evaluation concluded that the Research Division had not yet developed an adaptive research capability (Frolik and Thompson 1986, 28). The evaluators felt that the division lacked the institutional capacity

> to carry out an effective adaptive research program without continuing technical assistance. The critical mass of personnel is lacking in all sections and collectively. Some disciplines received little, if any, support from the FSR project. Capacity to plan, lead, and implement an effective, well-balanced, adaptive research program is a critical need. (Frolik and Thompson 1986, iii)

2.3 Tanzania Farming Systems Research Project

The Tanzania project was carried out within the fairly new Tanzania Agricultural Research Organization (Jackson and Osburn 1986). But the project's design had divorced the Tanzania Agricultural Research Organization from the research organization it represented. A former technical assistance team member stated: "Institutionalization [of FSR/E] should have begun within the research center at Ilonga, not in this hypothetical organization that was ostensibly created to unify all the research in the country" (A. Cunard, personal communication). The Project Completion Report concluded that FSR/E "failed to establish a firm organizational niche within the Government structure" (Faught 1986, 4).

2.4 Nepal Agricultural Research and Production Project

The midterm evaluation of the Nepal project found that the lack of permanent personnel in the Farming Systems Research and Development and the Socioeconomic Research and Extension Divisions contributed to the difficulty the project had in meeting its targets for placing participants in degree programs.

> Only three of ten degree candidates had been sent for higher education, mostly as a result of the shortage of permanent staff positions within the offices scheduled to receive training assistance. In some situations [this] has led to the local hire of technical assistants by [the technical assistance contractor] as an emergency measure to implement Project programs and/or to provide counterpart staff to the expatriate advisors. (Rood et al. 1988, 64-65)

Thus, the project "had not been as effective or efficient as hoped in promoting an understanding of FSR" (Rood et al. 1988, 15).

2.5 Honduras Agricultural Research Project

The Honduras project sought to institutionalize improved agricultural research methods. The third evaluation noted that this effort entailed institutionalizing a Central Unit for Technical Support (UNAT), "making that specialized technical support and training unit part of the regular...bureaucracy so that it continued as part of [the Ministry of Natural Resources (MRN)] after project assistance ended. Honduran technical leadership and [Government of Honduras] funding commitments are essential for institutionalization to succeed" (Hansen et al. 1984, 17). However, the Government of Honduras did not make a commitment to UNAT in terms of budgeting staff positions for FSR/E. As the evaluation noted:

> None of the [Honduras Agricultural Research Project] professionals occupy regular DIA [Department of Agricultural Research] line positions. There are no institutionalized positions so no one is really counterpar-

> ting anyone. Counterparting refers to the situation where one person has a regular position and is advised by someone. In [this project] no one has a regular position; all are paid, directly or indirectly, by USAID, and none have established DIA jobs.
>
> UNAT does not really exist except on paper, so there is no obvious bureaucratic home for [the project]....[The project] works and is housed in region 3...[but] it does not answer to the...MRN Regional Director. Although [the project] is apparently an MRN group it works semiautonomously, publishes reports that do not credit MRN or DIA as a sponsor, [and] deals with non-MRN institutions such as [the Centro Universitario Regional de Litoral Atlantico]. (Hansen et al. 1984, 17)

2.6 <u>ROCAP Small Farmer Production Systems</u>

The third evaluation of the ROCAP project noted that the Tropical Agricultural Research and Training Center (CATIE) is funded along project lines. As a result, the center may lose, from one project to the next, personnel who gained experience on an earlier project. The evaluation's "prognosis for continued FSR/E work at CATIE" was "pessimistic" (Zimet et al. 1986, 5-6). On this latter point, the evaluation stated:

> Even though some personnel that worked under the FSR project are presently working on other CATIE projects, such as Integrated Pest Management..., they are not applying the FSR methodology. This is particularly distressing in several cases where the [evaluation] team believes that the [farming systems] approach would enhance the other projects....Given this situation..., it is not possible for the team to state that the project has enhanced the ability of CATIE to carry out FSR on a continuing basis. It has been able to do so only partially under the specific case of the [Small Farmer Production Systems] project. (Zimet et al. 1986, 12-13)

<u>APPENDIX E</u>

<u>A.I.D.-FUNDED FARMING SYSTEMS RESEARCH AND EXTENSION PROJECTS REVIEWED: PROJECT DESCRIPTION SHEETS</u>

This appendix provides, for each farming systems research and extension (FSR/E) project reviewed, a project description sheet that identifies the core, operational, and generic constraints found in each project. The specific constraints identified in each project are noted by the coding system below. If a project coped effectively with constraints, the constraint code is followed by a plus (+) sign. The constraints are fully described in Section 3 of the main report.

Core Constraints:

1. Farmer orientation
2. Farmer participation
3. Locational specificity of technical and human factors
4. Problem-solving approach
5. Systems orientation
6. Interdisciplinary approach
7. Complementarity with commodity and discipline research
8. Technology testing in on-farm trials
9. Feedback to shape
   a. Agricultural research priorities
   b. Agricultural policies

Operational Constraints

1. Stakeholder understanding of FSR/E
2. Agricultural research policy/strategy defining role of FSR/E
3. Long-term commitment of resources
4. Existing research capability and shelf technology
5. Consensus on FSR/E methodology
6. Capability to process farming systems data
7. Consensus on criteria for evaluating FSR/E
8. Links with extension
9. Links with agricultural support services
10. Links with farmer organizations

Generic Constraints:

1. Project management structure
2. Government funding to meet recurrent costs
3. Staffing with trained personnel
4. Management of training
5. Management of technical assistance
6. Factors beyond a project's control

1. BOTSWANA AGRICULTURAL TECHNOLOGY IMPROVEMENT PROJECT (611-0201)

Initial Authorization: 1981 (for 5 years)

Goal: "To improve the welfare of small farmers and increase national food production through the development, extension and adoption of relevant technology."

Purpose: "To improve the capacity of the Ministry of Agriculture's research and extension programs to develop and effectively extend farming systems recommendations relevant to the needs of the small farmer." Project subpurposes included the following:

- -- To improve the capacity of the Department of Agricultural Research (DAR) to develop technologies appropriate for small-farmer needs.
- -- To improve the capacity of the extension service to transfer technologies that can be utilized by small farmers and strengthen and institutionalize the linkage between research and extension departments.

Outputs:

1. Strategy developed for agricultural research emphasizing small farmers ("farming systems approach to research")
2. New technologies tested on farmers' fields
3. New technologies tested at the DAR, based on ideas initiated by FSR and extension
4. Botswana Agricultural Marketing Board seed production unit completed and functioning

Implementing Agency: Department of Agricultural Research, Ministry of Agriculture.

Technical Assistance Contractor: Mid-America International Agricultural Consortium, with Kansas State University as lead university.

Evaluations: Two external evaluations--in 1984 (Francis et al. 1984) and in 1986 (A.I.D. 1986).

Constraints: Core--4, 6, 9a(+), 9b; Operational--1, 2, 4, 5, 6, 8; Generic--2, 3, 4, 5, 6

2. THE GAMBIA MIXED FARMING AND RESOURCE MANAGEMENT PROJECT (635-0203)

Initial Authorization: 1979 (for 4 years)

Goal: "To increase the economic well-being of the rural people of The Gambia."

Purpose: "To foster intensification and integration of crop and livestock enterprises within existing Gambian farming systems so as to contribute to increasing net rural family incomes on an ecologically sound sustained yield basis."

Outputs: This project was not conceived, designed, or initially implemented as an FSR/E project; thus it did not have explicitly stated FSR/E outputs. The project contained seven subprojects aimed at:

1. Developing land classification maps
2. Improving livestock nutrition and grazing management policies
3. Initiating programs to improve forage production and management program for increasing the supply of livestock feed
4. Improving rural transportation and on-farm use of animal traction
5. Improving the health and nutritional status of livestock
6. Recognizing the socioeconomic characteristics of small farmers
7. Training Government personnel to implement a mixed farming policy
8. Increasing Gambian production and use of maize for human and animal consumption

The objective of the fifth (socioeconomic) component was to plan and evaluate projects, not to participate in and support the development of FSR/E. However, during implementation, the project began, albeit only slowly and to a limited extent, to engage in FSR/E-type activities in collaboration with other project components (e.g., maize).

Implementing Agency: Ministry of Agriculture and Natural Resources, and the Ministry's SocioEconomic Unit.

Technical Assistance Contractor: Consortium for International Development, with Colorado State University as lead university.

Evaluations: Two--an early midterm evaluation in April 1983 (Osburn et al. 1983); and a final evaluation in March 1986 (Corty et al. 1986).

Constraints: Core--4, 6, 8; Operational--3, 6, 7, 9, 10; Generic--1, 2, 3, 5, 6

3. LESOTHO FARMING SYSTEMS RESEARCH PROJECT (632-0065)

Initial Authorization: 1978 (for 5 years)

Goal: "To improve the quality of rural life" and "to increase rural income from agriculture."

Purpose: To assist the newly established Research Division of the Ministry of Agriculture in conducting agricultural research "to create more productive agricultural enterprise mixes which are acceptable to farmers, sensitive to farmers' management ability, appropriate to resource availability, and protective of the land base." Also, "to develop effective means to reach farmers and gain their understanding and acceptance of the practices recommended."

Outputs:

1. Farming Systems Research (FSR) Unit
2. Farming systems program
3. Strategies for reaching farmers
4. Trained Basotho personnel
5. Research and information database
6. Agricultural research library

Implementing Agency: Research Division, Ministry of Agriculture

Technical Assistance Contractor: Consortium for International Development, with Washington State University as lead university.

Evaluations: Four--a preliminary evaluation in 1980 (Dunn and Bahl 1980); an interim evaluation in 1981 (Martin et al. 1981); a special evaluation in 1983 (Dunn 1983); and a final evaluation in 1986 (Frolik and Thompson 1986).

Constraints: Core--1, 3, 4, 7; Operational--1, 2, 3, 4, 5, 6, 7, 8, 9, 10; Generic--2, 3, 4, 5

4. MALAWI AGRICULTURAL RESEARCH PROJECT (612-0202)

Initial Authorization: 1979 (for 5 years)

Goal: "To increase agricultural production and real incomes of smallholders."

Purpose: To strengthen the capability of the Ministry of Agriculture's Department of Agricultural Research "to provide socially acceptable and economically sound research for smallholder needs in satisfactory quality and quantity and in a form usable by the extension services."

<u>Outputs</u>: Not an FSR project per se, but did provide support for two new sections in the Department of Agricultural Research: Farming Systems Analysis and Agricultural Economics. Outputs included strengthened quality and quantity of research programs in crop, livestock, and technical areas relevant to smallholders; field trials completed by technical assistance team and counterpart staff; and technology packages developed.

<u>Implementing Agency</u>: Department of Agricultural Research, Ministry of Agriculture.

<u>Technical Assistance Contractor</u>: University of Florida.

<u>Evaluations</u>: Two--a midterm evaluation in 1981 (Thorne 1981) when most of the technical assistance team members were arriving at post; and a second in 1983 (Baker et al. 1983).

<u>Constraints</u>: Core--3, 4, 6, 9; Operational--1, 2, 3, 5, 7, 8; Generic--1, 2, 3, 4, 5

5. <u>SENEGAL AGRICULTURAL RESEARCH AND PLANNING PROJECT (685-0223)</u>

<u>Initial Authorization</u>: 1981 (for 5 years)

<u>Goal</u>: "To increase the capacity of the Government of Senegal to more effectively plan and evaluate agricultural development policies and projects."

<u>Purpose</u>: The project had three subpurposes:

-- "To develop Senegalese agricultural research capacity through in-country, third country, and long-term overseas training and through participation in the design and execution of production systems research and macroeconomic research programs."

-- "To carry out macroeconomic research on food, nutrition, and agricultural policies...to provide guidance to policymakers on economic and institutional constraints on agricultural production and marketing with emphasis on the food grain subsector and food security."

-- "To assist in organizing and carrying out production systems research in major ecological zones in order to identify social, economic, technical, and institutional constraints on present farming systems and develop improved technical packages which are biologically stable, privately profitable, and socially acceptable."

Outputs:

1. Production systems studies, on-farm trials of improved technical packages for "recommendation domains"
2. Macroeconomic studies of the agricultural sector
3. Upgraded technical and professional skills for researchers
4. Expanded collection of socioeconomic documents in the Senegalese Agricultural Research Institute's Documentation and Information Service and improved documentation in two research stations
5. Improved computer capacity for the Production Systems Research and macroeconomic programs

Implementing Agency: Senegalese Institute for Agricultural Research, Government of Senegal.

Technical Assistance Contractor: Michigan State University.

Evaluations: One--in July 1985, at the end of the project's fourth year (St. Louis, Casey, and Pham 1985).

Constraints: Core--2(+), 3, 4, 9b(+); Operational--1, 4, 5, 6, 6(+); Generic--1, 2, 3, 4(+), 5(+), 6

6. TANZANIA FARMING SYSTEMS RESEARCH PROJECT (621-0156)

Initial Authorization: 1982 (for 3 years)

Goal: "Increase per capita food production. Better yielding and more profitable crop varieties and practices developed and dispersed to farmers."
Purpose: "To improve the food crops research program...by increasing its relevance to farmers through the introduction of a farming systems approach to research." Specific objectives relating to FSR were:

- To develop and institutionalize within the Tanzania Agricultural Research Organization a capability to sustain and extend adaptive (on-farm) food crop research nationally

- To develop and test a methodology for using the FSR approach as a research and information dissemination strategy

-- To integrate the FSR approach with the ongoing food crop research program

Outputs:

1. Research planning and management guidelines and plans developed by the Tanzania Agricultural Research Organization to: (a) conduct farming systems research; (b) strengthen the linkages between on-farm and off-farm research; and (c) establish linkages with other Government institutions serving agriculture
2. Agronomic research recommendations for maize, legumes, and/or sorghum/millet in Tanzania's Central, Northern, and Western agroecological zones
3. Five-year plans for major food crops, implemented and coordinated by Tanzanian researchers
4. Improved physical facilities at Ilonga Agricultural Research Institute
5. Expanded crop trials program
6. Crop genetics improvement program continued
7. Short- and long-term training continued

Implementing Agency: Tanzania Agricultural Research Organization.

Technical Assistance Contractor: Consortium for International Development, with Oregon State University as lead university.

Evaluations: Two--in 1986 (Jackson and Osburn 1986) and a Project Completion Report in 1986 (Faught 1986).

Constraints: Core--4, 4(+); Operational--2, 3, 8; Generic--3, 6

7. ZAMBIA AGRICULTURAL DEVELOPMENT RESEARCH AND EXTENSION PROJECT (611-0201)

Initial Authorization: 1980 (for 5 years)

Goal: "To assist the [Government of the Republic of Zambia] in improving the welfare of small farmers and increasing national food production through the development and adaptation of relevant technology."

Purpose: "To help the [Government] strengthen the agricultural research capacity of the Ministry of Agriculture and Water Development (MAWD) and to increase the effectiveness of the extension service in transferring relevant agricultural technology with special emphasis on small farmers."

Outputs:

1. Strengthening of the MAWD Commodity Research Teams on oilseeds and cereal grains
2. Effective operation of MAWD's first Adaptive Research Planning Team in Central Province
3. Enhancement of the capacity of the extension service to diffuse usable agricultural technology to small farmers through improved research/extension linkages and communication
4. Upgrading of the professional and technical skills in agricultural research and extension within MAWD through selected academic and practical training in Zambia and the United States, in other African countries, and at international institutions.

Implementing Agency: Research Branch, Department of Agriculture, Ministry of Agriculture and Water Development.

Technical Assistance Contractor: University of Illinois at Champaign-Urbana as lead university, Southern Illinois University, and the University of Maryland Eastern Shore.

Evaluations: Two--in 1983 (Benoit, Gelaw, and McDermott 1983) and in early 1985 (Sutherland and Warren 1985; and Yohe et al. 1985).

Constraints: Core--2, 7, 9(+); Operational--1, 2(+), 8, 9(+); Generic--4(+), 5(+)

8. NEPAL AGRICULTURAL RESEARCH AND PRODUCTION PROJECT (367-0149)

Initial Authorization: 1984 (for 5 years)

Goal: "To increase the sustainable productivity of Nepali small farmers."

Purpose: "To (a) strengthen [Government of Nepal] institutional capabilities to develop appropriate new technologies for small farmers; (b) develop methodologies for conducting comprehensive production programs in the hills; and (c) improve hill farmers' access to improved seed."

Outputs:

1. Improved research administration
2. Improved research information and documentation system

3. Expanded socioeconomic research program
4. Improved farming systems program
5. Improved commodity program and discipline division research
6. Hill production program developed
7. National seed development board established
8. Hill seed production program developed

The improved farming systems program included a Farming Systems Research and Development Division, and the expanded socioeconomic research program included a Socioeconomic Research and Extension Division.

Implementing Agency: National Agricultural Research Service Center, Department of Agriculture, Ministry of Agriculture.

Technical Assistance Contractor: Winrock International Institute for Agricultural Development.

Evaluations: One--a midterm evaluation in late 1987 (Rood et al. 1988).

Constraints: Core--2, 3, 5, 6, 9a, 9b; Operational--1, 2, 4, 7, 9; Generic--1, 2, 3, 4

9. PHILIPPINES FARMING SYSTEMS DEVELOPMENT PROJECT-EASTERN VISAYAS (492-0356)

Initial Authorization: 1981 (for 5 years)

Goal: "To improve the livelihood of the small farmers in selected rainfed areas of Region VIII."

Purpose: "To establish a proven mechanism for adapting rainfed agricultural technologies to the resource conditions found in Region VIII and to disseminate such technologies as appropriate."

Outputs:

1. Field research sites established: (a) specific improvements in current farming systems identified and disseminated; (b) site-specific and multilocational trials completed; (c) farmers trained and participating in research; (d) Ministry of Food and Agriculture staff trained; and (e) physical facilities completed.

2. Improved capacity of the Visayas State College of Agriculture to support farming systems development in Region

VIII: (a) on-campus trials completed in support of field research trials; (b) farming systems teams established; (c) the college conducting training in farming systems; (d) college staff trained; and (e) physical facilities completed.

3. Improved capacity of Region VIII Ministry of Food and Agriculture to plan, coordinate, and undertake farming systems research: (a) Project Director's Office established; (b) Ministry regional staff trained; and (c) physical facilities completed.

Implementing Agency: Region VIII/Ministry of Food and Agriculture and Visayas State College of Agriculture.

Technical Assistance Contractor: Cornell University.

Evaluations: Two--a process evaluation in 1983 (Mazo et al. 1983); and a midproject evaluation in 1985 (Sajise et al. 1985). A project audit was issued in 1987 (A.I.D. 1987).

Constraints: Core--2, 3, 4, 5, 6, 8, 9a; Operational--4, 5, 8, 9, 10(+); Generic--1, 2, 4, 5

10. GUATEMALA FOOD PRODUCTIVITY AND NUTRITIONAL IMPROVEMENT (520-0232)

Initial Authorization: 1975 (for 5 years)

Goal: "Improve the quality of life and increase the income of small farmers. Increase production and improve the nutritive quality of basic food grains, beans, and vegetables."

Purpose: "Improve the [Government of Guatemala's] capability to develop, screen, and introduce new and/or improved seed varieties, cultural practices, and crop mixes while putting presently available improved farming techniques into practice."

Outputs:

1. Improved varieties of corn, some bearing high-lysine gene, developed and generally available to small farmers
2. Improved varieties of sorghum with high protein content developed and generally available to small farmers
3. Improved varieties of beans developed and generally available to small farmers
4. Technological demonstration program for increased high-quality vegetable production under way

5. Trained professional research and extension staff developed and on board in the Agricultural Science and Technology Institute
6. Data on nutritive content of basic food products developed

Implementing Agency: Agricultural Science and Technology Institute

Technical Assistance Contractor: USAID/Guatemala (personal services contracts) and The Rockefeller Foundation.

Evaluations: Four--in 1975 (Harpstead et al. 1975); in 1977 (McDermott 1977a); in 1978 (Mann and Dougherty 1978); and a project impact evaluation in 1980 (McDermott and Bathrick 1982).

Constraints: Core 2(+), 4, 5, 6, 8; Operational--1, 3(+), 5, 7(+), 8; Generic--2(+), 3, 4(+), 5(+)

11. HONDURAS AGRICULTURAL RESEARCH PROJECT (522-0139)

Initial Authorization: 1978 (for 4 years)

Goal: "To increase the incomes and employment opportunities of small traditional and agrarian reform farm families."

Purpose: "To help the Government of Honduras expand its agricultural research service and make it more responsive to the technological needs of small traditional and agrarian reform farmers. The approach to be followed--multidisciplinary farm-based research--is already under way on a small scale."

Outputs:

1. Multidisciplinary teams trained and working
2. Research stations providing support to multidisciplinary teams
3. Delivery of research results to farmers and extension service; feedback to international research community
4. Long-range research strategy and master regional plan; public-private sector research coordinating mechanism

Implementing Agency: National Agricultural Research Program (later renamed the Department of Agricultural Research), Ministry of Natural Resources.

<u>Technical Assistance Contractor</u>: Consortium for International Development, with New Mexico State University as lead university.

<u>Evaluations</u>: Three--one in February 1980 (A.I.D. 1980), 19 months after the project began and approximately midway through the anticipated life of project; an annual progress evaluation in April 1981 (Beausoleil et al. 1981); and the third in January 1984 (Hansen et al. 1984), almost 3 years after the second evaluation.

<u>Constraints</u>: Core--6; Operational--2, 3, 5, 8; Generic--1, 2, 3, 5

12. <u>A.I.D./REGIONAL OFFICE FOR CENTRAL AMERICA AND PANAMA (ROCAP)</u>
<u>SMALL FARM PRODUCTION SYSTEMS (596-0083)</u>

<u>Initial Authorization</u>: 1979 (for 4 years)

<u>Goal</u>: To "improve the regional conditions in which the rural poor will have increased outputs and income from the land they work."

<u>Purpose</u>: To "develop a continuing Central American capability to conduct and convey to small farmers crop, animal, and mixed-farming production systems research"

<u>Outputs</u>:

1. Methodology for development of recommendations for crop, animal, and mixed farming systems
2. Recommendations for crop, animal, and mixed-farming systems in specific areas
3. Baseline information and research results where small farms are concentrated
4. Extrapolation of methodology for transfer of cropping systems recommendations from one geographic area to another
5. Recommendations for transfer of production systems technical packages to small farmers
6. Formal training through short courses and graduate training
7. In-service training through direct participation in field research
8. Institutional capacity to continue technical assistance for production and transfer of recommendations.

E-^N

<u>Implementing Agency</u>: Tropical Agricultural Research and Training Center.

<u>Technical Assistance</u>: Tropical Agricultural Research and Training Center.

<u>Evaluations</u>: Three--in 1981 (Mann et al. 1981); in 1982 (A.I.D. 1983); and in 1985 (Jones 1985 and Zimet et al. 1986).

<u>Constraints</u>: Core--2, 2(+), 4, 5, 8, 9; Operational--2, 2(+), 5, 8, 9; Generic--2, 3

Appendix F. Summary of Funding for Farming Systems Research and Extension (FSR/E) Projects Reviewed

						Funding Summary ($000)					
Country	Project Number	Project Title	Initial Obligation Year	Final Obligation Year	Life of Project Authorized	Obligation[a]	Expenditure[b]	Estimated FY 88 Expenditure	Proposed FY 89 Expenditure	Total to Obligation	FY89 Expenditure
Botswana	633-0221	ATIP	1981	1987	8,980			8,980	5,125	1,143	[illegible]
Gambia	635-0203	MFP	1979	1984	9,000			9,000	8,414	586	[illegible]
Lesotho	632-0065	FSRP	1978	1985	10,028			10,028	9,950	78	[illegible]
Malawi	612-0202	ARP	1979	1982	9,000			9,000	8,780	220	[illegible]
Senegal	685-0223	ARPP	1981	1985	5,350			5,350	4,670	680	[illegible]
Tanzania	621-0156	FSRP	1982	1982	3,000			3,000	2,614	386	[illegible]
Zambia	611-0201	ZAMARE	1980	1984	12,515			12,515	10,339	1,176	[illegible]
Nepal	367-0149	ARPP	1985	1989	10,000			8,051	2,394	2,500	[illegible]
Philippines	492-0356	FSDP	1981	1987	4,803			4,803	2,450	739	[illegible]
Guatemala	520-0232	FPNI	1975	--	--			1,730	1,730	--	[illegible]
Honduras	522-0139	ARP	1978	1983	2,750			2,628	2,628	--	[illegible]
ROCAP	596-0083	SFPS	1979	1985	8,155			8,155	8,155	--	[illegible]
Total											[illegible]

Note:

E-^N

Africa: Botswana Agricultural Technology Improvement Project (ATIP); Gambia Mixed Farming and Resource Management Project (MFP); Lesotho Farming Systems Research Project (FSRP); Malawi Agricultural Research Project (ARP); Senegal Agricultural Research and Planning Project (ARPP); Tanzania Farming Systems Research Project (FSRP); Zambia Agricultural Development Research & Extension Project (ZAMARE)
Asia and Near East: Nepal Agricultural Research and Production Project (ARPP); Philippines Farming Systems Development Project-Eastern Visayas (FSDP)
Latin America and Caribbean: Guatemala Food Productivity and Nutritional Improvement Project (FNPI); Honduras Agricultural Research Project (ARP); ROCAP Small Farm Production Systems Project (SFPS)

[a]Obligations through FY 88. Includes an estimated FY 88 obligation of $2,450 for Nepal.
[b]Expenditures through FY 87.
Includes: Guatemala (expenditure through FY 79 + estimated FY 80 expenditure); Honduras (expenditure through FY 86); ROCAP (expenditure through FY 86 + estimated FY 87 expenditure)
[c]Includes proposed FY obligation of $1,949 for Nepal.

Source: Agency for International Development, Congressional Presentation FY 81, 88, 89, Appendix III - Latin America and the Caribbean.

APPENDIX G

CHECKLISTS FOR ASSESSING AN AGRICULTURAL TECHNOLOGY DEVELOPMENT AND TRANSFER DESIGN

1. CORE CONSTRAINTS CHECKLIST

Farmer orientation. Does the design target small-farm families as the client group? Does the design provide for identifying the relevant management conditions of this group before proposing technological solutions, and for adapting technologies to local circumstances and needs?

Farmer participation. Does the design provide for practitioners to work with and involve the farm family in designing, implementing, and evaluating research and extension activities?

Locational specificity of technical and human factors. Does the design identify, in specific agroclimatic zones, client groups in terms of relatively homogeneous domains or groups of farming systems?

Problem-solving approach. Does the design group a region’s farming systems into domains useful in identifying (1) limiting technical, biological, and socioeconomic constraints to improved farm production and farmer income, and (2) potential technologies that farmers could feasibly adopt to remove or relax these constraints?

System orientation. Does the design view the total farm as a system of natural and human components, while focusing on a specific production subsystem in order to evaluate interactions between the subsystem and other subsystems, and the potential for and impact on the farm of introducing a change in the technology of the target subsystem?

Interdisciplinary approach. Does the design provide for agricultural and social scientists to collaborate in a manner that facilitates identification of the conditions under which small farmers operate, diagnosis of constraints, and the design, conduct, and evaluation of research and extension activities?

Complementarity with commodity and discipline research. Does the design draw upon technologies and management strategies generated by discipline and commodity research and adapt this knowledge to specific agroclimatic environments and socioeconomic circumstances of a relatively homogeneous target group of farmers?

Technology testing in on-farm trials. Does the design provide for farmers and practitioners to evaluate potentially improved technology under the environmental and management conditions in which it will be used, and for practitioners to learn about farmers' decision-making criteria?

Feedback to shape research priorities and agricultural policies. Does the design provide agricultural researchers and policymakers with information on farmers' goals, needs, priorities, and technology evaluation criteria, and how new technologies perform under farm-level conditions? Do the results of one season's trials generate hypotheses for testing in the next, and are trial results used to set on-station research priorities and to formulate agricultural policies?

2. OPERATIONAL CONSTRAINTS CHECKLIST

Stakeholder understanding of FSR/E. Does the design provide means to ensure that stakeholders understand the FSR/E concept? These stakeholders include, but are not limited to, the FSR/E practitioner's superiors (who make decisions about the allocation of resources affecting the ability of practitioners to do FSR/E), colleagues (e.g., commodity researchers), and FSR/E's ultimate clientele (farmers).

Role of FSR/E in agricultural research and extension. Do the country's research policy and strategy define the role that FSR/E is to play in the country's agricultural research and extension system?

Long-term commitment of resources. Does the agricultural research and extension system provide long-term commitment of resources to cover personnel and operational expenses associated with doing FSR/E (e.g., fuel expenses incurred with reconnaissance surveys and on-farm trials)? Is there a plan in place for these expenses to be covered beyond the life of the project? Are sufficient funds available to cover additional training and technical assistance beyond the life of the project?

Existing research capability and shelf technology. Does the agricultural research system have a strong discipline and commodity research program? To what extent is shelf technology already available for adaptation and testing in on-farm trials?

Consensus on FSR/E methodology. Has a consensus been established among all concerned parties on the methodology that will be followed in doing FSR/E?

Capability to process farming systems data. Do the agricultural research and extension system and the project's technical assistance team have adequate capability (hardware, software, skills, and experience) to analyze the data collected during the course of doing FSR/E?

Consensus on criteria for evaluating FSR/E. Has a consensus been established among all concerned parties on the criteria that will be followed to evaluate the project's progress in implementing FSR/E?

Links with extension. Does the technology development and transfer design provide an effective means of linking research and extension, whereby extension personnel are directly involved in developing FSR/E activities?

Links with agricultural support services. Does the design provide a means to improve farmers' access to the agricultural support services (credit, production inputs, markets, and so on) they require to adopt and use the improved technologies being developed by FSR/E practitioners?

Links with farmer organizations. Does the design provide an approach to work with and through farmer organizations as a means of enhancing farmer participation in, support of, and control over technology development and transfer?

BIBLIOGRAPHY[7]

Agency for International Development (A.I.D.). 1986. "Second External Evaluation of Agricultural Technology Improvement Project, May-June, 1986." Washington, D.C.: Center for Development Information and Evaluation, Agency for International Development. (PD-AAU-907)

---

[1]Items that may be ordered from CDIE are followed by the document number in parentheses.

Additional references on FSR/E are listed in four volumes of the Bibliography of Readings on Farming Systems, Farming Systems Support Project, International Programs, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida 32611. Document numbers are as follows:

Year	Volume	Document No.
1984	1	PN-AAR-839
1985	2	PN-AAU-145
1986	3	PN-AAV-904
1987	4	PN-AAY-255

Anderson, Jock R. 1985. "Assessing the Impact of Farming Systems Research: Framework and Problems." Agricultural Administration 20:225-235.

Ashby, Jacqueline. 1984. Participation of Farmers in Technology Assessment. Muscle Shoals, Alabama: International Fertilizer Development Center.

Baker, D.C., and D.W. Norman. 1988. The Farming Systems Research and Extension Approach to Small Farmer Development. Gaborone, Botswana: Ministry of Agriculture.

Baker, Murl, Joan Atherton, Daniel Galt, Curtis Nissly, Frank Mwambaghi, and Henry Mwandemere. 1983. "Evaluation Report for Malawi Agricultural Research Project." Washington, D.C.: Center for Development Information and Evaluation, Agency for International Development. (PD-AAM-810)

Biggs, Stephen D. 1989. Resource-Poor Farmer Participation in Research: A Synthesis of Experiences from Nine National Agricultural Research Systems. Special Series on the Organization and Management of On-Farm Client-Oriented Research (OFCOR). OFCOR Comparative Study No. 3. The Hague, Netherlands: International Service for National Agricultural Research.

Breth, Steven A. 1984. Through Farmers' Eyes. Kathmandu, Nepal: Department of Agriculture. [USAID/Nepal Integrated Cereals Project (367-0114).]

Butler Flora, Cornelia, Noel Young, Todd Meyn, Gladys Buenavista, and Stan Gacitua. 1988. "Global Review of Farming Systems Research and Extension Activities: A Results Inventory Based on Secondary Sources." Tucson: Office of Arid Land Studies, University of Arizona.

Byerlee, Derek, Larry Harrington, and Donald L. Winkelmann. 1982. "Farming Systems Research: Issues in Research Strategy and Technology Design." American Journal of Agricultural Economics 64(5):897-904.

Byrnes, Francis C. 1988. No Turning Back: Small Steps Lead Filipino Farmers Toward Self-Reliance and Increased Income. Quezon City, Philippines: Department of Agriculture. [USAID/ Philippines Rainfed Resources Development Project (492-0366)--Farming Systems Research and Development Project, Bicol Component, Region V.]

Byrnes, Kerry J. 1989. "Project Evaluation Documentation for A.I.D. Farming Systems Research and Extension (FSR/E) Projects." Washington, D.C.: Center for Development Information and Evaluation, Agency for International Development. (PN-ABB-707)

Cernea, Michael M., and Scott E. Guggenheim. 1985. "Is Anthropology Superfluous in Farming Systems Research?" Farming Systems Research, Kansas State University Research Series, 4(9):504-517. Also available in World Bank Reprint Series, No. 367.

Chambers, Robert, and Janice Jiggins. 1986. "Agricultural Research for Resource Poor Farmers: A Parsimonious Paradigm." Discussion Paper 220. University of Sussex: Institute of Development Studies.

Chambers, Robert, Arnold Pacey, and Lori Ann Thrupp, eds. 1989. Farmer First: Farmer Innovation and Agricultural Research. London: Intermediate Technology Publications; or New York: The Bootstrap Press.

Chapman, James A., and Roberto J. Castro. 1988. "Possible Future Directions for A.I.D. Activity in Farming Systems Research: A Concept Paper." Prepared for Office of Agriculture, Bureau of Science and Technology, Agency for International Development, Washington, D.C.

Collinson, Michael P. 1982. Farming Systems Research in Eastern Africa: The Experience of CIMMYT and Some National Agricultural Research Services, 1976-81. International Development Paper No. 3. East Lansing: Michigan State University.

Collinson, Michael P. 1988. "FSR in Evolution: Past and Future." Paper presented at the 8th Annual Farming Systems Research/Extension Symposium, Fayetteville, Arkansas, October 9-12, 1988.

Committee on Agricultural Sustainability for Developing Countries. 1987. "The Transition to Sustainable Agriculture: An Agenda for A.I.D." Washington, D.C.: World Resources Institute.

Conklin, Frank S. 1982. "FSR/E as a Field Methodology in Third World Countries: Its Historical Origins, Current Functions, and Suggestions for Improvement." Paper prepared for the Farming Systems Research Symposium, Kansas State University, Manhattan, Kansas, November 21-23, 1982.

Consultative Group on International Agricultural Research (CGIAR). 1987. CGIAR 1986-1987 Annual Report. Washington, D.C.: CGIAR Secretariat.

Dillon, John L., Donald L. Plucknett, and Guy J. Vallaeys. 1978. Farming Systems Research at the International Agricultural Research Centers. A report to the Technical Advisory Committee, Consultative Group on International Agricultural Research. Washington, D.C.: World Bank.

Ewell, Peter T. 1988. Organization and Management of Field Activities in On-Farm Research: A Review of Experience in Nine Countries. Special Series on the Organization and Management of On-Farm Client-Oriented Research (OFCOR). OFCOR Comparative Study No. 2. The Hague, Netherlands: International Service for National Agricultural Research.

Farming Systems Support Project. 1986. Strategy for Evaluation of Farming Systems Research Projects. Draft. Gainesville: University of Florida.

Farming Systems Support Project. 1988. Training, Networking, and Technical Assistance: The Project and Process of the Farming Systems Support Project--1982-1987. Gainesville: University of Florida.

Farrington, John, and Adrienne Martin. 1987. "Farmer Participatory Research: A Review of Concepts and Practices." Discussion Paper 19. London: Agricultural Administration (Research and Extension) Network, Agricultural Administration Unit, Overseas Development Institute.

Farrington, John, and Adrienne Martin. 1988. Farmer Participation in Agricultural Research: A Review of Concepts and Practices. Agricultural Administration Unit Occasional Paper 9. London: Overseas Development Institute.

Frankenberger, Tim, Billie R. Dewalt, Harold J. McArthur, Robert E. Hudgens, G. Mitawa, Kanok Rerkasem, Timothy Finan, Cornelia Butler Flora, and Noel Young. 1988. "Identification of Results of Farming Systems Research and Extension Activities: A Synthesis." Paper presented at the Eighth Annual Farming Systems Research/Extension Symposium, Fayetteville, Arkansas, October 9-12, 1988. (Summary of field studies of FSR/E programs in Botswana, Indonesia, and Guatemala, and a secondary review of FSR/E programs worldwide.)

Frankenberger, Timothy R., Billie R. Dewalt, Harold J. McArthur, Robert E. Hudgens, G. Mitawa, Kanok Rerkasem, Timothy Finan, Cornelia Butler Flora, and Noel Young. 1989. "Identification of Results of Farming Systems Research and Extension Activities: A Synthesis." Farming Systems Research-Extension Newsletter 1:8-10.

Fresco, Louise O., and Susan V. Poats. 1986. "Farming Systems Research and Extension: An Approach to Solving Food Problems in Africa." In Food in Sub-Saharan Africa, edited by Art Hansen and Della McMillan, pp. 305-331. Boulder, Colorado: Lynne Rienner Publishers.

Harwood, Richard R. 1979. Small Farm Development: Understanding and Improving Farming Systems in the Humid Tropics. Boulder, Colorado: Westview Press.

Hildebrand, Peter E. 1985. "On-Farm Research: Organized Community Adaptation, Learning and Diffusion for Efficient Agricultural Technology Innovation." Farming Systems Support Project Newsletter, 3(4):6-9.

Hildebrand, Peter E., and Robert K. Waugh. 1983. "Farming Systems Research and Development." Farming Systems Support Project Newsletter 1(1):4-5.

Lichte, John A. 1987. "Strategy for Evaluation of Farming Systems Research and Extension Projects." Draft. Gainesville: Farming Systems Support Project, University of Florida.

Livingston, Geoffrey O. 1985. The Evaluation of USAID-Funded Farming Systems Research Projects: Problems and Proposals. A Plan 8 Paper. East Lansing: Michigan State University.

Martin, Cal, Ken McDermott, Ned Greeley, and Tom Bebout. 1981. "Interim Evaluation of Farming Systems Research Project." Washington, D.C.: Center for Development Information and Evaluation, Agency for International Development. (PD-AAD-396)

Merrill-Sands, Deborah. 1985. "A Review of Farming Systems Research." Paper prepared for the Technical Advisory Committee, Consultative Group on International Agricultural Research.

Merrill-Sands, Deborah. 1986. "Farming Systems Research: Clarification of Terms and Concepts." Experimental Agriculture 22:87-104.

Merrill-Sands, Deborah. 1988. "Assessing the Institutional Impact of On-Farm Client-Oriented Research Programs: Lessons from a Nine-Country Study." Paper presented at the Eighth Annual Farming Systems Research/Extension Symposium, Fayetteville, Arkansas, October 9-12, 1988.

Merrill-Sands, Deborah, and Jean McAllister. 1988. Strengthening the Integration of On-Farm Client-Oriented Research and Experiment Station Research in National Agricultural Research Systems (NARS): Management Lessons from Nine Country Case Studies. Special Series on the Organization and Management of On-Farm Client-Oriented Research (OFCOR). OFCOR Comparative Study No. 1. The Hague, Netherlands: International Service for National Agricultural Research.

Norman, David W. 1974. "Rationalising Mixed Cropping Under Indigenous Conditions: The Example of Northern Nigeria." Journal of Development Studies 11:3-21.

Norman, David W., and Michael P. Collinson. 1985. "Farming Systems Approach Research in Theory and Practice." In Agricultural Systems Research for Developing Countries, edited by J.V. Remenyi. Canberra: Australian Centre for International Agricultural Research.

Plucknett, Donald L. 1987. "Farming Systems Research at the International Agricultural Research Centers." Paper presented at the Mid-Term Meeting of the Consultative Group on International Agricultural Research, Montpellier, France, May 19, 1987.

Plucknett, Donald L., John L. Dillon, and Guy J. Vallaeys. 1986. "Review of Concepts of Farming Systems Research--The What, Why and How." Paper prepared for the International Agricultural Research Center Workshop on Farming Systems Research, Hyderabad, India, February 17-21, 1986.

Poats, Susan. 1988. "Gender Analysis in Farming Systems Research and Extension Projects." Paper presented at the Eighth Annual Farming Systems Research/Extension Symposium, Fayetteville, Arkansas, October 9-12, 1988.

Poats, Susan, Daniel Galt, Chris Andrew, Lisette Walecka, Peter Hildebrand, and Kenneth McDermott. 1986. "Farming Systems Research and Extension: Status and Potential in Low-Resource Agriculture." A draft report submitted to the Office of Technology Assessment, United States Congress.

Poats, Susan V., Jean Gearing, and Sandra Russo. 1989. Gender Issues in Farming Systems Research and Extension: A Survey of Current Projects. Gainesville, Florida: Tropical Research and Development.

Ranaweera, N.F.C., and R.R. Gonzaga. 1988. "A Methodology to Assess the Impact of Farming Systems Research in Asia." Paper presented at the Eighth Annual Farming Systems Research/Extension Symposium, Fayetteville, Arkansas, October 9-12, 1988.

Rhoades, R.E., and R.H. Booth. 1982. "Farmer-Back-To-Farmer: A Model for Generating Acceptable Agricultural Technology." Agricultural Administration 11:127-137.

Shaner, W.W., P.F. Philipp, and W.R. Schmehl. 1982a. Farming Systems Research and Development: Guidelines for Developing Countries. Boulder, Colorado: Westview Press.

Shaner, W.W., P.F. Philipp, and W.R. Schmehl. 1982b. Readings in Farming Systems Research and Development. Boulder, Colorado: Westview Press.

Simmonds, Norman W. 1985. "Farming Systems Research: A Review." World Bank Technical Paper No. 43. Washington, D.C.: World Bank.

Sutherland, Alistair. 1987. Sociology in Farming Systems Research. Agricultural Administration Unit Occasional Paper 6. London: Overseas Development Institute.

Waugh, Robert K., Peter E. Hildebrand, and Chris O. Andrew. 1989. "Farming Systems Research and Extension." In The Transformation of International Agricultural Research and Development, edited by J. Lin Compton, pp. 207-226. Boulder, Colorado: Lynne Rienner Publishers.

Wiese, Karen. 1985. "Farming Systems Research: Issues for Evaluation." Paper prepared for Center for Development Information and Evaluation, Bureau for Program and Policy Coordination, Agency for International Development, Washington, D.C.

Zimet, David, Edwin C. French, and Chris O. Andrew. 1988. "A Systematic Tool for FSR/E Project Evaluation." Paper presented at the Eighth Annual Farming Systems Research/Extension Symposium, Fayetteville, Arkansas, October 9-12, 1988.

PROJECT-SPECIFIC REFERENCES[8]

Byrnes, Kerry J. 1988. Vignettes of Core, Operational, and Generic Constraints in 12 A.I.D.-Funded Farming Systems Research and Extension Projects, CDIE Working Paper No. 112--Case Study No. 13. (PN-ABC-127)

Botswana Agricultural Technology Improvement Project

Agency for International Development (A.I.D.). 1986. "Second External Evaluation of Agricultural Technology Improvement Project, May-June, 1986." (PD-AAU-907)

Byrnes, Kerry J. 1988. Botswana Agricultural Technology Improvement Project (633-0221), CDIE Working Paper No. 112--Case Study No. 1. (PN-ABC-073)

---

[1]Number in parentheses is the document number for ordering the item in question from the Agency for International Development's Center for Development Information and Evaluation (CDIE), Washington, D.C. 20523.

Francis, Chuck, Cornelia Flora, Boyd Whittle, and Howard Sigwele. 1984. "First External Evaluation of Agricultural Technology Improvement Project, July, 1984." (PD-BAU-445)

Frankenberger, Timothy R., and G. Mitawa. 1988. "Farming Systems Research and Extension Activities in Botswana: A Results Inventory." Tucson: Office of Arid Land Studies, University of Arizona.

The Gambia Mixed Farming and Resource Management Project

Agency for International Development (A.I.D.). 1985. "Project Paper for The Gambia Agricultural Research and Diversification Project." (PD-AAR-016)

Byrnes, Kerry J. 1988. Mixed Farming and Resource Management Project (635-0203), CDIE Working Paper No. 112--Case Study No. 2. (PN-ABC-074)

Corty, Floyd L., William Derman, Udai R. Bishnoi, and James T. O'Rourke. 1986. "Final Evaluation of Gambia Mixed Farming and Resource Management Project." (PD-BBE-211)

Osburn, James, Robert Adams, Ans Burgett, Thomas Eponou, Howard Sprague, and Gloria Steel-e. 1983. "Early Mid-Term Evaluation of Gambia Mixed Farming and Resource Management Project." (PD-BAN-055)

Guatemala Food Productivity and Nutritional Improvement

Agency for International Development (A.I.D.). 1975. "Project Paper for the Food Productivity and Nutritional Improvement Project." (PD-AAA-947-B1)

Agency for International Development (A.I.D.). 1977. "Project Appraisal Report for the Food Productivity and Nutritional Improvement Project." (PD-AAA-947-F1)

Agency for International Development (A.I.D.). 1978. "Project Evaluation Summary for Food Productivity and Nutritional Improvement Project." (PD-AAA-947-G1)

Byrnes, Kerry J. 1988. Food Productivity and Nutritional Improvement Project (520-0232), CDIE Working Paper No. 112--Case Study No. 10. (PN-ABC-082)

DeWalt, Billie R., and Robert Hudgens. 1988. "Farming Systems Research & Extension in Guatemala: A Results Inventory." Tucson: Office of Arid Land Studies, University of Arizona.

Harpstead, Dale D., Ralph W. Cummings, Jr., Fernando Fernandez, J. Kenneth McDermott, and Edwin J. Wellhausen. 1975. "Review: The Institute of Agricultural Science and Technology in Guatemala (ICTA)." Guatemala City, Guatemala: ICTA.

Mann, F., and D. Dougherty. 1978. "Evaluation of Food Productivity and Nutritional Improvement Project." (PD-AAY-546)

McDermott, J. K. 1977a. "Report of an Evaluation of ICTA." (PD-AAY-547)

McDermott, J.K. 1977b. "Trip Report on Evaluation of ICTA." Washington, D.C.: Technical Assistance Bureau, Office of Agriculture, Agency for International Development.

McDermott, J. K., and David Bathrick. 1982. Guatemala: Development of the Institute of Agricultural Science and Technology (ICTA) and Its Impact on Agricultural Research and Farm Productivity. Project Impact Evaluation No. 30. (PN-AAJ-178)

Honduras Agricultural Research Project

Agency for International Development (A.I.D.). 1978. "Project Paper for Agricultural Research Project." (PD-AAB-952-B1)

Agency for International Development (A.I.D.). 1980. "Project Evaluation Summary (PES) of the First Evaluation of the Agricultural Research Project." (PD-AAJ-774). (For complete evaluation, see Laird et al. 1980.)

Beausoleil, Joseph, Gordon Appleby, Fernando Fernandez, Daniel Galt, Robert Hudgens, and Michael Weber. 1981. "Second Evaluation of USAID/Honduras Agricultural Research Project." (PD-AAJ-313)

Byrnes, Kerry J. 1988. Honduras Agricultural Research Project (522-0139), CDIE Working Paper No. 112--Case Study No. 11. (PN-ABC-083)

Galt, Daniel, Alvaro Diaz, Mario Contreras, Frank Peairs, Joshua Posner, and Franklin Rosales. 1982. "Farming Systems Research (FSR) in Honduras, 1977-81: A Case Study."

Working Paper No. 1. East Lansing: Department of Agricultural Economics, Michigan State University. (PN-AAM-827)

Hansen, Art, Mason E. Marvel, Vernon B. Cardwell, and Gustavo Arcia. 1984. "Third Evaluation of Honduras Agricultural Research Project." (PD-AAR-620)

Laird, Reggie, Franklin Martin, Astolfo Fumagalli, Manuel Ruiz, and Robert K. Waugh. 1980. "La Evaluación del PNIA - Febrero 1980." (PD-AAX-835)

Lesotho Farming Systems Research Project

Byrnes, Kerry J. 1988. Lesotho Farming Systems Research Project (632-0065), CDIE Working Paper No. 112--Case Study No. 3. (PN-ABC-075)

Dunn, James F. 1983. "Project Evaluation Summary of Special Evaluation of Farming Systems Research Project, conducted by Cal Martin, Dan Galt, and Carolyn Barnes." (PD-AAM-972)

Dunn, James F., and Byron Bahl. 1980. "Project Evaluation Summary of a Preliminary Evaluation of Farming Systems Research Project." (PD-AAG-092)

Frolik, Elvin F., and William N. Thompson. 1986. "Final Evaluation of Farming Systems Research Project." (XD-AAV-915-A)

Martin, Cal, Ken McDermott, Ned Greeley, and Tom Bebout. 1981. "Interim Evaluation of Farming Systems Research Project." (PD-AAI-396)

Malawi Agricultural Research Project

Baker, Murl, Joan Atherton, Daniel Galt, Curtis Nissly, Frank Mwambaghi, and Henry Mwandemere. 1983. "Evaluation Report for Malawi Agricultural Research Project." (PD-AAM-810)

Byrnes, Kerry J. 1988. Malawi Agricultural Research Project (612-0202), CDIE Working Paper No. 112--Case Study No. 4. (PN-ABC-076)

Thorne, Marlowe D. 1981. "Report of First Internal Evaluation of Malawi Agricultural Research Project, November-December 1981." (PD-AAN-267)

Nepal Agricultural Research and Production Project

Agency for International Development (A.I.D.). 1984. "Project Paper for Nepal Agricultural Research and Production Project." (PD-AAQ-449)

Byrnes, Kerry J. 1988. Nepal Agricultural Research and Production Project (367-0149), CDIE Working Paper No. 112--Case Study No. 8. (PN-ABC-080)

Rood, Peter G., R.K. Patel, Badri N. Kayastha, Remsh Munamkami, Narayan Regmi, Ben Stoner, and Tish Butler. 1988. "Report of Mid-Term Evaluation of Nepal Agricultural Research and Production Project." Cambridge, Massachusetts: WPI Inc.

Philippines Farming Systems Development
Project-Eastern Visayas

Agency for International Development (A.I.D.). 1981. "Project Paper for Farming Systems Development Project-Eastern Visayas." (PD-AAM-430)

Agency for International Development (A.I.D.). 1987. "Audit of Farming Systems Development Project-Eastern Visayas." (PD-AAV-833)

Byrnes, Kerry J. 1988. Farming Systems Development Project--Eastern Visayas (492-0356), CDIE Working Paper No. 112--Case Study No. 9. (PN-ABC-081)

Mazo, José V., Rebecca V. Barbusa, James Beebe, Emiliana N. Bernardo, and Agapito C. Tauro. 1983. "Report on the Process Evaluation of Farming Systems Development Project--Eastern Visayas." (PD-AAP-045)

Sajise, Percy, Doyle Baker, Sam Fujisaka, David Hitchcock, Inocencio Bolo, and Enrique Pacardo. 1985. "Mid-Project Evaluation Report of Farming Systems Development Project--Eastern Visayas." (PD-CAM-419)

ROCAP Small Farmer Production Systems

Agency for International Development (A.I.D.). 1983. "Project Evaluation Summary (PES) of Second Evaluation of Small Farm Production Systems Project." (PD-AAM-808)

Agency for International Development (A.I.D.). 1986. "Project Evaluation Summary (PES) of Third Evaluation of Small Farm Production Systems Project." (PD-AAT-736)

Byrnes, Kerry J. 1988. Small Farmer Production Systems Project (596-0083), CDIE Working Paper No. 112--Case Study No. 12. (PN-ABC-084)

DeWalt, Billie R. 1988. "Farming Systems Research and Extension Activities at CATIE: A Results Inventory." Tucson: Office of Agricultural Studies, University of Arizona.

Hobgood, Harlan H., Rufo Bazan, Rollo Ehrich, Francisco Escobar, Twig Johnson, and Marc Lindenberg. 1980. Central America: Small-Farmer Cropping Systems. A.I.D Project Impact Evaluation Report No. 14. (PN-AAH-977)

Jones, James C. 1985. "Farming Systems Research and Extension in CATIE: 1975-1985. Notes and Observations." A report prepared for the Centro Agronomico Tropical de Investigación y Ensenañza, Turrialba, Costa Rica.

Mann, Fred L., Donald Esslinger, Albert R. Hagan, and Harry C. Minor. 1981. "Central America--Evaluation of Projects: Small Farm Production Systems (SFPS) and Agricultural Research and Information System (PIADIC) (596-0083 and 596-0048)." (PD-AAJ-278)

Zimet, David, Joseph Conrad, Edwin C. French, and Federico Poey. 1986. "Evaluation Report on CATIE Small Farm Production Systems." (PD-AAT-736)

Senegal Agricultural Research and Planning Project

Agency for International Development (A.I.D.). 1981. "Project Paper for the Senegal Agricultural Research and Planning Project." (PD-BAE-227)

Agency for International Development (A.I.D.). 1984. "Project Amendment for the Senegal Agricultural Research and Planning Project." (PD-BAV-474)

Bernsten, Richard. 1985. "Mission Report-Summary, Overview, Observations. Senegal Agricultural Research and Planning Project." East Lansing: Michigan State University, Agricultural Economics Department.

Byrnes, Kerry J. 1988. Senegal Agricultural Research and Planning Project (685-0223), CDIE Working Paper No. 112--Case Study No. 5. (PN-ABC-077)

Eicher, Carl K. 1982. "Reflections on the Design and Implementation of the Senegal Agricultural Research Project." Dakar, Senegal: Michigan State University/Senegal Agricultural Research Institute.

Sall S., M. Kamanga, and J. Posner. 1982. "Recherche sur les Systèmes de Production en Casamance." Note méthodologique. Djibelor, Senegal: Centre de Recherches Agricoles de Djibelor, Senegal Agricultural Research Institute.

St. Louis, Robert, C. Franklin Casey, and Kham T. Pham. 1985. "Mid-Term Threshold Evaluation of the Senegal Agricultural Research and Planning Project." (PD-AAY-558)

Tanzania Farming Systems Research Project

Byrnes, Kerry J. 1988. Tanzania Farming Systems Research Project (621-0156), CDIE Working Paper No. 112--Case Study No. 6. (PN-ABC-078)

Consortium for International Development. 1983. "Tanzania Farming Systems Research (621-0156) Project Workplan (Years 1 and 2)." (PD-BAO-051)

Cunard, A. 1985. "End-of-Tour Report, Tanzania Farming Systems Research Project." Dar es Salaam, Tanzania: Agency for International Development.

Faught, William A. 1986. "Project Completion Report: Tanzania Farming Systems Research Project." (PD-AAU-448)

Jackson, Robert I., and Donald D. Osburn. 1986. "Report of Evaluation of the Tanzanian FSR Project and Related Activities--Land Development and Station Development at Ilonga." (PD-BBB-811)

Zambia Agricultural Development Research and Extension Project

Agency for International Development (A.I.D). 1980. "Project Paper for Zambian Agricultural Development Research and Extension Project." (PD-AAG-766)

Benoit, Randy, Bantayehu Gelaw, and Kenneth McDermott. 1983. "Evaluation of Agricultural Development Research and Extension Project (ZAMARE)." (PD-AAN-807)

Byrnes, Kerry J. 1988. Zambia Agricultural Development Research and Extension Project, (611-0201), CDIE Working Paper No. 112--Case Study No. 7. (PN-ABC-079)

Kean, Stuart A., and Lingston P. Singogo. 1988. Zambia: Organization and Management of the Adaptive Research Planning Team (ARPT), Research Branch, Ministry of Agriculture and Water Development. Special Series on the Organization and Management of On-Farm Client-Oriented Research (OFCOR). OFCOR Case Study No. 1. The Hague, Netherlands: International Service for National Agricultural Research.

Sutherland, Alistair, and Mike Warren. 1985. "Socio-Economic Component of the USAID Mid-Term Evaluation of the Zambia Agricultural Research and Extension Project (ZAMARE)." (Appendix 3 of Yohe et al. 1985; PD-BAW-778)

Yohe, John, Loy Crowder, Earl Kellogg, Eugenio Martinez, and Eugene Pilgrim. 1985. "Report on Midterm Evaluation of Agricultural Development Research and Extension Project (ZAMARE)." (PD-BAW-778)