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# A Review of AID Experience:

# Farming Systems Research & Extension (FSR/E) Projects--1975-1987[1]

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ABSTRACT

This report reviews Agency for International Development (AID) experience in implementing farming systems research and extension (FSR/E) projects. Drawing on evaluation reports, case studies were prepared on 12 AID-funded FSR/E projects implemented between 1975 and 1987: 7 in Africa, 2 in Asia, and 3 in Latin America and the Caribbean. These projects did not achieve the expected level of impact, where impact is defined in terms of technology development and transfer, and institutionalization of FSR/E. Three general categories of factors were found to have impeded project implementation and impact: core, operational, and generic constraints. The study identifies lessons learned that need to be taken into account in designing, implementing, and evaluating technology development and transfer projects involving an FSR/E component. The study contributes to the ongoing discussion about the potential of FSR/E as a strategy to strengthen agricultural research and extension systems in the developing countries.

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[1]The views and interpretations expressed are those of the author and should not be attributed to the United States Agency for International Development or the Center for Development Information and Evaluation (CDIE). The author appreciates the contributions made by Tim Frankenberger of the FSR/E Network Steering Committee; AID officials including Joan Atherton, Roberto Castro, Cal Martin, Wendell Morse, Ken Prussner, Emmy Simmons, Gloria Steele, Marcus Winter, and Michael Yates; CDIE colleagues, particularly Siew Tuan Chew, Paula Goddard, and Haven North; and Francis C. Byrnes.

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TABLE OF CONTENTS

## List of Tables



## List of Boxes

## List of Annexes

# PREFACE

The present study is a retrospective on United States Agency for International Development (AID) experience with farming systems research and extension (FSR/E) projects funded by the Agency between the mid-1970s to the mid-1980s. Based on a case study review of the evaluations of 12 AID-funded FSR/E projects, the study attempts to assess the impact of these projects on agricultural technology development and transfer, and institutionalization of FSR/E in research and extension systems.

Some readers may find it discomforting that the present study does not point to any one FSR/E project as more successful than another. Readers holding such concerns should bear in mind that the FSR/E projects reviewed were evaluated while implementation was yet proceeding. Consequently, the evaluations could not provide a sound basis for judging that any project was a failure or a success. However, the study does not pull any punches in taking a critical look at the constraints that systematically plagued implementation and impact of the FSR/E projects reviewed.

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

The reader should note that two other FSR/E assessments were being developed at the same time the present study was conducted: (1) ISNAR's study of on-farm client-oriented research (Merrill-Sands, 1988), and (2) the FSR/E Network Steering Committee's "results inventory" of FSR/E (Frankenberger, et al., 1988). The lessons learned from the projects reviewed in the present study are reinforced by the lessons learned emerging from these other assessments, in particular, the "results inventory" as elaborated in section 7 of this report.

The author wishes to express his appreciation to the many individuals who contributed to the development of this study, in particular, Tim Frankenberger, Siew Tuan Chew, and Francis C. Byrnes.

# EXECUTIVE SUMMARY

This report synthesizes United States Agency for International Development (AID) experience with farming systems research and extension (FSR/E) projects funded by the Agency between the mid-1970s to the mid-1980s. AID sought through these projects to strengthen the capability of agricultural research and extension systems to develop and transfer improved agricultural technologies to resource-poor, small farmers.

The study's findings and lessons learned are primarily based on a case study review of evaluations of a sample (see Annex A) of 12 AID-funded FSR/E projects--7 in Africa, 2 in Asia and the Near East, and 3 in Latin America and the Caribbean, as follows:

- Botswana Agricultural Technology Improvement (ATIP)
- Gambia Mixed Farming and Resource Management (MFP)
- Lesotho Farming Systems Research (FSRP)
- Malawi Agricultural Research (ARP)
- Senegal Agricultural Research and Planning (ARPP)
- Tanzania Farming Systems Research (FSRP)
- Zambia Agricultural Research and Extension (ZAMARE)
- Nepal Agricultural Research and Production (ARPP)
- Philippines Farming Systems Development (FSDP)
- Guatemala Food Productivity and Nutritional Improvement (FPNI)
- Honduras Agricultural Research (ARP)
- ROCAP Small Farmer Production Systems (SFPS)

Lessons learned from these projects are reinforced by conclusions emerging from recent FSR/E assessments and field studies of FSR/E projects and programs in several developing countries.

## Purpose of Study

This study contributes to an ongoing discussion within AID about the role that FSR/E can play in strengthening developing country agricultural research and extension systems. AID's main avenue of support for FSR/E has been bilaterally-funded agricultural research and extension projects. The 12 FSR/E projects reviewed for the present study, each having a farming systems component, accounted for more than $80,000,000 of AID's expenditures on agricultural research and extension projects between 1975 and 1987. Yet the considerable discussion that has attended AID's support for FSR/E during the past decade has continued to raise a question of whether the direction and level of Agency support for FSR/E is appropriate relative to AID's mandate.

Answering this question is difficult because of apparent confusion about what FSR/E is, how FSR/E differs from conventional approaches to agricultural research and extension, when FSR/E is appropriate, how FSR/E is implemented, and whether and how to institutionalize FSR/E. Indeed, ambiguity in terminology and conceptualization of FSR/E became more acute as the scope of activities encompassed by the term FSR broadened.

A major difficulty has been a lack of information on (1) the factors that have influenced the relative success or failure of donor-supported projects in implementing FSR/E; (2) the role that FSR/E has played in strengthening the technology generation and transfer capacity of national agricultural research and extension systems; and (3) 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 time frame. Expectations for FSR/E may have been unrealistic (e.g., someone oversold the idea). Even if expectations were realistic, there is the question of what lapse of time is necessary before assessing whether FSR/E has succeeded or failed and to what degree. Finally, where FSR/E projects have been less successful than had been expected or desired, FSR/E could fall into disrepute, with the attendant risk of failing to recognize those elements of the FSR/E approach of value which should be incorporated into future development assistance projects in agriculture.

These various difficulties--the confusion surrounding FSR/E, the lack of information in the aforementioned areas, and the potential of failing to recognize FSR/E's valuable elements--have restricted the basis on which an informed judgement could be made about the direction and level of FSR/E support appropriate to AID's mandate. Yet AID has a vested interest in ensuring that experience gained and lessons learned from FSR/E projects are available to assist Agency personnel in assessing whether FSR/E has a role to play in AID's evolving development assistance strategy.

Accordingly, the present study provides information on the impact of AID-funded FSR/E projects and the factors that have influenced the performance of these projects. This information, in turn, can be used to identify ways to improve the design, implementation, and evaluation of any Agency project involving an FSR/E component.

## Overview of FSR/E

Compared with conventional approaches to agricultural research, FSR/E practitioners seek 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. The "farming systems" approach originated in a perception that conventional agricultural research followed a basically "top-down" approach to technology development that lacked understanding of the management conditions under which resource-poor, small farmers operate. As a result, technology development was "guided" by a number of erroneous assumptions; all too frequently, "improved" technologies generated in research programs guided by these assumptions failed to provide the farmer with any incentive to adopt the technologies in question, given the management conditions under which he or she operated.

In response to this situation, a growing number of FSR/E practitioners argued: (1) that technology development for small farmers must be grounded in a knowledge of their farming system, and (2) that technology evaluation must take into account not only agricultural criteria (e.g., yield improvement) but also the socioeconomic circumstances of the farm families who operate these systems. Early work of farming systems practitioners as well as farming systems programs initiated by the International Agricultural Research Centers played a formative role in the origin and evolution of the farming systems approach. In the late 1970s and early 1980s, the number of donor-funded farming systems projects (or projects containing a farming systems component) increased rapidly.

While numerous terms and acronyms have been used to refer to the "farming systems" approach, the "FSR/E" acronym is used here because it explicitly addresses the need for links among farmers, extension workers, and researchers. FSR/E seeks, through on-farm research and associated extension activities, to test, adapt, integrate, and disseminate new technologies for adoption by farmers. In conducting research on a farm as a system, FSR/E focuses on the farm family's attributes (for example, goals, preferences, skills, access to resources, choice of productive activities, and management practices); the interdependencies among system components which family members are able to control; and these components' interaction with physical, biological, and socioeconomic factors not under the farmer's control.

The scope of FSR/E tends to be more limited than that of integrated rural development (IRD) which focuses on a broad set of development problems. As a strategy, FSR/E focuses on a more narrowly-defined problem--developing improved agricultural technologies and disseminating them for adoption by farmers. FSR/E's principal products are information and technology; its primary clients are limited-resource farmers, conventional agricultural researchers involved in applied research, and agricultural policy makers.

## Core Characteristics of FSR/E

While much discussion has surrounded the FSR/E concept over the past decade, most FSR/E practitioners would agree that FSR/E is a process entailing the following characteristics:

FSR/E is farmer-oriented. FSR/E practitioners target small-farm families as the client group for agricultural research, with the objective of generating technology relevant to the management conditions of this client group. This is done by identifying these conditions before proposing technological solutions, and by adapting technologies to local circumstances and needs.

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

FSR/E recognizes the locational specificity of technical and human factors. FSR/E practitioners identify client groups in terms of homogeneous groups of farming systems in specific agro-climatic zones.

FSR/E is a problem-solving approach. Once a region's farming systems are grouped into homogeneous agro-climatic zones, a FSR/E practitioner identifies the limiting technical, biological, and socioeconomic constraints to improved farm productivity and farm family income. Data on these constraints provide one of the bases for identifying technologies that may be effective in removing or relaxing the constraints and feasible for the client group of farming households to adopt. Thus, the primary concern of FSR/E is helping farmers to solve problems.

FSR/E is systems-oriented. FSR/E views the total farm in a holistic manner as a system of natural and human components, and focuses on specific production subsystems to evaluate (1) interactions between these subsystems and other subsystems, and (2) the potential for and impact on the farm of introducing a change in the technology of one or more target subsystems.

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.

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

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 decisionmaking criteria, and allows for potentially improved technology to be evaluated under the environmental and management conditions in which it will be used.

FSR/E provides feedback for shaping research priorities and agricultural policies. FSR/E is a dynamic and iterative process that provides information on farmer goals, needs, priorities, and criteria for evaluating technologies, and 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 provide an input to the setting of on-station research priorities as well as to the formulation of regional- and national-level policy.

Each of the nine characteristics must be present in a technology development and transfer (TD&T) methodology in order for the methodology to provide a technically sound approach to doing FSR/E. If one or more of the characteristics is missing or weak in a TD&T methodology, the methodology really does not constitute a technically sound FSR/E and the methodology's practitioners are not really doing FSR/E. For example, a TD&T 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, the FSR/E practitioner needs to be careful that he or she does not neglect any of the core characteristics or overemphasize one characteristic to the detriment of the others.

## Impact of FSR/E Projects

A review of the evaluations of 12 AID-funded FSR/E projects produced information indicating that these projects all too frequently failed to achieve the desired or expected level of impact, where impact is defined in terms of (1) development and transfer of improved agricultural technologies to farmers, and (2) institutionalization of FSR/E in agricultural research and extension systems. Specifically, the evaluations did not provide convincing evidence that these FSR/E projects had made a major impact on technology development and transfer. Further, in terms of institutionalization, the review found that FSR/E projects generally were not successful in institutionalizing FSR/E within agricultural research organizations. It should be noted, however, that the reviewed projects typically were evaluated during implementation and did not provide information to assess institutionalization impact beyond the life of a project.

On a positive note, some projects were more successful than others, particularly in training research and extension personnel in the principles of FSR/E and providing them with opportunities to gain practical field experience in doing FSR/E. Participation in FSR/E not only has changed the attitudes of many researchers about small farmers as the clients of agricultural research but also has influenced the way in which researchers define research problems, set research priorities, and carry out problem-oriented research at the farm level. In the final analysis, such changes may have a much longer-term impact on the institutionalization of FSR/E than short-term objectives (e.g., establishing a "FSR Unit" within a research organization).

## Constraints in FSR/E Projects

The limited impact of the FSR/E projects reviewed prompts one to ask why these projects were not more successful. In other words, what factors operated as constraints to impede greater project impact on technology development and transfer and institutionalization of FSR/E? Generally, project impact was impeded by three general categories of constraints--core, operational, and generic, as follows.

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 the core characteristics of FSR/E outlined above. For example, in 7 or more of the 12 projects reviewed, the project's approach to FSR/E was found to be weak or lacking in problem-solving orientation and interdisciplinarity.[3] Five of the core constraints were present in five or more of the projects.

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

- Stakeholder understanding of FSR/E
- Agricultural research policy/strategy defining role of FSR/E
- Long-term commitment of resources
- Existing research capability and shelf technology
- Consensus on FSR/E methodology
- Capability to process farming systems data
- Consensus on criteria for evaluating FSR/E
- Links with extension
- Links with agri-support services
- Links with farmer organizations

For example, seven or more of the projects experienced difficulties in four of these areas--stakeholder understanding of FSR/E, agricultural research policy or strategy defining the role of FSR/E, consensus on FSR/E methodology, and links with extension. Seven of the operational constraints were present in five or more of the projects.

Generic Constraints -- A generic constraint is present when implementation of a FSR/E project is impeded by problems that can arise in any AID-funded project, regardless of the project's technical focus. Potential problems areas include:

- Project management structure
- Government funding to meet recurrent costs
- Staffing with trained manpower
- Management of training
- Management of technical assistance
- Factors beyond a project's control

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[3]Given that the study's sample was limited to 12 projects, a threshold of 7 is significant in the sense of being one more than half (6) of the 12 FSR/E projects reviewed. The specific set of 7 or more projects encountering problems in one constraint are not necessarily the same set of projects that encountered problems in any of the other constraints.

In two problem areas, staffing with trained manpower and government funding to meet recurrent costs, problems of one type or another were encountered in seven or more of the FSR/E projects reviewed. Five of the generic constraints were found in five or more of the projects.

Lessons Learned

Based on this study's review of AID's experience with 12 FSR/E projects and a recent "results inventory" of FSR/E projects and programs (Frankenberger, et al., 1988), the following appear as key "lessons learned."

Impact of FSR/E Projects -- Assessment of the impact of FSR/E on technology development and transfer is confounded by three factors (Baker and Norman, 1988:12, as cited in Frankenberger, et al., 1988:1):

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

-- Technology adoption depends upon numerous factors, including the performance of agri-support institutions (credit, production inputs, markets) that are not under the control of FSR/E teams; and

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

Beyond these factors, advocates of FSR/E may have created unrealistic expectations about how quickly or the extent to which FSR/E could by itself contribute to increasing the productivity of a country's agricultural technology development and transfer system. For example, in many countries, as Baker and Norman (1988:28) point out, there is a lack of on-shelf technologies ready for location-specific, on-farm testing and adaptation to variation in the agro-ecological environment. The problem is particularly acute in marginal areas where FSR/E teams often have been assigned. Research payoffs under such conditions take considerable time to develop and, in the short run, will be limited. Compared with more favorable environments, fewer successful interventions are available for harsh agro-ecological zones; and even marginal improvement may require substantial modifications of existing farming systems.

Thus, it is not reasonable to assume that viable results can be achieved in the same time frame for both types of environment. Yet unfair comparisons may have reinforced the impression that FSR/E has not lived up to expectations. "The 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 FS approach has not lived up to expectations" (Baker and Norman, 1988:28).

In this light, the question of whether the FSR/E concept was oversold by practitioners or overbought by AID becomes a moot point. What should have been clear from the start is that FSR/E cannot by itself be expected to make a major impact. Progress in this respect, by the nature of the activity's research component, will take time and require coordination with other agri-support institutions. Thus, donors will need to take a long-term view and set more realistic objectives.

Finally, the gap between actual and desired levels of impact of FSR/E on technology development and transfer and institutionalization of FSR/E does not appear to be associated with any shortcoming in the FSR/E concept *per se* but rather with the failure of FSR/E projects to address more effectively the core, operational, and generic constraints that impeded implementation.

Core Constraints -- During the early years of FSR/E projects, the "farming systems research" concept was neither well defined nor widely understood. Further, *bona fide* FSR/E practitioners were few and far between; within AID probably even fewer understood the core characteristics required in doing FSR/E. Indeed, the record shows that simply forming a multidisciplinary team does not guarantee that the team's members will take an interdisciplinary or problem-solving approach to the problems faced by farmers. Similarly, placing a FSR/E unit in a research organization does not mean that the organization will understand FSR/E or have the resources needed to support FSR/E. Indeed, these organizations often have lacked adequate resources to carry out conventional on-station agricultural research.

Over the years, the FSR/E concept evolved as practitioners sought to apply the concept. During this time, and as a result of confusion and uncertainty about what FSR/E is or should be, many so-called FSR/E projects (or projects including a FSR/E component) were not doing FSR/E because their approaches to FSR/E failed to comply with the core characteristics of FSR/E. Indeed, some confused on-farm trials as being synonymous with FSR/E; such a conception failed to recognize that the other core characteristics need to be present to ensure that farming systems practitioners are doing FSR/E and to increase the chances that FSR/E will make an impact. By neglecting one or more of these core characteristics, FSR/E project personnel implemented approaches that fell short of being technically-sound FSR/E.

Operational Constraints -- FSR/E project designs did not systematically address the broad range of operational constraints that were found to impede implementation of these projects. Indeed, projects sought to introduce the FSR/E approach without fully realizing that "doing FSR/E" would quickly run into the same set of constraints that have traditionally plagued the efforts of donor agencies to strengthen agricultural research and extension systems in the developing countries. One could even argue that the introduction of FSR/E made matters worse to the extent that conventional agricultural research and extension systems saw FSR/E as competing for scarce resources.

Generic Constraints -- If lack of attention to 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 AID projects, regardless of their technical content. Where AID is still committed to providing development assistance for FSR/E via projects, this study identifies key generic constraints that merit greater attention during project design and implementation.

The Farmer in FSR/E -- FSR/E sees the farmer as playing a central role in the technology development and transfer process--one of being an active collaborator, not just a passive observer. Yet FSR/E practitioners often have had difficulty implementing the farmer participation concept because research and extension systems are geared to respond to the top-down lines of authority and responsibility characteristic of highly centralized and vertically structured organizations, rather than to farmer-identified needs and priorities. Farmer participation in FSR/E likely would 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, with little or no attention paid to the other commodities that many subsistence farmers produce for sale. Several evaluations raised the issue of whether FSR/E should place greater emphasis on cash crops and technologies to assist small commercial and subsistence farmers to raise higher-valued crops or animals. Subsistence farmers, as the evaluations noted, have little interest in increasing food production beyond the quantity needed to meet family subsistence, if increased production of a crop leads to a fall in the price of that crop in the market. In short, the evaluations raised the question of whether FSR/E could play a greater role in designing farming systems that meet family subsistence requirements, while providing technological options that enable farmers to produce crops and animals having cash-earning potential.

<u>Systems in FSR/E</u> -- FSR/E projects have struggled with achieving a balance between doing systems analysis and developing improved technologies. While some FSR/E practitioners spend so much time studying the farm as a "system" that they never get around to testing potential technologies or institutional changes to overcome identified constraints, other FSR/E practitioners focus on one commodity (e.g., maize) of a farming system but fail to examine the commodity's interrelationships with the farm family and other components (e.g., livestock) of the farming system. Further, the increased attention now being paid to system components such as livestock, agro-forestry, gender, and consumption is often driven more by current fads and/or interest group advocacy than by the implications these components may have for the choice of technology options that will enhance the overall income of the farm family household.

A central issue in explaining the limited impact of FSR/E lies in how FSR/E practitioners have perceived and responded to the objective of FSR/E. While a systems orientation is a core characteristic of FSR/E, practitioners often have not gone beyond 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. In their haste to test technological alternatives in on-farm trials, the FSR/E practitioner has been overly driven by an emphasis on improving production technology, primarily for crops, as the end rather than a means.

Where the larger objective of increasing farm family income is not built into the design of FSR/E activities, the likelihood is increased that the approach will not focus adequately on the farm and farm family as a system, with the result of losing the concept of a system as a guiding rationale in FSR/E. Maintaining a focus on the farm and the farm family as a system is important because resource-poor farmers formulate management strategies and make decisions within the context of the mix of crop, livestock, and off-farm enterprises that comprise the whole economic system exploited by the farm family household. Thus, neither yield nor profit maximization is an appropriate criterion for assessing the potential utility and acceptability of a new technology in such farming systems. Yet FSR/E practitioners all too often have been obsessed with crop production technology, and failed to address the larger objective of providing small farmers with technology options to facilitate their climb up the economic ladder.

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 be careful that they do not focus so much on the trees (or crops) that they cannot see the forest (or other economic enterprises affecting farm management decisionmaking).

The failure to take a "systems" approach in FSR/E projects often may be traced to the staffing of these projects with technical assistance personnel who had little or no prior experience in doing FSR/E. They may have been experts in their own disciplines or university departments but were not accustomed to working together on an interdisciplinary team to solve farmer-relevant problems in a systems context. Clearly there is a dysfunctionality in training professionals in 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-related problem in FSR/E projects has been that on-station and on-farm technology testing place different emphases on establishing cause and effect relationships. On-station trials, which aim to establish such relationships, are highly controlled; on-farm trials are less controlled. While statistical analysis is crucial to interpreting on-station trials, 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 together 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 -- The emphasis in FSR/E on research aimed at developing technologies to relax production constraints often has resulted in a failure by FSR/E practitioners to address institutional constraints to farmer adoption of the technologies being developed. Such technologies frequently cannot be adopted by farmers unless they also have access to agri-support services (e.g., credit, production inputs, markets). Yet the institutions providing such services are characteristically weak in the developing countries. Research on improved technologies needs to be coordinated with research on the institutions that provide the agri-support services needed by farmers to adopt the improved technologies developed by FSR/E practitioners. While social scientists can play an important role in developing research on institutional issues, characterizing farming systems, diagnosing socioeconomic constraints, and monitoring and evaluation, few social scientists are brought into FSR/E programs. The problem is aggravated by a shortage of trained social scientists as well as agricultural scientists' perceptions of social scientists.

Extension in FSR/E -- Each of the FSR/E projects reviewed was located in an agricultural research organization, thereby raising the problem of how a project's research component was to be linked with extension. This problem is the obverse of that encountered by the World Bank in supporting institutionalization of the Training and Visit (T&V) System in many countries. While the Bank was fairly successful in establishing the T&V System in national extension organizations, T&V quickly ran up against the problem of accessing improved technologies that were ready for transfer to farmers. This led to a greater recognition of the need for extension personnel to be linked into site-specific adaptive research as the key to accessing improved technologies for dissemination through the T&V System.

While some FSR/E projects attempted to link research and extension by means of a Research Extension Liaison Officer, most FSR/E projects tended to view the "farming systems approach" as a research strategy, not as a strategy to integrate research and extension. This view assumes that improved technologies can be developed by researchers and then turned over to extension for dissemination to farmers. What this view fails to recognize is that extension's participation in on-farm research can enhance the responsiveness of a technology development and transfer (TD&T) system to farmers' needs.

A TD&T system, in a developing country context, resembles a chain with many weak links. While FSR/E is not a "missing link," it does focus on 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 for new FSR/E projects but to strengthen FSR/E as an integral part of the 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., providing researchers with feedback on farm-level conditions that need to be taken into consideration in setting priorities for station-based experiments). Rather, the extension agent was seen only as a helper (e.g. locating farmers who are willing to provide land for the researcher's on-farm trials).

Establishing the Link ("/") in FSR/E -- Because improved agricultural technologies are rarely transferable directly from research to extension, FSR/E teams can play an important bridging role between research and extension, working with extension and farmers to test technologies from research and with researchers to provide feedback from farmers to establish research priorities. In other words, farming systems practitioners can form the core of a FSR/E program in individual ecological zones. Such a FSR/E program would integrate research and extension personnel within the region or zone in question.

Placing a FSR/E program administratively under research can facilitate access to research results and shelf technology, and enhance the ability of FSR/E to influence on-station research priorities. 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, linking research and extension in an effective manner continues to be a major challenge for implementing a FSR/E program that can impact on technology development and transfer.

The challenge is not made any less difficult by the fact that there are few, if any, professional rewards for interdisciplinary and interinstitutional collaboration to do FSR/E. Unless incentives are provided, it will be difficult for research and/or extension personnel to make a commitment to FSR/E, that is, to working together in a way that makes the link ("/") of research and extension a productive partnership. As long as career development is contingent on advancement in a centralized research or extension organization, it will be difficult or even impossible to retain trained FSR/E personnel where they are most needed--working collaboratively with farmers at the farm level.

Methodology of FSR/E -- FSR/E's impact on technology development and transfer will be negligible as long as research and extension personnel fail to agree on a strategy for doing FSR/E. An effective strategy would outline the process and steps of technology development and transfer, specify responsibilities of research and extension personnel, and establish the necessary feedback, resource, and accountability channels. An agreed upon strategy would also be useful in training new FSR/E practitioners entering a country's research and extension system.

A key contribution of AID-funded FSR/E projects has been provision of opportunity 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. The experience of FSR/E projects suggests that, while much progress has been made to date, much work yet needs to be done in developing a consensus on the "how to" of FSR/E. Areas in which methodological development is needed include diagnosis and analysis of system components, establishing 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 agri-support services (e.g., extension, credit, production inputs, markets, and policy).

Project Orientation to FSR/E -- Agricultural research is widely recognized as a long-term venture. Yet AID's support for FSR/E always has been cast in terms of short-term projects in which core, operational, and generic constraints hampered implementation and impact. While FSR/E projects often have been criticized for not living up to their promise, many projects really were not doing FSR/E or, if they were, were poorly funded and/or managed relative to the magnitude of the problems they faced. In this sense, one could argue that the farming systems approach (or FSR/E) has yet to be put to a crucial test in an AID-funded project.

On the other hand, it also can be argued that FSR/E would not be where it is today in many countries without the support AID and other donors provided for FSR/E projects. In spite of the progress that has been made, one hears of cases where a "farming systems approach" was just beginning to become institutionalized in a particular country when the donor who initially supported FSR/E in that county decided that FSR/E did not work and that it is time to shift gears and redirect resources to new priorities (e.g., sustainability). Forgotten in the shuffle has been the realization that the typical three- or five-year time frame of FSR/E projects provided too short a period to institutionalize FSR/E as an integral component of a country's technology development and transfer system.

Sustainability of Natural Resources -- Those now concerned with "new" issues such as sustainability may fail to see that FSR/E has a role to play in addressing sustainability issues in AID-funded projects. To be sure, the FSR/E projects reviewed were not unaware of the issue of sustaining the natural resource base; indeed, several of the FSR/E projects reviewed tried to develop technologies that would enhance the sustainability of farming systems. However, AID's current emphasis on sustainability suggests that FSR/E practitioners need to pay more attention to how FSR/E can contribute to enhancing sustainability of the farming systems for which improved technologies are being developed.

The problem is not one of throwing the baby (FSR/E) out with the bath water (i.e., the shortcomings of past FSR/E projects). The problem is to ensure that projects wrapping the baby (FSR/E) in a new blanket (i.e., sustainability) are not undermined by the same core, operational, and generic constraints that were nemeses in past FSR/E projects. Indeed, those advancing an agenda for a "sustainable agriculture" should heed the lessons learned in past FSR/E projects and ensure that the constraints that impeded those projects do not come back to haunt new projects that seek to accelerate the "transition to sustainable agriculture" (Committee on Agricultural Sustainability for Developing Countries, 1988).

Sustainability of FSR/E -- FSR/E initiatives implemented through richly endowed donor-funded projects will not likely to be sustainable given the limited resources of national agricultural research and extension systems. FSR/E cannot be sustained where local institutions are unable to provide sufficient funds to meet the recurrent operational expenses involved in carrying out farm-level activities (e.g., on-farm trials). FSR/E cannot proceed where salary-loaded research and extension budgets leave few, if any, resources for field operations. External support for FSR/E needs to be structured in a way that ensures:

-- that host country organizations develop a capability to assume an increasingly larger portion and eventually all of the recurrent costs of doing FSR/E; and

-- that the level of FSR/E supported by a country serves to complement conventional agricultural research and extension systems.

Evaluation of FSR/E Impact and Benefits -- 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. Ideally, impact and benefit assessment of FSR/E should take into account the extent to which FSR/E-produced farming systems better achieve the goals of farm families, and are socially desirable in terms of such criteria as sustainability, effects on landless laborers, etc. However, there are a number of conceptual problems involved in properly assessing the impact of FSR/E in terms of these two dimensions.

Some have argued that assessment of impact and benefits is only possible in terms of simple criteria such as the speed and extent of adoption of recommended changes by farmers; and intuitive assessments of social desirability, guided where possible by empirical data on such effects as extent of soil loss, employment levels, and so on. Another factor is the extent of institutionalization of FSR/E in national agricultural research and extension systems. This will play an important role in determining how quickly innovations in biotechnology can be transformed into technology adapted to farming systems.

FSR/E Is No Panacea -- The FSR/E projects reviewed were implemented during a time in which FSR/E "theory" and "practice" were being developed. FSR/E often proceeded by trial and error rather than being guided by any proven "theory" or methodology. Under pressure to implement FSR/E projects, implementors jumped into a murky river without knowing how deep the muddy water, how swift or turbulent the current, or what obstructions might lie below the surface. In many cases, technical assistance personnel charged with implementing FSR/E projects did not know how to swim and had to struggle to keep their heads above water.

But implementors were not totally at fault. Pressures in AID to develop projects and obligate funds, combined with expectations that funding of FSR/E projects would reap a bountiful harvest, led AID to support, particularly in Africa, research projects containing FSR/E components. Importantly, during this period, there were few bona fide FSR/E practitioners available to ensure that these projects' FSR/E components would be technically sound in design and implementation. Further, AID's own oversight capability to monitor and evaluate this new technical area was limited. As a result, expectations for FSR/E were raised far beyond what even proven FSR/E practitioners could deliver, given the core, operational, and generic constraints that prevailed in all of the projects reviewed. Matters were only made worse to the extent that implementation relied on university or contractor personnel who lacked adequate training in and orientation to FSR/E and/or the country in which they were to function.

In short, AID's experience with FSR/E projects should serve as a lesson to AID to exercise greater caution as the Agency now seeks to mount new attacks on old problems. Specifically, as AID turns its attention to "new" problems such as sustainability, the Agency should refrain from assuming that there are or may be "magic bullets" for developing agricultural research and extension. There are no "magic bullets" to get agricultural research and extension to focus on sustainability any more effectively than they focused on FSR/E. The solution does not lie in "magic bullets" (e.g., biotechnology) but rather in making a commitment to address systematically the problems of agricultural research and extension on a sustained, long-term basis.

Current Status of FSR/E in AID -- Why did AID not better anticipate core, operational, and generic constraints when FSR/E projects were designed? AID is involved in a "learning process," that is, learning how best to implement development assistance and, more particularly, how FSR/E can contribute to technology development and transfer and, more recently, sustainability. During the late 1970s and early 1980s, FSR gained popularity and became the "in" thing. The term's popularity even led to its use in several AID project titles, perhaps in part to ensure rapid project approval. However, by the mid-1980s, the FSR concept had fallen or begun to fall into disrepute in AID. Indeed, the use of the term "farming systems" in AID project titles came to be avoided to minimize the possibility that a project might not be approved.

No doubt AID-funded FSR/E projects encountered problems along the way, with projects failing, at least in the short run, to achieve desired levels of impact. Yet in the longer run, as recent FSR/E assessments and field studies of FSR/E projects and programs have suggested, FSR/E institutionalization has proceeded in many countries to an extent beyond that found when the projects reviewed in this study were evaluated. Indeed, despite "declining support" for FSR/E among donors, "numerous countries around the world have reorganized their national research organizations to accommodate FSR/E" (Frankenberger, et al., 1988:4). Further, at least two regional networks, the Asian Farming Systems Network and the West African Farming Systems Network, have been established.

Despite these signs of institutionalization of FSR/E, the trend in AID funding away from FSR/E per se and toward other themes (e.g., biotechnology, non-traditional agricultural exports, and sustainability) has likely reduced the pace of institutionalization of FSR/E in many countries (Baker and Norman, 1988). Assessing the current state of institutionalization of FSR/E, Collinson (1988:2) concluded that:

> Progress...has been slow. ...of the many developing countries that have embraced FSR concepts, none has yet completed the nationwide build up of human and institutional capacity, nor the re-organization of research process, which the full exploitation of [FSR/E] concepts implies.

In spite the problems encountered in implementing FSR/E projects, AID does appear to recognize that FSR/E can contribute positively to strengthening agricultural research and extension systems. Key characteristics of FSR/E (e.g., on-farm trials) are now being designed, almost routinely, into AID-funded projects to strengthen agricultural research and extension. For example, current AID projects providing support for FSR/E include Burkina Faso Agricultural Research and Training Support (686-0270) and Bangladesh Agricultural Research Phase II (388-0051). However, the present study's scope precluded determining whether such newer projects address the core, operational, and generic constraints to FSR/E in a more effective manner than they were addressed in past FSR/E projects.

Further, a recent AID-sponsored survey of USAID Missions found a continuing concern about how to enhance FSR/E's impact on technology development and transfer and institutionalization of FSR/E in national agricultural research and extension systems. Asked to rate the priority of FSR/E-related activities in their programs, USAID Mission responses indicated that a high priority is placed on training research and extension personnel in FSR/E, institutionalization of FSR/E, and technology transfer.

What is the connection between the aforementioned survey and the present study? The present study has documented a range of constraints--core, operational, and generic--that have plagued past FSR/E projects. In so doing, the paper sheds light on the constraints that AID must address more effectively if indeed the Agency continues to place high priority on such activities as training in FSR/E, institutionalization of FSR/E, and technology transfer. Thus, the challenge for current and future AID-funded agricultural research and extension projects is to address these multiple constraints in a much more effective manner.

## 7.3 Implications for AID Programming

In reviewing the core, operational, and generic constraints that have plagued AID-funded FSR/E projects, this paper sheds light on the constraints that AID must address more effectively if the Agency continues to place high priority on such activities as training in FSR/E, institutionalization of FSR/E, and technology transfer. The challenge for current and future AID-funded agricultural research and extension projects is to address these multiple constraints in a much more effective manner. There are three major implications for AID programming:

Implication 1: AID can strengthen the contribution of agricultural research and extension systems to technology development and transfer (TD&T) by ensuring that FSR/E's nine core characteristics are systematically built into agricultural TD&T methodologies.

If properly implemented, FSR/E can contribute to technology development and transfer. This requires that the core characteristics of FSR/E be systematically built into the TD&T methodologies of agricultural research and extension systems, and that none of the characteristics are neglected or overemphasized to the detriment of another.

Each of these characteristics comprises a necessary but not sufficient condition for doing technically-sound FSR/E; if any characteristic is weak or missing in a technology development and transfer (TD&T) methodology, the methodology does not provide a technically-sound concept of FSR/E and the methodology's practitioners are not doing FSR/E. For example, a TD&T methodology that emphasizes "technology testing in on-farm trials" can easily fail to give adequate attention to other core characteristics of FSR/E. Those who would practice FSR/E need to be careful that they do not neglect any of the core characteristics or overemphasize any characteristic to the detriment of the other characteristics. Technically-sound FSR/E requires that all nine core characteristics are systematically built into a TD&T methodology.

Implication 2: AID can strengthen the contribution of FSR/E to TD&T by ensuring that agricultural research and extension projects provide means to remove or relax the operational constraints that can impede implementation of FSR/E.

The present study demonstrates that FSR/E cannot by itself ensure that improved technologies will be developed and transferred to farmers. In each FSR/E project reviewed, one or more operational constraints impeded implementation of a project's approach to FSR/E and ultimately FSR/E's impact on technology development and transfer. Thus, FSR/E is not a substitute for conventional agricultural research nor can FSR/E by itself make a significant impact on TD&T. FSR/E needs to be part of a broader TD&T methodology that takes into account and provides means to address the operational constraints to FSR/E.

Implication 3: AID can strengthen the contribution of FSR/E to technology development and transfer by ensuring that the core and operational constraints to doing FSR/E are systematically addressed on a sustained, long-term basis.

AID-funded FSR/E projects encountered a variety of problems generic to any AID project, regardless of its technical content. These problems were classified in terms of six categories of generic constraints as follows: project management structure, government funding to meet recurrent costs, staffing with trained manpower, management of training, management of technical assistance, and factors beyond a project's control.

Implementation of a FSR/E project and institutionalization of FSR/E are not facilitated by a project format that has only a three- to five-year life span. Success in agricultural research requires a longer time frame, and this is no less true in FSR/E. While FSR/E is not a substitute for conventional agricultural research, FSR/E can be instrumental in accelerating the speed with which agricultural technologies are developed and transferred to farmers. But this process is not aided by a "go-no go" orientation to agricultural research in general or FSR/E in particular. Support needs to be sustained over the long-term.

If support for FSR/E is to be provided in a project format, AID must address generic constraints more effectively through improved project design, flexibility in implementation, and improved coordination of project staffing, training, and technical assistance. Also, care needs to be taken to ensure that projects including a FSR/E component are supported by an adequate management structure. Finally, implementation and institutionalization of FSR/E cannot proceed without funding to meet recurrent costs. In this area, AID needs to structure its support for FSR/E in such a way that incentives are provided to encourage greater public and private sector support for FSR/E in particular and agricultural research and extension in general.

## 1. INTRODUCTION

### 1.1 Background

This report synthesizes United States Agency for International Development (AID) experience with farming systems research and extension (FSR/E) projects funded by the Agency between the mid-1970s to the mid-1980s. AID 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% of IARC budgets supports farming systems research programs (Anderson, 1985:225);

-- Centrally funded S&T/Office of Agriculture projects -- e.g., the Collaborative Research Support Projects (CRSPs), the Farming Systems R&D Methodology Project, and the Farming Systems Support Project (FSSP);

-- AID Regional Bureau-funded projects -- e.g., the Africa Bureau-funded CIMMYT Farming Systems Research Project; and

-- Bilaterally-funded projects -- e.g., AID/Mali-funded Farming Systems Research and Extension Project.

USAID country missions continue to design new and/or fund ongoing projects having a FSR/E component. However, AID funding for the FSSP terminated December 31, 1987, thereby ending one of the mechanisms through which the Agency supported FSR/E over the years. Yet bilaterally-funded projects continue to be a main avenue of AID support for FSR/E. The question arises whether the current direction and level of support for bilaterally-funded FSR/E projects is appropriate relative to the Agency's mandate.

Answering this question is difficult because of the confusion as to 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 Sands (1986:87) 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.

A second difficulty is the lack of information on:

-- 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; and

-- 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 time frame. Expectations for FSR/E may have been unrealistic (e.g., someone oversold the idea). Even if expectations have been realistic, there is the question of what lapse of time is necessary before assessing whether FSR/E has succeeded or failed and to what degree.

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

These various difficulties--the confusion surrounding FSR/E, the lack of information in the aforementioned areas, and the potential discrediting of FSR/E, while failing to recognize the approach's valuable elements--restrict the basis on which an informed judgement 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, at the crossroads, in making decisions about the nature and level of support for FSR/E that will be in the Agency's best interest.

## 1.2 Objective

The objective of the review is to contribute to the ongoing discussion within the Agency about FSR/E. Specifically, the review provides the reader with information about 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 Target Audience

The primary audience for this synthesis is comprised of AID officials concerned with strengthening technology development and transfer capacity in the developing countries. Another audience includes professional staff of agricultural education, research, and extension organizations in the developing as well as developed world. The term extension is used in the generic sense of covering the full range of organizations engaged in agricultural technology transfer--public sector agencies, private voluntary organizations (PVOs), and private sector firms.

### 1.4 Methodology

A description of the study's methodology is presented in Annex A. Data for the study were collected through a review of FSR/E literature, key informant interviews, and the preparation of individual case studies on 12 AID-funded FSR/E projects, including projects which, while not specifically called "Farming Systems Research and Extension" projects, included a significant FSR/E component. The case study of each project was based on a review of the AID-sponsored evaluation documents for that project. The individual case studies are available on request from AID's Center for Development Information and Evaluation (CDIE).

Annex D provides a project description sheet on each of the 12 projects. Annex E summarizes AID's funding of these projects. These 12 projects, each having a major FSR/E component, accounted for more than $80,000,000 of the funds spent by AID on agricultural research and extension projects between 1975 and 1987.

### 1.5 Organization of Report

Section 1 introduces the study's objectives and methodology, while Section 2 provides an overview of FSR/E. Section 3, drawing on the 12 FSR/E project case studies, assesses project impact in terms of technology development and transfer, and institutionalization of FSR/E. In the following three sections, potential constraints to project impact are explored. Section 4 focuses on core constraints, while Sections 5 and 6 focus on operational and generic constraints, respectively. Finally, Section 7 presents the study's conclusions, focusing on the findings, the lessons learned, and implications for AID programming arising from this study's review of AID's experience with FSR/E projects.

# 2. OVERVIEW OF FSR/E

> Some have recommended that the term FSR 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).

Considerable discussion has surrounded the farming systems research and extension (FSR/E) concept over the past decade. However, a consensus on FSR/E is emerging. This chapter presents a summary overview of the emerging consensus.

## 2.1 Origin of FSR/E

The origin of the Farming Systems Research and Extension (FSR/E) concept lies in pioneering "farming systems" studies conducted in the post-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 Collinson and Norman in Africa; Hildebrand and Hart in Latin America; and Bradfield, Harwood, and 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 Sands, 1986:88-89):

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

-- That small farmers reject technologies out of sheer ignorance, traditionalism, or sloth. We now recognize that small farmers are rational decision-makers; they often pursue goals and employ criteria for evaluating technologies distinct 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 whole economic system exploited by the household, including cropping, livestock, and off-farm enterprises. Neither yield nor profit maximization can be assumed to be the appropriate criteria 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 rendered inappropriate by the great diversity in 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, and all too frequently, the so-called "improved" technologies generated in research programs guided by these assumptions failed to provide the farmer with any incentive to adopt the subject technologies, given the management conditions under which he or she operated.

Responding to this situation, a growing number of farming systems (FS) practitioners argued: (1) that development of improved technology for small farmers must be grounded in a knowledge of the existing farming system; and (2) 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 during this period began to provide evidence that multidisciplinary teams comprised of natural and social scientists could identify opportunities for appropriate technology change among farmers.

The early work of FS pioneers as well as research programs initiated by the IARCs played a formative role in the origin and evolution of FSR. During the late 1970s and early 1980s, the number of "farming systems" projects increased rapidly. But, as Chapman and Castro (1988:4-5) 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 LDC 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 AID 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. . . .

Thus, as Chapman and Castro (1988:6) 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.

## 2.2 Defining FSR/E and "Farming System"

Since the "early days" of the FS pioneers, the FSR concept has continued to evolve with implementation and practical experience. One sign of this 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 (albeit land, labor, time, or whatever) on the system.

Yet another sign of the continuing evolution of the FSR concept was the addition of the "/E" to an earlier, more narrowly defined concept that saw FSR as "an approach to research" and a "normal part of the agricultural research process" (Plucknett, 1987). However, while FSR is certainly not a new science or discipline, it is 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 (FSR/E) but also with the full range of agricultural support institutions governing 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, the "FSR/E" acronym 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. On the other hand, a "farming system" may be defined as:

> 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, et al., 1982:214).

In conducting research on a farm as a system, FSR/E focuses on:

-- the farm family's attributes (for example, goals, preferences, skills, access to resources, choice of productive activities, and management practices);

-- the interdependencies among system components which farm family household members are able to control; and

-- the interaction of these components with the physical, biological, and socioeconomic factors not under the household's control (Shaner, et al., 1982:13).

The scope of FSR/E tends to be more limited than that of integrated rural development (IRD) which focuses on a broad set of development problems. FSR/E, in contrast, 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 (FSR/E) but also by implementing appropriate policy and support systems (FSIP). FSR/E is a strategy aimed at developing and disseminating improved agricultural technologies at the farm level. The principal product of FSR/E is technology and the primary clients are limited-resource farmers. FSIP operates at a more macro level than FSR/E and attempts to analyze and influence policy and/or the progress of institutions which may affect small farmers. The principal product of FSIP is information, and the primary clients are policy makers and managers of services and infrastructure (Hildebrand and Waugh, 1983).

## 2.3 Goals of FSR/E

Nearly a decade ago, the Technical Advisory Committee (TAC) to the Consultative Group on International Agricultural Research (CGIAR) commissioned a Review Team to analyze the FSR programs at the IARCs. The overall goal of FSR, in the view of the Review Team, is "to contribute to the improvement of human welfare through sustainable increased agricultural productivity" (Dillon, et al., 1978:17). Adapting the Review Team's conception of the more specific goals of FSR, the goals of FSR/E may be stated as follows (adapted from Dillon, et al., 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 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; and

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

## 2.4 Objectives of FSR/E

TAC's FSR 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 are (adapted from Dillon, et al., 1978; Plucknett, et al., 1986; and Plucknett, 1987):

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

- To identify and evaluate existing, important farming systems in specific physical and socioeconomic environments, 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, etc.) and opportunities for change in existing farming systems and thereby to assist in focusing research on key constraints that limit production, farm income, and their sustainability;

-- To enhance the capacity of research organizations to conduct research on priority farming systems' problems so that they are better able to design improved production systems;

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

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

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

While these objectives imply an active FSR/E program, all objectives likely would not receive full or equal treatment in a given FSR/E program.

## 2.5 Core Characteristics of FSR/E

FSR/E is a process having nine core characteristics, with each characteristic being a necessary but not a sufficient condition for doing FSR/E. These characteristics are (adapted from Sands, 1985, 1986; Wiese, 1985; Hildebrand, 1985; and Farrington and Martin, 1987):

FSR/E is farmer-oriented. FSR/E practitioners target small-farm families as the client group for agricultural research, with the fundamental objective of generating technology relevant to the management conditions of this client group. This is done by identifying these conditions before proposing technological solutions, and by adapting technologies to local circumstances and needs.

FSR/E involves the client group as participants in the research and extension process. FSR/E practitioners involve and work with client group members (i.e., small farmers) in designing, implementing, and evaluating research and extension activities.

<u>FSR/E recognizes the locational specificity of technical and human factors</u>. FSR/E practitioners identify client groups in terms of homogeneous groups of farming systems in specific agro-climatic zones. These groupings may be further defined in terms of research, recommendation, and diffusion domains. The criteria used to classify farming systems into a domain will depend on the practitioner's objectives. For example, a practitioner working at an International Agricultural Research Center may develop generalized categories of farms grouped largely according to agro-climatic 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 socioeconomic status of the household.

<u>FSR/E is a problem-solving approach</u>. Once a region's farming systems are grouped into homogeneous agro-climatic zones, a FSR/E practitioner identifies the limiting technical, biological, and socioeconomic constraints to improved farm productivity and farm family income. Data on these constraints provides one of the bases for identifying technologies that may be effective in removing or relaxing the constraints and feasible for the client group of farming households to adopt. Thus, the primary concern of FSR/E is helping farmers to solve problems.

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

<u>FSR/E is interdisciplinary</u>. 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.

<u>FSR/E complements, not replaces, conventional commodity and discipline research</u>. FSR/E draws upon technologies and management strategies generated by conventional discipline and commodity research and adapts this knowledge to the agro-climatic environment and socioeconomic circumstances of a relatively homogeneous target group of farmers.

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 decisionmaking criteria, and allows for potentially improved technology to be evaluated under the environmental and management conditions in which it will be used.

FSR/E provides feedback for shaping research priorities and agricultural policies. FSR/E provides information on farmer goals, needs, priorities, and criteria for evaluating technologies, and how new technologies perform under farm-level conditions. Results of one season's trials generate hypotheses for testing in the next. Further, trial results provide an input to the setting of on-station research priorities as well as to the formulation of regional- and national-level policy.

Each of the nine characteristics must be present in a technology development and transfer (TD&T) methodology in order for the methodology to provide a technically sound approach to doing FSR/E. If one or more of the characteristics is missing or weak in a TD&T methodology, the methodology really does not constitute a technically sound FSR/E and the methodology's practitioners are not really doing FSR/E. For example, a TD&T 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, the FSR/E practitioner needs to be careful that he or she does not 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 Norman and Collinson, 1985; and Sands, 1986:94-96); (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 this 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 basic steps are followed: (1) a review of secondary sources for basic data and descriptive information on the target region, (2) the identification of recommendation domains or target groups of farmers, (3) an exploratory survey or reconnaissance of the region, and (4) a formal verification survey.

### 2.6.2 Design or Planning

During this 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) as well as farmers' knowledge play an important role in identifying potential technologies to deal with the identified constraints. Also important at this stage is the *ex ante* evaluation of 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 this stage, technologies identified in the design stage are tested under farm conditions to identify:

> 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 (Sands, 1986:95).

Farm family participation in on-farm trials is critical. Farmers evaluate new technologies under their own management conditions. These evaluations are channelled 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 this stage, adapted technologies are disseminated through extension 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, the farming systems for which 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 this stage, occurring throughout the FSR/E process, the pattern of farmer adoption of technology is monitored as a check on the technology's relevance and utility. Within resource limitations, 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). Such information as may be gleaned is used as a guide in setting priorities for future agricultural research as well as for agricultural policy and other agricultural support institutions serving small-farm agriculture.

## 2.7 Summary

This section has provided an overview of key concepts that define that field of farming systems research and extension (FSR/E). Table 1 provides a summary listing of these key concepts. Additional aspects on FSR/E are discussed in Annexes B and C. Annex B reviews types of FSR/E, while Annex C discusses emerging trends in FSR/E.

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Table 1. Key Concepts in Farming Systems Research and Extension.

Core Characteristics of FSR/E

* Farmer orientation
* Farmer participation
* Locational specificity of technical and human factors
* Problem-solving approach
* Systems orientation
* Interdisciplinarity
* Complementarity with commodity and discipline research
* Technology testing in on-farm trials
* Feedback to shape agricultural research priorities and agricultural policies

Stages of FSR/E

* Diagnosis or Description
* Design or Planning
* Testing or Experimentation
* Extension or Recommendation and Dissemination
* Monitoring and Evaluation

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## 3. IMPACT OF FSR/E PROJECTS

The project evaluation documents reviewed for this study shed only limited light on the question of the extent to which FSR/E projects were successful in achieving their stated purposes and goals. The limited utility of these evaluations in assessing FSR/E project impact on technology development and transfer or institutionalization of FSR/E in agricultural research and extension systems derives from several factors.

First, assessment of the impact of FSR/E on technology development and transfer is confounded by three factors (Baker and Norman, 1988:12; as cited in Frankenberger, et al., 1988:1):

- -- The relative contributions of conventional agricultural research and FSR/E are not readily separable since they are complementary activities.
- -- Technology adoption depends on numerous factors, including the performance of agri-support institutions (credit, production inputs, markets) that are not under the control of FSR/E teams; and
- -- Because FSR/E encompasses technological development and institutional change, significant results may only be achievable in a longer-time frame (e.g., 10-25 years).

Second, the FSR/E projects reviewed typically were yet being implemented when they were evaluated. If "significant results may only be achievable in a longer-time frame (e.g., 10-25 years)," then the typical three- to five-year time frame of the FSR/E projects reviewed could not provide sufficient time for improved technologies to be developed and transferred to small farmers on any significant scale. While a FSR/E project may have begun to make an impact, this impact really may not begin to be significant until some point in time after a project has been evaluated or even some point long after the project has ended.

Third, reading an evaluation of a FSR/E project is a great deal like looking at the light from a star. The light from a star cannot confirm that the star still exists. Similarly, a FSR/E project evaluation that is now two years old may provide a glimmer that the project had started to impact on technology development and transfer or institutionalization of FSR/E. However, while that project's impact subsequently may have been greater than that suggested by the evaluation report, that report cannot confirm the current status or impact of FSR/E in the country in which the FSR/E project in question was conducted. Like a star that has died, the initial spark of enthusiasm for FSR/E may have been extinguished in the wake of competing demands on scarce resources.

Despite limitations involved in using evaluations to review AID's experience with FSR/E projects, the evaluations do begin to sketch a picture of the extent to which AID-funded FSR/E projects made progress in fostering technology development and transfer and institutionalizing FSR/E in the countries in which these projects were implemented. However, the emerging picture is one that shows FSR/E projects moving at a relatively slow pace in developing improved agricultural technologies, transferring these technologies to farmers, and institutionalizing FSR/E.

This is important in the context that FSR/E projects typically encountered pressure to establish credibility in the face of expectations of quick results. The second evaluation of Lesotho/FSRP, for example, recommended that the technical assistance (TA) 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; emphasis added). In another project (Botswana/ATIP), the problem of quickly establishing credibility was also 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 AID, 1986: Annex J, p. J-2; emphasis added).

Indeed, "pressures from donor agencies and government officials for 'quick results,' whether real or imagined, result in frustrations for [farming systems] teams" (AID, 1986:Annex J, p. J-2). Such considerations led the first ATIP evaluation 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).

While most FSR/E practitioners believe that FSR/E initiatives should be 10-20 years, most AID-funded FSR/E projects were authorized for five years (although AID Handbook policy permits project designs up to 10 years). However, as one observer noted, 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, five-year time frame" (Francis, et al., 1984:12).

In the following, vignettes from FSR/E project evaluations provide evidence, in one country after another, of the slow pace of impact of the reviewed FSR/E projects on technology development and transfer, and institutionalization.

## 3.1 Technology Development and Transfer

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

Lesotho/FSRP -- By FSRP's second evaluation, TA had been provided for nearly two 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 underway 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 evaluation's 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 of relevant technology (Martin, et al., 1981:21). During the two years following the second evaluation, FSRP 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).

Senegal/ARPP -- The mid-term ARPP evaluation 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 ARPP was initiated, there was a recognition that some of the project's 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 implementors recognized that progress toward this objective might not be clearly measurable in the first phase of the project (St. Louis, et al., 1985:2).

Overall, the evaluation noted the dissatisfaction expressed over the "lack of results" of Production Systems Research (PSR). 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. ...PSR tries to account for the complexity of a...system and how changes can be expected to influence it. This...puts PSR into an extensive time frame, 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 pay off of the current data collection and analysis methods...could very well justify the delay (St. Louis, et al., 1985:61).

Tanzania/FSRP -- FSRP provides an example of the negative impact on technology development that results when AID support for a FSR/E project is provided for only a short length of time and project support is then cut off. This project sought to introduce FSR in the Tanzanian Agricultural Research Organization. Implementation was curtailed when application of the Brooke amendment required USAID/Tanzania to reduce funding to the Mission's projects. Comparing actual to planned accomplishments, the Project Completion Report found that FSRP had fallen short of its targets (Faught, 1986:15). FSR had been introduced "on too limited a scale and conducted for too short a time to have had any significant impact" (Faught, 1986:15).

Philippines/FSDP -- The first FSDP evaluation found that FSDP had, during its first two 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 FSDP made progress during the next two 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).

ROCAP/SFPS -- The first SFPS evaluation (Mann, et al., 1981) found the project staff troubled by the requirement that "techpacks" (technology packages) be developed for mixed farming systems. While the design called for a specific number of techpacks, the evaluation noted that the success of SPFS "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 FSR/E methodologies, and institutionalizing FSR/E require a period of time that may be longer than that allowed by the time frame of a project.

## 3.2 Institutionalization of FSR/E

Generally, FSR/E projects made a major contribution in terms of training developing country nationals in FSR/E theory and practice. However, significantly less progress has been made in terms of institutionalizing FSR/E within ongoing agricultural research and extension systems. Consider the following examples from FSR/E projects.

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

> apparent that the original Logframe was overly optimistic and unrealistic. While...ATIP...is already identifying technical changes which will work under specific conditions, it is not likely that these will increase grain production by 10% or increase per capita income by 10% (as stated in the original Logframe) (AID, 1986:6).

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

Accordingly, USAID/Botswana's revised Logical Framework for ATIP identified institutionalization of FSR 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" (AID, 1986:8). However, by the second evaluation, institutionalization was no longer expected to take place

> before the end of the present [TA] contract. Rather, ...the project will have provided sufficient experience and empirical evidence by the PACD to demonstrate whether...the FSR approach should be institutionalized (AID, 1986:6).

When the PACD was extended, the rationale was to provide an additional year in which to test the FSR approach. The evaluation concluded that Botswana's severe agro-climatic conditions had not given ATIP "an opportunity to fully test the effectiveness of an FSR approach or develop technologies appropriate to varying rainfall conditions" (AID, 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" (AID, 1986:6).

<u>Lesotho/FSRP</u> -- While one FSRP objective was to develop a FSR Unit, the second FSRP evaluation concluded that the project's designers had been unrealistic in thinking that a FSR Unit could be established as a separate unit within a newly created Research Division (RD). 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 RD professionals felt that the TA team should support the building of the entire RD. The evaluation recommended that FSRP reduce "its visibility as a Farming Systems Project," that the FSR Unit not be established, and that the project identify more closely with the RD, 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 output of a FSR Unit had not been officially changed by the third evaluation, all parties (GOL, TA team, and USAID/Lesotho) agreed that the project should strengthen the overall RD program rather than establish a FSR Unit. With the TA team's departure, the final evaluation concluded that the RD had not yet developed an adaptive research capability (Frolik and Thompson, 1986:28). The evaluation felt that the RD 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).

<u>Tanzania/FSRP</u> -- FSRP was carried out within the fairly new Tanzania Agricultural Research Organization (TARO) (Jackson and Osburn, 1986). But the project's design had divorced TARO from the research organization it represented. A former TA team member recalled: "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 on FSRP concluded that FSR/E had "failed to establish a firm organizational niche within the Government structure" (Faught, 1986:4).

Nepal/ARPP -- The mid-term ARPP evaluation found that the project's attempt to base FSR activities in the Farming Systems Research and Development Division (FSRDD) "had not been as effective or efficient as hoped in promoting an understanding of FSR as a...research strategy" (Rood, et al., 1988: 15). The lack of permanent personnel in the FSRDD and the Socioeconomic Research and Extension Division contributed to ARPP's difficulty in meeting its targets to place 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 TA 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).

Honduras/ARP -- ARP sought to institutionalize improved agricultural research methods, that is, to make those methods a part of the normal, ongoing routine. ARP's third evaluation noted that this 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 GOH funding commitments are essential for institutionalization to succeed (Hansen, et al., 1984:17).

However, the GOH did not make a commitment to UNAT in terms of budgeting staff positions for FSR/E. As the evaluation noted:

> None of the HARP professionals occupy regular DIA [Department of Agricultural Research] line positions. There are no institutionalized positions so no one is really counterparting anyone. Counterparting refers to the situation where one person has a regular position and is advised by someone. In HARP 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 HARP. ...HARP works and is housed in region 3...[but] it does not answer to the...MRN Regional Director. Although HARP is apparently an MRN group it works semi-autonomously, 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).

ROCAP/SFPS -- The third SFPS evaluation noted that the Tropical Agricultural Research and Training Center (CATIE) is funded along project lines. As a result, CATIE 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 (IPM), 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 SFPS project (Zimet, et al., 1986:12-13).

## 3.3 Assessment of FSR/E Project Impact

On a positive note, FSR/E projects have been influential in training developing country professionals in the principles of FSR/E and providing opportunities during implementation to gain practical field experience in doing FSR/E. FSR/E projects also have been influential in changing the attitudes and perceptions of researchers about small farmers as the clients of agricultural research. Finally, FSR/E projects have influenced the way in which agricultural researchers define research problems, set research priorities, and carry out problem-oriented research at the farm level. In the final analysis, such changes may have a much longer-term impact on institutionalization of FSR/E than short-term project objectives (e.g., establishing a "FSR Unit" within a research organization).

Yet these vignettes, viewed collectively, suggest that AID-funded FSR/E projects all too frequently failed to achieve the desired or expected level of impact, where impact is defined in terms of (1) development of improved agricultural technologies and their transfer to farmers, and (2) institutionalization of FSR/E as a routine modus operandi in agricultural research and extension systems. Of course, it should be remembered that the reviewed projects typically were evaluated during implementation and that these evaluations did not provide information to assess impact beyond the life of a project.

Nevertheless, the picture emerging from these evaluations, of FSR/E projects not living up to the early expectations held for them, prompts one to ask why these projects were not more successful. In other words, what factors or constraints operated in these projects to impede greater project impact on technology development and transfer, and institutionalization of FSR/E?

Analysis of case studies summarizing evaluations of the 12 AID-funded FSR/E projects reviewed suggests that implementation and impact have been impeded by a series of factors that may be classified into three general categories of constraints:

-- Core constraints;

-- Operational constraints; and

-- Generic 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 the core characteristics of FSR/E outlined in section 2.5, as follows:

- o Farmer orientation
- o Farmer participation
- o Locational specificity of technical and human factors
- o Problem-solving approach
- o Systems orientation
- o Interdisciplinarity
- o Complementarity with commodity and discipline research
- o Technology testing in on-farm trials
- o Feedback to shape agricultural research priorities and agricultural policies

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

- o Stakeholder understanding of FSR/E
- o Agricultural research policy/strategy defining role of FSR/E
- o Long-term commitment of resources
- o Existing research capability and shelf technology
- o Consensus on FSR/E methodology
- o Capability to process farming systems data
- o Consensus on criteria for evaluating FSR/E
- o Links with extension
- o Links with agri-support services
- o Links with farmer organizations

A generic constraint is present when implementation of a FSR/E project is impeded by problems that can arise in any AID-funded project, regardless of the project's technical focus. Potential problem areas include:

- o Project management structure
- o Government funding to meet recurrent costs
- o Staffing with trained manpower
- o Management of training
- o Management of technical assistance
- o Factors beyond a project's control

Table 2 provides a summary of the frequency of negative and/or positive instances of these constraints across the twelve FSR/E projects reviewed. Any particular constraint can impede implementation and impact of a given FSR/E project, and any particular constraint may be more important in one FSR/E project than another. However, certain constraints appeared with greater frequency across projects than other constraints. Given that the study's sample was limited to 12 projects, a threshold of 7 is significant in the sense of being one more than half (6) of the 12 FSR/E projects reviewed. It should be noted that the specific set of 7 or more projects encountering problems in one constraint are not necessarily the same set of projects that encountered problems in any of the other constraints.

As the reader may observe in Table 2, the core constraints that appeared most frequently (i.e., in 7 or more projects) were:

- -- "Problem-solving" approach; and
- -- Interdisciplinarity.

The operational constraints that appeared most frequently were:

- -- Links with extension;
- -- Consensus on FSR/E methodology;
- -- Stakeholder understanding of FSR/E; and
- -- Agricultural research policy or strategy defining the role of FSR/E;

The generic constraints appearing most frequently were:

- -- Management of technical assistance;
- -- Staffing with trained manpower; and
- -- Government funding to meet recurrent costs.

In the following three sections, vignettes from the 12 FSR/E projects reviewed illustrate the core, operational, and generic constraints that FSR/E project implementors encountered in trying to carry out their concept of and approach to FSR/E. In turn, by highlighting the factors that have impeded implementation and impact of FSR/E projects, this paper alerts those designing, implementing, and evaluating projects involving an FSR/E component to specific constraints which, if addressed more effectively, could enhance the contribution and impact of FSR/E in AID-funded agricultural research and extension projects.

Table 2. Frequency of Negative (-) and/or Positive (+) Instances of Core, Operational, and Generic Constraints in Twelve AID-Funded FSR/E Projects--1975-1987.

| Core Constraints | - | + |
|---|---|---|
| o Farmer Orientation | 1 | 0 |
| o Farmer Participation | 4 | 3 |
| o Locational Specificity of Technical and Human Factors | 5 | 0 |
| o Problem-Solving Approach | 8 | 0 |
| o Systems Orientation | 5 | 1 |
| o Interdisciplinarity | 7 | 0 |
| o Complementarity with Commodity and Discipline Research | 2 | 0 |
| o Technology Testing in On-Farm Trials | 4 | 1 |
| o Feedback to Shape: | | |
| Agricultural Research Priorities | 4 | 2 |
| Agricultural Policies | 2 | 1 |
| **Operational Constraints** | | |
| o Stakeholder Understanding of FSR/E | 7 | 0 |
| o Agricultural Research Policy or Strategy Defining Role of FSR/E | 7 | 2 |
| o Long-Term Commitment of Resources | 5 | 1 |
| o Existing Research Capability and Shelf Technology | 5 | 0 |
| o Consensus on FSR/E Methodology | 8 | 0 |
| o Capability to Process Farming Systems Data | 4 | 2 |
| o Consensus on Criteria for Evaluating FSR/E | 4 | 1 |
| o Links with Extension | 9 | 0 |
| o Links with Agri-Support Services | 5 | 1 |
| o Links with Farmer Organizations | 0 | 3 |
| **Generic Constraints** | | |
| o Project Management Structure | 6 | 0 |
| o Government Funding to Meet Recurrent Costs | 9 | 1 |
| o Staffing with Trained Manpower | 10 | 0 |
| o Management of Training | 5 | 3 |
| o Management of Technical Assistance | 10 | 3 |
| o Factors Beyond a Project's Control | 4 | 0 |

Note: Annex A (Methodology of Study) discusses the procedure followed to identify these constraints. Frequencies are based on a simple count of the number of projects in which the case studies provided evidence of a constraint's presence.

## 4. CORE CONSTRAINTS IN FSR/E PROJECTS

FSR/E involves nine core characteristics (section 2.5). On the one hand, if a FSR/E project's concept of and approach to FSR/E lacks or is weak in one or more of these characteristics, the project's chances of impacting on technology development and transfer or institutionalization of FSR/E are likely reduced. On the other hand, if any one or more of these core characteristics is weak or missing in a FSR/E project, the chances are likely increased that the project is not really doing FSR/E. Thus, if one asks why AID-funded FSR/E projects have not made a greater impact on technology development and transfer or institutionalization of FSR/E, then one explanation may be that the concept of and approach to FSR/E in many of these projects lacked or was weak in one or more of the nine core characteristics. Whatever was being done under the name of "farming systems," it was not FSR/E or in some way fell short of being FSR/E.

Certain core constraints appeared more frequently across the 12 FSR/E projects than others. In seven or more of the 12 projects, the project's concept of and approach to FSR/E was weak or lacking in "problem solving" orientation and interdisciplinarity. A threshold of 7 is significant in the sense of being one more than half (6) of the 12 projects[4] While certain core constraints appeared more frequently than others across projects, it may be more important to remember that the presence of any particular constraint in a FSR/E project can seriously impede that project's implementation and impact, and that core constraints were found in all of the FSR/E projects reviewed.

### 4.1 Farmer Orientation

FSR/E is farmer-oriented. FSR/E practitioners target small-farm families as the client group for agricultural research, with the fundamental objective of generating technology relevant to the management conditions of this client group. This is done by identifying these conditions before proposing technological solutions, and by adapting technologies to local circumstances and needs. However, establishing a "farmer orientation" in a FSR/E project is not something that just comes along naturally. The case of Lesotho/FSRP is illustrative.

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[4]The 7 or more projects encountering problems in a particular constraint are not necessarily the same projects that encountered problems in any of the other constraints.

Lesotho/FSRP -- The second FSRP evaluation found that the TA team's failure to develop a profile of farming systems in the project's target area was a constraint to reaching "a consensus on what type of farmers...and what production technologies should receive...attention" (Martin, et al., 1981:19). "Lack of consensus 20 months after initiation of the project as to who...the target population is and what types of innovations are most likely to improve his/her farm enterprise is a significant liability" (Martin, et al., 1981:28).

A constraint to consensus was the existing split in agricultural policy. While donor projects were aimed at the Lesotho smallholder, the GOL was "engaged in a substantial program of large-scale mechanized farming to make Lesotho self-sufficient in food grains by using modern technology and inputs in a...commercial operation" (Martin, et al., 1981: 31). This split carried over into FSRP; while some felt that FSRP should aim at improving the level of subsistence agriculture, others felt that FSRP should develop small-scale commercial agriculture. "The project itself is divided on this issue" (Martin, et al., 1981:31).

## 4.2 Farmer Participation

FSR/E involves the client group as participants in the research and extension process. FSR/E practitioners involve and work with client group members (i.e., small farmers) in designing, implementing, and evaluating research and extension activities. Deficiencies in establishing farmer participation were encountered in at least a third (4) of the FSR/E projects reviewed. Philippines/FSDP provides an example.

Philippines/FSDP -- The first FSDP evaluation found evidence that farmer participation did not go beyond farmers being asked about their problems and giving their consent for FSDP to conduct trials in their fields. Many farmer-cooperators appeared "to have had little control over the choice of the cropping pattern for the verification trials thereby suggesting that farmers have had little say about the proposed solutions" (Mazo, et al., 1983: 32). This point was supported by a number of instances cited by the evaluation (Mazo, et al., 1983:30, 32):

- Growing crops on fields where farmers indicated another crop as the traditional crop.
- Planting crops in spite of the farmers' warning that the timing was wrong and could bring about severe pest infestation, with the project telling the farmers that timing would not be an important factor because insecticides could be applied if needed.

- -- Planting rice in a farmer's field even after the farmer had indicated a preference to eat corn and would now have to buy it.
- -- Not considering farmers' preference for the eating qualities of the traditional rice variety and that this variety's price was almost twice that of the variety the project was trying to introduce.
- -- Designing cropping trials without reference to seasonal variability in market demand and prices or the farmer's knowledge of these factors.
- -- Ignoring the farmer's wife in the design of procedures to gain farmer cooperation in identifying production constraints, despite evidence that the farmer's wife plays a major role in making decisions about the investment of family resources.

Most farmer-cooperators did not "feel or act as partners of the site teams in the conduct of the experiments. A number... have been involved only in plowing the field and, in many cases, all other labor was...provided by [the Site Research Management Unit] or by hired hands" (Mazo, et al., 1983:33). Minimal farmer participation, combined with farmer perception that they were not members of the field site teams, led to a situation where the farmers had a minimal understanding of FSDP's activities. Most farmers believed that the trials demonstrated new technology that was already proven and that they were expected to adopt. "There was...no appreciation...that the trials represented experiments to test and to compare different approaches under farm conditions" (Mazo, et al., 1983:33). Some farmers did not know what crop varieties had been planted, while few farmers could provide the rationale for rotating leguminous crops with grain crops.

One problem was that the work of the Site Research Management Unit (SRMU) teams placed project staff in the position of being perceived by farmers not as researchers but as extension workers. When an evaluation team asked cooperators what was the project's purpose, farmers usually responded "to give advice to farmers" (Sajise, et al., 1985:46). Asked how the project had benefited them, the same cooperators cited the new crops and varieties, the provision of inputs (e.g., fertilizers) for cropping pattern trials, and livestock dispersals. The evaluation also noted that FSDP's extension role hid the project's main purpose (technology development) from farmers. "Very few farmers, cooperators and non-cooperators, had any notion that [farming systems] involves research to develop and screen new technologies" (Sajise, et al., 1985:47).

## 4.3 Locational Specificity of Technical and Human Factors

FSR/E recognizes the locational specificity of technical and human factors. FSR/E practitioners identify client groups in terms of homogeneous groups of farming systems in specific agro-climatic zones. Difficulties in taking "locational specificity" into account were evident in five of the 12 projects reviewed. The cases of Senegal/ARPP and Philippines/FSDP are illustrative.

Senegal/ARPP -- The mid-term ARPP evaluation noted that the project's Production Systems Research (PSR) teams had found that it took a longer to develop cropping pattern recommendations in on-farm trials than in on-station trials. Delays in developing recommendations in on-farm trials, due to erratic rainfall patterns, micro-variation in topography, and ethnic heterogeneity, led ARPP into a debate on the importance of precision versus timeliness of research findings. While the PSR team was considering the possibility of doing research on the management of livestock in each production zone to improve the precision of research findings, the team recognized that many other secondary criteria could be used to define production zones but would disperse the area into several smaller zones. This would increase field costs, pose logistical problems, and make it difficult for extension services to provide specific technology packages over a larger area.

Philippines/FSDP -- The second FSDP evaluation noted that the project's mandated focus on crops grown by upland farmers directed research resources to previously neglected crops but "eliminated problem identification as the first step in the farming system approach at the site level" (Sajise, et al., 1985:32). Most Site Research Management Units (SRMU) merely targeted their efforts on farmers with less than 3 hectares of land. Thus, there was little stratification of the target population due an implicit assumption

> that all farming households in upland areas are relatively homogeneous.... . . . The various sondeos, socioeconomic profiles, and baseline studies reflected an assumption of homogeneity with data presented largely in terms of modal distributions. Cooperator selection and technologies being developed and methods of working with site farmers have, as one result, assumed homogeneity. . . . Understanding diversity would allow for better targeted research and extension efforts, and would allow for a better understanding of cases of adoption and non-adoption (Sajise, et al., 1985:35, 57).

But FSDP had 72 research locations scattered over the Eastern Visayas, with 6 sites and 12 farms per site. Several factors impeded implementation, including staff inexperience in implementing FSR, lack of understanding of the existing farming systems, and the time involved in traveling between research sites. Further, the "generally large number of locations at each site where field tests [were] underway may have prevented the [Site Research Management Unit] staff from spending time to fully understand the existing systems and how these should affect the proposed interventions (Mazo, et al., 1983:56). This led the evaluation to conclude that FSDP had too many research locations and recommended that the number of locations be reduced.

## 4.4 Problem-Solving Approach

FSR/E is a problem-solving approach. Once a region's farming systems are grouped into homogeneous agro-climatic zones, a FSR/E practitioner identifies the limiting technical, biological, and socioeconomic constraints to improved farm productivity and farm family income. Data on these constraints provides one of the bases for identifying technologies that may be effective in removing or relaxing the constraints and feasible for the client group of farming households to adopt. Thus, the primary concern of FSR/E is helping farmers to solve problems. Establishing a problem-solving approach was found to be a constraint in at least eight of the 12 projects reviewed. Botswana/ATIP and ROCAP/SFPS are illustrative.

Botswana/ATIP -- The second ATIP evaluation noted that extension workers may not have cooperated in ATIP because they did not understand FSR. However, the evaluation team found that senior level extension staff had a very good basic knowledge of FSR. To the contrary, the team expressed concern that ATIP staff were "not focusing enough attention on...important problems identified by farmers, but rather on what [ATIP staff]...had decided to do research on" (AID, 1986:42).

ROCAP/SFPS -- The third SFPS evaluation noted the lack of a "problem-solving" approach in SFPS' technique of characterizing the farmers at project sites in each participating country. The technique of characterizing "was observed religiously at the outset of each country project" (Zimet, et al., 1986:59). However, it was not clear "precisely what were the objectives to be achieved and how they were to be reached" (Zimet, et al., 1986:59). Some of the problems with the characterization were:

- There was limited multidisciplinary involvement of host country and CATIE personnel during the survey process.

-- The survey instrument required too much time to complete (up to four hours per respondent in Panama) and precluded or limited the farmer from providing his or her perspective on farming problems.

-- Survey data were sent to Turrialba for analysis instead of being analyzed on site as a cooperative effort between host country and CATIE personnel.

## 4.5 Systems Orientation

FSR/E is systems-oriented. Viewing the total farm as a system of natural and human components, FSR/E focuses on specific subsystems to evaluate interactions between those subsystems, other farm subsystems, the farm as a total system, and the environment beyond the farm. FSR/E seeks to identify the potential for and impact on the farm of introducing a change in the technology of a specific target subsystem. Difficulties in establishing a systems orientation appeared in at least five of the 12 projects reviewed. An example is provided by Tanzania/FSRP.

Tanzania/FSRP -- One of the project's FSR teams identified February as the month when there was a food shortage in Kilosa district. In response, the FSR team designed and implemented on-farm trials to test an early maturing maize variety known as Kito: "Early on-farm trial results were whopping successes. Almost all farmers were pleased. Seed is in great demand and is reflected in scarce seed supplies" (Jackson and Osburn, 1986:9). Kito's story illustrates the role that a systems approach can play in identifying production problems and designing on-farm trials to test solutions. It also brings home the necessity of adequate research support; Kito was an on-shelf technology and ARPP discovered and assessed its adaptability to existing farming systems (Jackson and Osburn, 1986:10). The key was looking at the total system rather than at only a single component.

Kito had originally not proven popular with farmers. But the major emphasis of corn breeders had been developing high yielding varieties for production during the Masika (long rains) season. While the short season Kito reduced the risk of crop failure from drought when planted in the Masika season, Kito's yields in the Masika season were lower than full season varieties. However, when planted in the Vuli (short) season, Kito yielded as well as traditional long season varieties and provided a harvest several weeks earlier than the traditional varieties. Also, it was found that:

> subsequent Masika season crops of maize or cotton following Kito planted in the Vuli season yielded 20 to 30 percent more than they did if planted after traditional full season varieties. Over the two year period that the trials were run approximately 50 farmers per season grew Kito and in the 1985/86 season Kito seed were sold to an additional 500 farmers (Faught, 1986:4).

Thus, commodity researchers working with a narrower commodity focus, saw no value in the Kito variety. Their partial analysis was incorrect, and highlighted the consequences when a total system perspective is not adopted (Jackson and Osburn, 1986:10).

However, while the first evaluation indicated that the diagnosis stage of FSRP had been adequately designed, the evaluation also pointed out that project had not investigated "all...the resource allocation decisions that farmers must make" nor addressed "the functioning of the total system...in an explicit systematic fashion" (Jackson and Osburn, 1986:5). The evaluation recommended that FSRP conduct earlier-proposed market analysis and intra-household studies "to provide...the missing links regarding the total system" (Jackson and Osburn, 1986:5).

The evaluation also noted that most Tanzanian commodity researchers were also part-time farmers. One would expect that they would be "readily cognizant" of

> the constraints that farmers in the area have, and in turn, that hands-on experience would influence their commodity research activities. Apparently this is not the case in that the...researchers rarely, if at all, visited FSR/E... trials. In addition the constraints that commodity researchers had with their own farm operations were significantly different than other farmers. ...the commodity researchers <u>lacked the total system perspective</u> and were not fully aware that other farmer[s'] constraints were different (Jackson and Osburn, 1986:7; emphasis added).

## 4.6 Interdisciplinarity

Collaboration among agricultural and social scientists in FSR/E facilitates identification of the conditions under which small farmers operate; accurate 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. Problems in achieving interdisciplinarity in FSR/E were found in at least eight of the 12 FSR/E projects reviewed. Some of the problems are illustrated by Malawi/ARP.

Malawi/ARP -- While the ARP Project Paper emphasized the importance of a multidisciplinary team approach, the second ARP evaluation found that the TA skill mix contained in the PP would lead one "to believe that most of the expatriate researchers were to advise on several crop programs" (Baker, et al., 1983:21). Further, the expatriates were to work as a team, "each making some contribution to improving the technical quality or relevance of the various research programs to the smallholder farmer" (Baker, et al., 1983:21). However, each TA team member tended to work independently and to specialize in particular crops, thereby deemphasizing the importance of a multidisciplinary approach.

A particularly difficult problem was that of defining the role of agricultural economics vis-a-vis the Farming Systems Analysis (FSA) section. Neither the Outputs section nor the Logical Framework of the Project Paper listed "anything specific for the economics section" (Baker, et al., 1983:30). Further, the duties for the economist listed in the Long Term TA Job Descriptions differed from the work plan of the economist provided by the TA contractor. While the work plan listed six objectives, there was little emphasis on supporting the FSA section. The evaluation found that the research program of the agricultural economics section leaned more toward

> addressing macroeconomic policy issues than...economic constraints faced by Malawi smallholder[s]. . . . Therefore, the evaluation team recommends that the section spend more time in (a) farm-level trial design and analysis of trial results, (b) determining whether or not improved treatments benefit the farmer more than they cost him, and (c) collaborating with the adaptive research effort via the FSA section. If this recommendation is followed, the...work plan of the...agricultural economist will begin to look more like the original job description for this position outlined in the Project Paper (Baker, et al., 1983:34-35).

Another TA position during ARP's initial two years was a farming systems analyst to establish and serve as acting head of the FSA section of the Department of Agricultural Research (DAR). An anthropologist was recruited to head the FSA section. Having identified local maize as the predominant variety in the majority of farm cropping systems, the FSA section proceeded to conduct a series of on-farm trials on fertilizer in local maize in the 1981-82 cropping season. One trial was designed for a cropping system including maize, cowpea, and sunflower. There were four treatments: (1) local maize without fertilizer, (2) local maize with fertilizer, (3) improved maize without fertilizer, and (4) improved maize with fertilizer.

Based on the harvest data for that season, the FSA section concluded that variety made little difference without fertilizer, and that both varieties responded to fertilizer. But including local maize as the key treatment in the on-farm fertilizer trials led to "a basic misunderstanding about the role of FSR" (Baker, et al., 1983:39). While the FSA section's approach to the diagnostic phase of FSR had been helpful in assessing farmers' needs,

> problems arose when the FSA section headed the subsequent trial design phase. Some DAR officials and [TA contractor] research staff believe the trial design phase should have been a joint exercise, where agronomy takes the lead with [the] FSA section assisting. ...the original job description for the Farming System Analyst position states...: "Assist the Research Coordinator and research officers in... selection and evaluation of smallholder research projects to ensure [in]corporation of local smallholder farming systems data into research planning." (PP, Annex A, p. 11) (Baker, et al., 1983:40).

Apparently, as the second evaluation found, the "agricultural scientists...did not like the idea of a social scientist designing, implementing, harvesting and analyzing agronomic on-farm trials" (Baker, et al., 1983:41). Also, the evaluation team concluded that there had been

> very little [TA] team interaction between the diagnostic survey stage and the farm trial design phase. . . . Instead of assisting the rest of the team in design of trials, the FSA section head had employed a more direct approach.... There were few alternatives, however, as the...DAR staff and...technical assistance [team] had no formal mandate to work in an interdisciplinary mode; thus the FSA section was forced to rely on recruiting voluntary assistance. . . . The FSA section head was forced into a choice between proceeding using whatever manpower and agronomic advice was available and willing to participate in 1981-82, or waiting another season to initiate on-farm trials. As the FSA technical assistance was only funded for the first two years of the five year project, delaying the trials would have meant that the objectives of the FSA workplan would have fallen short of achievement (Baker, et al., 1983:41).

The evaluation noted that identifying the importance of local maize was an important outcome of the diagnostic phase of the FSR methodology being implemented by the FSA section. However, as the evaluation also noted, basing the first round of on-farm trials on local maize varieties seemed to go counter to the government's policy of quickly increasing per hectare yields in smallholder fields. Further, from an agronomic point of view,

> it was assumed by the...DAR researchers, based on years of experience that the improved varieties...are genetically superior to the local varieties in their ability to yield well under high doses of nitrogen fertilizer and good management. What the...[FSA section's on-farm trials] measured, however, during only one growing season, was the response of an improved versus a local variety using DAR-recommended levels of fertilizer in the farmer's cropping system (which...included both sunflower and cowpea) under his (or her) own management. Thus, the improved variety was subjected to two conditions for which it was not specifically bred (Baker, et al., 1983:41).

The evaluation noted that very few agronomists/breeders would place as much emphasis on one year's data as did the FSA section that was headed by an anthropologist. However, as the evaluation also noted, the MOA/DAR and the TA team misinterpreted the implications of the on-farm trials (OFTs).

> What the results indicate is not that there are no differences between varieties, but that in the particular [Agricultural Development District (ADD)] farmer system and under the unique farmer management during the 1981-82 season, there were no statistically significant differences between varieties. Further, the importance of considering alternative sets of recommendations for different levels of farmer resources was pointed out. The...MOA/DAR-[TA] research team should have used this information as... positive feedback from the farm level to refine on-station research priorities to address the issues raised by the OFTs. They should not have reacted negatively to the results of the OFTs. ...the way in which the FSA section reported...results should have been positive - "we believe more on-station work could be done on improved varieties grown...with other crops..., rather than "there are no differences between local maize and the improved variety."
>
> Once the...actors began to go separate ways, subsequent contacts became less frequent and opinions about..."others" solidified and became self-reinforcing. The FSA section viewed the OFTs as ultra-high priority and dedicated much time to them; other [TA team] scientists had their own programs and priorities, and little inclination to visit trials into which they had little or no input; some MOA officials continued to lament...that the FSA section was taking the lead in...farm trials (Baker, et al., 1983:41-42).

Between the 1981-82 and 1982-83 seasons, the Chief Agriculture Research Officer (CARO) and the TA team chief of party decided to stop the FSA section's OFTs until such time as agronomy could be "officially" involved in the effort.

## 4.7 Complementarity with Commodity and Discipline Research

FSR/E complements, not replaces, conventional commodity and discipline research. FSR/E draws upon technologies and management strategies generated by discipline and commodity research and adapts this knowledge to the agro-climatic environment and socioeconomic circumstances of a relatively homogeneous target group of farmers. FSR/E cannot complement what does not exist. Where conventional agricultural research programs are weak, it is very difficult for FSR/E to play a complementary role in technology development and transfer. Two of the FSR/E projects reviewed provide cases in point: Lesotho/FSRP and Zambia/ZAMARE.

Lesotho/FSRP -- The second FSRP evaluation recommended that, while the TA team worked to strengthen the Research Division (RD) as a newly formed institution, the TA team needed to play "a stronger role in the management and planning areas...to provide a sharper focus on reaching the specific objectives of conducting relevant research and...transferring technology to small holders" (Martin, et al., 1981: 8). Acknoweldgement of the need for the TA team to strengthen the RD reflected the evaluation team's conclusion that the project's ability to complement commodity and disciplinary agricultural research was constrained by "the absence of an ongoing agricultural research program" (Martin, et al., 1981:8). Indeed, Lesotho did not have a published set of crop production recommendations.

Zambia/ZAMARE -- The second ZAMARE evaluation reported that the project had sought, during its early efforts to institutionalize FSR in the Research Branch, to avoid arousing animosity on the part of Commodity and Specialist Research Teams (CSRTs) personnel (Sutherland and Warren, 1985). Given the considerable TA and training support that were being given to the Adaptive Research Planning Team (ARPT) by outside agencies and the government, the evaluation felt that there was a danger that technical component research would be overlooked.

> This is due in part to the tendency to see farming systems research as a panacea. However, it has become very obvious to those with ARPT that it is not, and that whilst it does have several unique and important features it must be seen as an integral part of the Research Branch complementing the work of the CSRTs. For, when no technical component research has been undertaken...., then ARPT is not able to test any possible technological situations (Sutherland and Warren, 1985:56; emphasis added).

## 4.8 Technology Testing in On-Farm Trials

On-farm collaboration between FSR/E practitioners and farmers provides each with a deeper understanding of the farming system and the farmer's decisionmaking criteria, and allows for potentially improved technology to be evaluated under the environmental and management conditions in which it will be used. While the importance of technology testing in on-farm trials is now widely recognized, problems associated with this activity appeared in at least a third (4) of the FSR/E projects reviewed. A major question is that of the emphasis that FSR/E practitioners should place on testing technologies vs. validating technologies in on-farm trials. How the question is answered has implications FSR/E is carried out, in particular, how farmers are involved in the research process. A case in point is ROCAP/SFPS.

ROCAP/SFPS -- The third SFPS evaluation noted the following pattern in on-farm trials conducted by the Tropical Agricultural Research and Training Center (CATIE). First, SFPS emphasized developing complete technological packages vs. improving single components of production systems. Second, the "trials were managed by researchers and the inputs were furnished." Third, "more field management was given by CATIE staff than should be done at the validation stage" (Zimet, et al., 1986:42). Also, there were instances where CATIE field teams performed validation when research was not really complete in order to conform with a contractual obligation to validate "tech-packs." In this regard, the evaluation team noted its belief

> that validation should test the acceptability (by the producer) of the technology.... This cannot be accomplished if the field team is involved in the management of the production-site or if inputs are supplied to the farmer. Thus, we believe that CATIE validated the technical efficiency of the technology...and did not attain the goal of validation (Zimet, et al., 1986:41)

While CATIE recognized the importance of the evaluation team's definition of validation (testing a technology's acceptability by a farmer), CATIE saw validation as a further stage of research than CATIE was trying to accomplish under SFPS (AID, 1985). The evaluation responded by noting its belief that

> a good part of the [CATIE] effort was misspent because the validation was generally of the technology not of the acceptability of the technology. (The result of doing the former is a reduced frequency of adoption by producers). What the team (as well as most practitioners) believes to be the correct definition would have been applied had either CATIE or ROCAP been better versed in FSR/E techniques (Zimet, et al., 1986:126).

## 4.9 Feedback to Shape Agricultural Research Priorities and Agricultural Policies

FSR/E provides feedback for shaping research priorities and agricultural policies. FSR/E is a dynamic and iterative process that provides information on farmer goals, needs, priorities, and criteria for evaluating technologies, and how new technologies perform under farm-level conditions. Results of one season's trials generate hypotheses for testing in the next. Further, trial results provide an input to the setting of on-station research priorities as well as to the formulation of regional- and national-level policy. At least six of the FSR/E projects reviewed encountered problems in providing feedback to shape agricultural research priorities and/or agricultural policies. Philippines/FSDP and Botswana/ATIP are illustrative.

### 4.9.1 Agricultural Research Priorities

Philippines/FSDP -- Site Research Management Unit (SRMU) teams were to provide researchers at the Visayas State College of Agriculture (VISCA) with feedback on farm-level production constraints that might be investigated in the "back-up research program." But the proposed studies in this program were not linked in any way with the project's farm-level trials or even with specific problems at the project sites (Mazo, et al., 1983: 34). Further, Ministry of Agriculture and Food "site personnel informed the Evaluation Team that they [had] not made any suggestions to the VISCA Technical Team on the specific back-up research to be conducted" (Mazo, et al., 1983:34).

### 4.9.2 Agricultural Policy

Botswana/ATIP -- The second ATIP evaluation suggested that the project could be more effective in collecting information from farmers about the effects of national policy on their productivity and income, identifying possible modifications in policy which will enhance productivity and income, and working with colleagues in the Ministry of Agriculture to provide information to decision makers in the Department of Planning and Statistics (AID, 1986).

## 5. OPERATIONAL CONSTRAINTS IN FSR/E PROJECTS

The FSR/E projects reviewed in section 4 illustrated that implementation and impact of a FSR/E project may be constrained when the project implementor's concept of and approach to FSR/E lacks or is weak in one or more of the core characteristic of FSR/E. However, even if steps are taken to ensure that all nine core characteristics are in place in a FSR/E project, project implementation and impact may yet be jeopardized by operational constraints. An operational constraint is present when a farming systems practi-tioner's efforts to operationalize (implement) the FSR/E concept are impeded by problems in any of the following areas:

- o Stakeholder understanding and support of FSR/E
- o Agricultural research policy/strategy defining role of FSR/E
- o Long-term commitment of resources
- o Existing research capability and shelf technology
- o Consensus on FSR/E methodology
- o Capability to process farming systems data
- o Consensus on criteria for evaluating FSR/E
- o Links with extension
- o Links with agri-support services
- o Links with farmer organizations

Seven or more of the FSR/E projects reviewed experienced difficulties in four areas--stakeholder understanding of FSR/E, agricultural research poicy or strategy defining the role of FSR/E, consensus on FSR/E methodology, and links with extension. While FSR/E practitioners emphasize the importance of taking a systems approach, the record reveals that the implementors of FSR/E projects often paid relatively little attention to dealing systematically with operational constraints that could impede the practitioner's ability to do FSR/E. Project-specific examples now illustrate each operational constraint.

### 5.1 Stakeholder Understanding and Support of FSR/E

Successful FSR/E depends, in large part, on stakeholders having an adequate understanding of the FSR/E approach. These stakeholders include, but are not limited to, the FSR/E practi-tioner's superiors (who allocate resources affecting a project's ability to do FSR/E), colleagues (e.g., commodity researchers), and FSR/E's ultimate clientele, namely, farmers. FSR/E project implementation and impact will be impeded where project personnel fail to ensure that key stakeholders understand, hold realistic expectations for, and fully support the FSR/E approach. This constraint appeared as a negative factor in at least seven projects. Botswana/ATIP illustrates the issue.

Botswana/ATIP -- The second ATIP evaluation noted "little indication that...FSR...had been understood and adopted" or "that this approach is likely to be widely adopted by the [Ministry of Agriculture] in the near future" (AID, 1986: 18). Some Crop Production Officers (CPOs) believed that Department of Agricultural Field Services administrators had little or no interest in FSR because no administrator had ever attended an ATIP-sponsored FSR workshop. CPOs felt that "until...real interest in and support for the Farming Systems Approach are demonstrated by administration, ...it will be a waste of time for field staff to study and develop the technique further" (cited in AID, 1986:36).

The evaluation also noted that FSR is a difficult concept "to articulate and to incorporate into an established research and extension system, since impact may not be as easily measured as that of a new maize hybrid or an irrigation scheme" (AID, 1986:1). Indeed, the project's first evaluation pointed out that a "major conceptual difficulty in institutionalizing" FSR/E is "starting with a 'bottom-up' approach in an organization which has an essentially 'top-down' operating mode and decision-making structure" (Francis, et al., 1984:10). As the second evaluation emphasized, decision makers at the national level as well as regional and district agricultural officers need to understand "how the farming systems approach can enhance the effectiveness of the research and extension system" (AID, 1986:1).

## 5.2 Agricultural Research Policy or Strategy Defining Role of FSR/E in Research and Extension

A second operational constraint to doing FSR/E (and implementing FSR/E projects) occurs when a country's agricultural research policy or strategy does not define a role for FSR/E in the existing research and extension system. An even more basic constraint may be the simple lack of an agricultural research policy and strategy. This constraint appeared in at least nine FSR/E projects. Contrasting examples may be seen in Lesotho/FSRP (negative) and Zambia/ZAMARE (positive).

Lesotho/FSRP -- The second FSRP evaluation found that the Research Division lacked an agricultural research policy and strategy and that this lack of policy and strategy had impeded implementation of FSRP (Martin, et al., 1981).

Zambia/ZAMARE -- Adaptive Research Planning Teams (ARPTs) in ZAMARE were operational by the project's end in six of Zambia's nine provinces. Although each ARPT was supported by a separate donor, all operated under a National Coordinator reporting to the Chief Agricultural Research Officer. Thus, the funding provided by USAID/Zambia to the first ARPT was part of an overall program of donor support for FSR/E in Zambia.

## 5.3 Long-Term Commitment of Resources

Agricultural research cannot be successful in developing improved technologies without a long-term commitment of resources. FSR/E as a component of the overall agricultural research and extension process is dependent on resources being available to cover expenses associated with intensive field work (e.g., fuel expenses incurred with reconnaissance surveys and on-farm trials). These expenses need to be covered not only during but also beyond the life of the project. Resources also will be needed beyond the LOP for training and possibly technical assistance. This constraint appared in at least six projects, with negative examples in five cases, and a positive example in one. Tanzania/FSRP and Guatemala/FPNI are illustrative.

Tanzania/FSRP -- The FSRP Project Completion Report (PCR) indicated that FSRP had been less than successful in improving management capability within the Tanzania Agricultural Research Organization (TARO). In this respect, the PCR noted that "the experience of going through planning, budgeting, and monitoring and other exercises involved in a research program jointly with trained and experienced researchers...must have improved the skills and capability of the TARO staff to carry out these activities in the future" (Faught, 1986:5). However, any "improvement in TARO management that did occur may have been wiped out with the dismissal of the TARO Director and other top staff shortly before USAID/[TA contractor] participation terminated" (Faught, 1986:5). The PCR concluded that:

> The major lesson that should have been learned, or perhaps more appropriately re-learned, is that development of a research capability and the institutionalization of such capability is a very long term activity. Resources that are used for short-term support of such activities are generally, if not always, wasted (Faught, 1986:16).

Guatemala/FPNI -- An impact evaluation of FPNI concluded that much of FPNI's progress could be attributed to the important role that the Rockefeller Foundation and AID had played, over a long period, in developing the research capacity of the Agricultural Science and Technology Institute (ICTA). In the five years preceding ICTA's creation, USAID/Guatemala worked with the GOG in planning and implementing the reorganization of the public agricultural sector. Early and sustained Mission support to ICTA helped to ensure timely and appropriate assistance.

## 5.4 Existing Research Capability and Shelf Technology

FSR/E's ability to complement commodity and disciplinary research depends on the ability of existing commodity and disciplinary research to support FSR/E. An important indicator of this ability is the existence of "shelf technology" that can be adapted and tested in on-farm trials. This constraint appeared in at least five of the projects reviewed. Botswana/ATIP and Nepal/ARPP provide two illustrative cases.

Botswana/ATIP -- While several technologies derived from station-based research had been tested in "maximum yield" plots by ATIP's fourth year, there was "no consistency to performance nor general application of technology" (AID, 1986:22). The evaluation concluded that: "Few interventions had been sufficiently tested and proven...to move forward to the dissemination stage" (AID, 1986:5). Thus, the lack of technologies derived from station-based research impeded ATIP's ability to develop technologies ready for extension to disseminate to farmers.

Nepal/ARPP -- The mid-term ARPP evaluation found that the research base for technologies for hill agriculture was poor, with a lack of technically feasible, economically viable, and socially acceptable technologies (Rood, et al., 1988).

## 5.5 Consensus on FSR/E Methodology

While the nine core characteristics of FSR/E define what FSR/E is, they do not define how to do FSR/E. The plan of work for doing FSR/E is usually spelled out in a statement of methodology. Yet the performance record of AID-funded FSR/E projects suggests that a major constraint in these projects often was a lack of consensus over the methodology for doing FSR/E. Indeed, this constraint appeared in at least 8 of the 12 FSR/E projects reviewed. Two examples were Lesotho/FSRP and Philippines/FSDP.

Lesotho/FSRP -- The third FSRP evaluation found that, while the project's methodology for FSR/E was still "evolving," it was also the case that Research Division (RD) staff and units did not agree on the project's FSR methodology. This led the evaluation team to express concern over "the many concepts of FSR held by either [TA team] or Basotho staff in the RD" (Dunn, 1983:27-28). The need for clarification on the FSR/E approach to be followed was again echoed by the fourth evaluation's recommendation that "the FSR interpretation (there are many) for Lesotho" be spelled out in writing, with copies...made available to all concerned Frolik and Thompson, 1986:iv).

Philippines/FSDP -- While FSDP's Project Paper stated that "the existing farming system is the starting point...from which any changes and improvements must be made," the first evaluation questioned "why...the main crop...grown by...farmers during the past years" had been changed in on-farm trials. This "may be viewed as tantamount to a total change" of the existing farming system (Mazo, et al., 1983:24). Concern was also expressed that FSDP was trying to introduce "more than one or two major modifications at the same time" in a farm, this also being "tantamount to...total change in the farming system" (Mazo, et al., 1983:2).

As a result, the evaluation expressed concern that FSDP staff "may be thinking incorrectly that the goal of farming systems research is to introduce an entirely new farming system and the role of...verification trials is to demonstrate the superiority of [the] new system (Mazo, et al., 1983:25). An example of this questionable approach was a project-sponsored study of ducks that was neither linked with farmer crop production activities nor conducted at sites where farmer-cooperators had previously raised ducks. This indicated

> a seemingly widespread misconception that the purpose of FSDP...is to introduce a new livestock system to replace, rather than modify, the existing systems of the farmer-cooperators. The suggestion of one of the researchers to have separate cooperators for livestock further displays a serious misunderstanding of what is meant by integration of crops and livestock under a farming systems approach to research (Mazo, et al., 1983:25-26).

Given the proposed operational procedures for FSR/E outlined in the second evaluation (Sajise, et al., 1985: 33-34), there is a question of whether FSDP had established, even three years into the project, consensus on a methodology for implementing FSR/E.

## 5.6 Capability to Process Farming Systems Data

FSR/E involves considerable data collection and analysis. Lack of adequate capability to process farming system research data will constrain doing FSR/E (or implementing a FSR/E project). This problem may exist because of the volume of data needing to be analyzed, lack of data analysis equipment (e.g., computers), or lack of personnel trained in data analysis. This constraint appeared as a negative factor in six projects and a positive factor in two projects. Examples from Gambia/MFP and Senegal/ARPP are illustrative.

Gambia/MFP -- The first MFP evaluation noted that while the Socio-Economic Unit (SEU) was generally on schedule in initiatin its surveys and studies, the same could not be said for output delivery (Osburn, et al., 1983). There were numerous delays in developing, pre-testing, and coding survey questionnaires. The SEU lacked microcomputers and delays were encountered in data processing in the TA contractor's home office. By the first evaluation (April 1983), the results of the baseline survey, for which the preparation for data collection had started in September 1981, were still unavailable, largely because the SEU lacked experience in data collection, processing, and analysis. While the TA team's two social scientists (an agricultural economist and a rural sociologist) provided leadership for the development of the project's socio-economic studies, they lacked experience in designing and conducting large-scale data collection programs, and in analyzing data with computerized data processing. As the evaluation noted: "Learning on-the-job... has caused unfortunate delays (Osburn, et al., 1983:70-71).

Senegal/ARPP -- While ARPP cut back over time in the amount of data collected, the first evaluation cautioned that "there is too great a risk that too much data will be collected and...will never get analyzed (St. Louis, et al., 1985:37). The evaluation observed that ARPP was facing a formidable analysis task, and recommended that serious consideration be given to merging the entire data set on the TA contractor's mainframe computer in the U.S., in order to speed up analysis and generation of results.

Yet two of ARPP's three Production Systems Research (PSR) teams had access to appropriate microcomputer software, and had developed the necessary skills for data management and analysis. As a result, ARPP had gained some experience in using microcomputers for data analysis of production and marketing issues.

> In the Casamance, ...the team has made effective use of the FARMAP and MSTAT programs because its staff has had both the capacity to collect needed data and to formulate sound research and analytical approaches. They have been able to gain an understanding of and quantify...constraints to the production systems (St. Louis, et al., 1985:73).

However, progress in Fleuve, because of a later start, had not been as great, while Sine Saloum had been seriously hampered, in part, because the PSR team at this site lacked any computer capacity because of inadequate facilities to house a computer.

## 5.7 Consensus on Criteria for Evaluating FSR/E

A key factor in implementing any goal-oriented activity is obtaining feedback on the activity's progress toward its goal, and using this feedback to determine if any mid-course corrections are needed. While clearly defined criteria are essential for evaluating an activity, this has been a problem in evaluating FSR/E projects. As one evaluation team pleaded: "Agreement should be reached on some practical suggestions for conducting FSR project evaluations which will be more satisfactory to USAID Missions, AID/W, and project contractors" (Francis, et al., 1984:12). While some attention has been directed to this issue (Farming Systems Support Project, 1986; Lichte, 1987), this attention came too late to be of any help to most of FSR/E projects reviewed in the present study. Indeed, at least a third (four) of these projects encountered difficulty in establishing a consensus on criteria to evaluate a FSR/E project. Lesotho/FSRP, Malawi/ARP, and Nepal/ARPP provide examples of some of the problems faced in evaluating FSR/E projects.

Lesotho/FSRP -- The third FSRP evaluation used objectively verifiable indicators (OVIs) from the Project Paper to assess the project's progress (Dunn, 1983). But these OVIs focused on the status of project activities (e.g., FSR Unit, farming systems program), not on impact in terms of farmer adoption of technology or increases in crop yield and farm income. Yet the OVIs were useful in identifying whether FSRP was meeting its objectives or targets. In some cases, however, the OVIs were no longer meaningful or relevant. This suggested that it may not be possible to define meaningful objectives for an FSR/E project. Two of the OVIs for one FSRP component (FSR Unit) are illustrative.

One OVI for this component stated: Research priorities are determined through the use of social and economic benefit/cost techniques by 12/79 (OVI1). However, the third FSRP evaluation found, nearly four years after the target date, that there was no evidence that either technique was ever applied to selection of research priorities (Dunn, 1983). In this case, the objective implied by the OVI simply may not have been met because FSRP did not implement the required activity; it could also mean that it was difficult, if not impossible, to define realistic social and economic criteria and/or to measure benefits and costs.

Another OVI stated: The FSR Unit is pursuing or considering a program for replicating FSR/E after the project ends (OVI4). While including the TA team in the Research Division provided a foundation for institutionalizing FSR/E in the Division, the second evaluation earlier recommended that FSRP abandon the concept of a separate FSR Unit (Martin, et al., 1981). In this case, the objective implied by this OVI was no longer relevant by the time of the fourth evaluation.

Malawi/ARP -- The second ARP evaluation dealt with the problem of establishing evaluation criteria by identifying three "critical aspects" to assess the extent to which ARP's purpose was being achieved (Baker, et al., 1983). These aspects were: (1) Are the research programs technically sound, relevant to smallholders' needs, and conducted in a coordinated manner? (2) Is a research management system in place which efficiently allocates financial and human resources in accordance with project priorities? (3) Is there an adequate information dissemination system which provides research results to the appropriate clients of the research organization? However, the evaluation recommended that benchmarks needed to be more closely and carefully emphasized during project design, a task that may be difficult since the farm-level problems and constraints that need to be addressed by a FSR/E project likley are not yet known at the time a project is being designed.

Nepal/ARPP -- The Project Paper for ARPP outlined a "Project Monitoring Plan" divided into two categories (routine project implementation monitoring and impact monitoring). The latter category was concerned with ARPP's components (e.g., agricultural research). While the PP listed the elements to be monitored, the design did not include a plan of how the monitoring would be done, by when, or by whom. Subsequently, 30 months after ARPP started, the mid-term evaluation found that, while all parties had complied with routine reporting requirements, the evaluation team "could find no evidence of any specific reporting on impact achievement..., nor any indication that the Project Paper Plan was ever adjusted or used" (Rood, et al., 1988:87).

## 5.8 Links with Extension

A constraint that appeared repeatedly was the problem of FSR establishing adequate links with extension. All of the FSR/E projects reviewed were based in a research unit of one type or another, not in a governmental extension organization. Given that agricultural research in many countries traditionally has not had strong links with extension, the basing of FSR in a research unit automatically created a problem of how effectively to link research and extension. This constraint appeared in 9 of the 12 projects. Examples of this constraint are provided by the Philippines/FSDP and Guatemala/FPNI.

Philippines/FSDP -- The first FSDP evaluation found that little attention had been given to integrating project functions and activities into existing Ministry of Agriculture and Forests (MAF) programs. FSDP had not addressed the potential for linking the project with the MAF's extension delivery system, despite the presence of an MAF extension unit at all FSDP sites. The evaluation reported that

> the "Special Project" status of the FSDP...had isolated the project from the rest of the [MAF]. Middle and lower level MAF staff who are not part of the project indicated a pervasive feeling that the project is not part of [the MAF]. ...there has been little thought given to the relationship of the project to the [Regional Integrated Agricultural Research Stations (RIARS)] (Mazo, et al., 1983:46).

Guatemala/FPNI -- The second FPNI evaluation found that, while the project had made progress in developing its FSR methodology, there was yet a need to improve the linkage of ICTA with the extension service (DIGESA). On this count, the evaluation noted: "There seems to be a clear recognition of the fact that ICTA simply cannot diffuse the technology alone. It needs DIGESA and others" (McDermott, 1977a:8). Even as ICTA was expanding its program of on-farm trials (pruebas), ICTA had still not developed "vital linkages" with the DIGESA (McDermott, 1977a:19), nor was it clear how ICTA's recognition of the need for such linkages was "going to be translated into effective action" (McDermott, 1977a: 8). While ICTA discussed "the need to involve DIGESA and others in the pruebas" (McDermott, 1977a:8), the third evaluation concluded that an imbalance had developed in ICTA's ability to link information generation with information transfer, suggesting that ICTA needed to improve "the system of forward and backward linkages between the information generation and information transfer processes" (Mann and Dougherty, 1978:1).

## 5.9 Links with Agri-Support Services

The incentive for a farmer to adopt an improved technology depends on the farmer's ability to access the services required to support adoption and continued use of the technology. Such services include but are not limited to agricultural credit, production inputs, and markets. The lack of adequate links of FSR/E with agri-support services was a constraint in a at least five FSR/E projects. ROCAP/SFPS is illustrative.

ROCAP/SFPS -- The first SFPS evaluation observed that some of the farm operations developed by the project seemed

> to depend heavily upon considerably more than application of the technology introduced. They required intensive assistance by CATIE and/or national institution personnel in obtaining credit (or directly providing resources), locating and installing inputs, generating markets, etc. This emphasizes the fact that improved technology is a necessary, but far from sufficient, ingredient to transform the income and condition of the small farmer (Mann, et al. 1981:2-3).

Improvements in the small farm system likely will not take place on more than a few farms unless complementary activities provide small farmers access to input and output markets, credit, and continuing technical assistance.

The need to leverage change in key agri-support systems had still not been addressed by the time of the third SFPS evaluation (Zimet, et al., 1986). In the case of annual crops, "there was no parallel planning of commercial stocks of seeds of new crops and/or varieties. This led to...delays in the early acceptance of technologies tested that depended on this input" (Zimet, et al., 1986:42). Overall, the evaluation concluded that dissemination of a new technology, an extension exercise, needs to have strong links with agri-support institutions (e.g., credit).

### 5.10 <u>Links with Farmer Organizations</u>

FSR/E projects usually were implemented on a one-to-one basis, the FSR/E team or practitioner working with the individual farmer, despite the potential for working with and through farmer organizations to increase the impact of assistance efforts. Exceptions were Lesotho/FSRP and Philippines/FSDP.

<u>Lesotho/FSRP</u> -- The design of the FSRP provided for the development and testing of alternative strategies for farmer communication and education. This entailed Village Agricultural Committees (VACs) and a group approach on communal vegetable fields and grazing schemes. Other extension techniques (e.g., producing and distributing "Cropping Guidelines" and other technical publications) were also developed. But FSRP had taken no steps to monitor and evaluate the effectiveness of these alternative strategies for reaching farmers (Martin, et al., 1981). This problem was still found to exist at the time of the third evaluation (Dunn, 1983), leading the evaluation to make two recommendations--one that the project assess the impact of the VACs and the group approach on adoption rates of recommended technologies, the other that the project consider testing a facilitator approach to communicating with farmers.

<u>Philippines/FSDP</u> -- The first FSDP evaluation concluded that the project had not made any effort to involve farmer organizations or any other community organizations. "Group involvement came only in the group meetings organized for the purpose of briefing the farmers of the project, but all dealings between the project and the farmers are on [an] individual farmer basis" (Mazo, et al., 1983:42). However, the second evaluation found that FSDP had begun to involve farmer organizations in the development of work plans of the Site Research Management Units (SRMUs), the evaluation of research results, and the extension of technologies (Sajise, et al., 1983).

# 6. GENERIC CONSTRAINTS IN FSR/E PROJECTS

The preceding sections have illustrated several points about the AID-funded FSR/E projects reviewed: (a) that these projects had limited impact on technology development and transfer, and institutionalization of FSR/E (section 3); (b) that the concept of and approach to FSR/E in each project lacked or was weak in one or more of the core characteristics of FSR/E (section 4's discussion of core constraints); and (c) that these projects encountered difficulty in doing FSR/E because of the presence of one or more operational constraints (section 5).

But implementation of FSR/E projects also has been impeded by a third type of constraint, namely, generic constraints. A generic constraint may be defined as a factor that can impede any type of AID-funded project, regardless of the project's technical content. Thus, a generic constraint (e.g., mismanagement of a project's TA component) can impede implementation of a project, regardless of whether the project's focus is FSR/E, self-financing primary health care, or whatever.

Six types of generic constraints were found in the FSR/E projects reviewed, as follows:

- o Project management structure
- o Government funding to meet recurrent costs
- o Staffing with trained manpower
- o Management of training
- o Management of technical assistance
- o Factors beyond a project's control

Seven or more of the projects reviewed experienced difficulties in two of these areas--staffing with trained manpower and government funding to meet recurrent costs. Each of the constraints is now reviewed and illustrated with project-specific examples.

## 6.1 Project Management Structure

Project management structure appeared as a constraint in at least 6 of the 12 projects reviewed. Sometimes a project's management structure was not adequate to handle an "unwielding and over-ambitious" project design (e.g., Gambia/MFP). At other times, as in the case of Nepal/ARPP, the problem was simply an ineffective project management structure (e.g., having responsibility for but not authority over the resources needed to carry out a task). In other cases, the problem involved insufficient planning and coordination among the TA team, the counterpart organization, and the USAID Mission (e.g., Honduras/ARP). Consider the following example.

Nepal/ARPP -- The mid-term evaluation found that ARP's "dispersed and vaguely defined" management structure had impeded implementation. For example, the evaluation found that the Project Coordinator's role and authority were never defined, and that he had not been given adequate staff to support "much real coordinating, planning, [or] monitoring. ...even the Project Director has not been very much involved in Project management, especially after [the National Agricultural Research Service Center] was established as a new ministerial body, separate from the [Department of Agriculture]" (Rood, et al., 1988:67).

### 6.2 Government Funding to Meet Recurrent Costs

This constraint appeared in at least nine of the FSR/E projects reviewed. Basically, when this constraint was present, implementation was impeded by a lack of timely availability of salaries for personnel, fuel for vehicles, fertilizer for trials, etc. Senegal/ARPP provides a typical example.

Senegal/ARPP -- The mid-term ARPP evaluation reported that implementation was constrained by the inability of the Senegalese Institute of Agricultural Research (ISRA) to meet the salaries and operational expenses of research and secretarial staff. The Production Systems Research (PSR) teams encountered problems in implementing their programs because of the lack of human and financial resources. Thus, "lack of funds at the field level... delayed the progress of the PSR field programs" (St. Louis, et al., 1985:xv).

### 6.3 Staffing with Trained Manpower

A key component in implementing a FSR/E project is ensuring that the counterpart organization assigns trained personnel to the project. Where trained manpower cannot be provided, be it for lack of funded positions or lack of trained people to fill those positions, project implementation will suffer. This constraint appeared in at least 10 of the 12 projects. Consider the example of Lesotho/FSRP.

Lesotho/FSRP -- The second FSRP evaluation found that implementation was impeded when the Ministry of Agriculture could only assign a limited number of trained professionals to the Research Division (RD) (Martin, et al., 1981). There were not enough trained Basotho agriculturalists available who could be allowed to leave for training, while others were assigned to work as TA team counterparts. Also, there were delays in assigning counterparts and assistants to FSRP; some counterparts were not assigned until six months to a year after the TA team's arrival.

## 6.4 Management of Training

Training has been one of the key inputs in the design of AID-funded FSR/E projects. However, problems in implementing training occurred in at least 5 of the 12 projects. Problems included difficulties in obtaining candidates for training, delays in obtaining clearances to send participants to training, and the departure of TA personnel before training participant returned to their countries. Malawi/ARP is illustrative.

Malawi/ARP -- The second ARP evaluation found that delays in clearance to create the first position in the Farming Systems Analysis (FSA) section and in hiring the first Malawian for that position resulted in a year's delay before the first participant could leave for training, while the second participant had still not been identified (Baker, et al., 1983). Further, neither participant was scheduled to return before the departure of the TA team member who was serving as the acting FSA section head. In considering the interaction between the TA team and Malawian project staff, the evaluation also found that TA team members "almost unanimously...regret...that they are not providing more on-the-job training and supervision for junior research staff" (Baker, et al., 1983:20).

The Project Paper stated that "all of the training decisions were based on the specific needs of research.... The training program represents the summation of specific project needs for better trained professional researchers." However, the second evaluation found that the eight Ph.D. candidates proposed in the PP had been increased to 12 trainees (Baker, et al., 1983). The evaluation noted that the increase in the number of Ph.D. candidates and the greater length of a doctoral program would result in a larger number of trainees returning after the PACD, thereby making it difficult for them to benefit from the TA provided by the project. This would jeopardize the output of

> an established and sustained program of research relevant to the smallholder.... . . . It will particularly affect the ability of the newly-returned researchers to benefit from the guidance of the technical assistance team and the continuity the latter have provided while participants were absent (Baker, et al., 1983:12, 15, 17).

The Regional Inspector General's audit in November 1982 noted the need for the project's TA component "to be synchronized with... long-term training...to insure a reasonable overlap between returning trainees and AID-funded expatriate researchers."

## 6.5 Management of Technical Assistance

All of the FSR/E projects reviewed included an expatriate technical assistance (TA) component. Most of these 12 projects encountered problems in managing the project's TA component. In some cases, TA personnel lacked FSR/E experience. Indeed, many donor-sponsored FSR/E projects were "staffed with individuals having little or no training or experience in on-farm research methods or team research approaches" (Baker and Norman, 1988:29). Also, a project's TA personnel often lacked experience in the country in which the project was being implemented. Finally, tours of duty often lasted nor more than two years and sometimes were less. Malawi/ARP provides an example of many of these problems.

Malawi/ARP -- ARP was designed using AID's "collaborative assistance" mode which permits a Title XII university to be selected competitively to participate in the final design of the project and promptly commence implementation when AID approves funding for the project. However, delays in executing the TA contract resulted in the TA contractor losing several intended TA team members. This, in the view of the evaluation, had a

> negative impact on project implementation. It appears that the project designers wrote the project job descriptions with fairly specific individuals in mind but could only field part of that team by the time the contract for technical assistance was finally signed. As a result, the particular skills mix of the team actually fielded has not been as comprehensive as what seems to have been intended at the time the project was designed. For example, the PP called for a crops agronomist who was expected to work on a variety of food and forage crops. The individual fielded was primarily a forage crops agronomist and as a result, food crop agronomic research was somewhat neglected during the early years of the project (Baker, et al., 1983:20).

The evaluation concluded that the project had failed "to provide qualified individuals for the positions designated in the Project Paper" (p. 8 of PES for Baker, et al., 1983). The TA personnel would have benefited by "more experience in agricultural research in developing countries, particularly in Africa" (Baker, et al., 1983:21). Further, most short-term consultants

> were in-country for a duration of two weeks or less and that few...consultants...made repeated trips to Malawi. The team would have preferred to see fewer...con-sultants, longer durations of the consultancies and key... technical expertise returning periodically to assist the ...the [Department of Agricultural Research] (Baker, et al., 1983:21).

A second problem in managing a project's TA component is ensuring a smooth start up on the part of the TA team. Several difficulties in this area arose in Lesotho/FSRP.

Lesotho/FSRP -- The second evaluation found that FSRP's start up had been impeded by a slow start on the part of the TA team (Martin, et al., 1981). This was caused by a number of factors including selection of team members without the involvement of the TA team leader, lack of orientation to the project before leaving the U.S., delays in team member arrival, team members not arriving in the sequence planned, lack of orientation assistance by USAID/Lesotho when team members arrived, inadequate introduction of team members and the project itself to government agencies and other entities with which they were expected to work, and delays in housing and office construction.

A third problem in managing the TA component of FSR/E projects has been that project administration requirements often distracted TA personnel from their primary task, namely, doing FSR/E. This problem appeared in at least six projects including Botswana/ATIP and Honduras/ARP.

Botswana/ATIP -- The second ATIP evaluation found that the TA team's chief of party (COP) was a recognized leader in FSR. However, the COP's administrative duties limited him to spending only 20% of his time in the field, "with much of this allocated to routine administration" (AID, 1986:56). In the evaluation team's view, the COP needed additional administrative support. This need was critical since ATIP team members had "limited experience" implementing FSR/E (AID, 1986:26).

Honduras/ARP -- The TA team's chief of party (COP) estimated that 75% of his time had been spent on administration, while approximately 50% of the agricultural economist's time had been similarly occupied (Hansen, et al., 1984). The evaluation found that the TA economist had become "more involved in administrative matters and in [university] related work, substantially reducing the time allocated to field work" (Hansen, et al., 1984:30). The scope of this problem, and its existence in ARP as in other USAID/Mission projects, prompted the question of why USAID contracts fail to

> recognize the essential importance of administration and automatically provide for administrative assistance.... This Contract, like many others, only requests technical people for technical work as if COP responsibilities were inconsequential. In many instances this results in a COP assuming that the technical work is what counts and trying to minimize administrative tasks. In other instances this results in a technically qualified COP who does not really have the necessary administrative skills or experience (Hansen, et al., 1984:24).

It may be noted, in passing, that the various problems associated with the management of the TA component of FSR/E projects do not appear to stem from any inadequacy on the part of the TA personnel (usually from U.S. universities) who provided TA in these projects. Indeed, a recent evaluation of the IFAD-funded SAFGRAD FSR/E program in Africa found that inadequacies in the management of the TA component of FSR/E projects also arose when FSR/E projects relied on Africans to provide technical assistance in FSR/E.

> The 'Africanisation' of the technical assistance was a worthy experiment to have included in this project since previous experiences with non-African technical assistance have demonstrated that there are typically many difficulties of implementation and effectiveness with such assistance. The present project seems to suggest that much of the same sort of difficulties are experienced with the African "variety", suggesting...that such difficulties...are not ethnically related but are inherent in external technical assistance (Anderson, et al., 1987:44).

## 6.6 <u>Factors Beyond a Project's Control</u>

The last generic constraint confronted by the FSR/E projects reviewed was that of factors beyond the ability of a project to control. Project designers cannot predict the future or plan for all possible contingencies. Yet acts of nature (i.e., droughts) or man (i.e., government policies, coups) can and will come along, disrupting and impeding project implementation and impact. At least a third of the 12 projects encountered problems in this category, as the following examples illustrate.

<u>Botswana/ATIP</u> -- The second ATIP evaluation found it "difficult to document" that the project's farming systems (FS) methodologies had made an impact (AID, 1986:28). With limited and erratic rainfall during ATIP's first four years, there was "no indication of consistent and demonstrated increases in production [or] income as a result of introduced technologies, except under favorable soil and rainfall conditions" (AID, 1986:18). In effect, the long period of drought during the project's early years effectively precluded the from project from making the progress that project designers had anticipated.

<u>Gambia/MFP</u> -- Early implementation of the MFP was disrupted by an attempted coup d'etat (Osburn, et al., 1983). However, by the second evaluation, MFP had prepared and delivered a tested maize production technology package to farmers (Corty, et al., 1986). This success was demonstrated by

> the increase in maize area from about 2,600 hectares at the beginning of the project to 18,000 hectares by [the] end of 1985. The average national yield has increased from 1.6 t/ha to 2.5 t/ha and there is a significant increase in number of maize growing farmers (Corty, et al., 1986:13a).

But most harvested maize is used locally, with marketed maize often finding its way into Senegal where prices were as high as D900 per ton. In October 1985, The GOG increased the producer floor price of maize 54% (from D390 to D600). Marketing arrangements were also changed. Instead of the Grain Produce Marketing Board buying the crop, local cooperative societies were authorized to buy all cereals and sell to the Gambian Credit Union (GCU). However, farmers were able to sell in the local market at higher prices than those offered by the GCUs.

MFP's design provided for PL 480 Title III Program funds to cover field operating costs and contractor logistical support (i.e., housing, furnishings). These funds were completely administered by the Senegalese Institute for Agricultural Research (ISRA) through the Ministry of Economy and Finance (MEF). But several factors made timely provision of adequate funds impossible. For example, sales of rice were proceeding slowly and sufficient funds were not were not being generated to support all Title III activities at required levels.

<u>Senegal/ARPP</u> -- The ability of the ARPP to plan its research program was constrained by the rapidly changing parameters of Senegalese agriculture (e.g., drought, rising input prices and food import bill, and changes in institutional roles and operating mechanisms) (St. Louis, et al., 1985).

<u>Tanzania/FSRP</u> -- Several factors beyond the control of the FSRP impeded the project's ability to make an impact on farmer adoption of improved technology. These included

> a) the rigidly controlled Government market for cereals, which gave rise to a purchase and payment system that deprived the farmer of any incentive to produce more than absolutely necessary, b) the UJAMA "villagization" scheme that removed farmers from their fertile fields and gave them infertile ones, and c) the inability of the Government to make good on many of its promises to villagers in providing them with services (A. Cunard, personal communication).

While two evaluations of FSRP failed to identify these factors as constraints on project success, the evaluations did identify that project implementation had been severely curtailed by the Brooke Amendment, a development that could not have been foreseen.

# 7. SOME CONCLUSIONS ABOUT AID-FUNDED FSR/E PROJECTS

## 7.1 Findings

A review of evaluations of 12 AID-funded FSR/E projects produced information indicating that these projects all too frequently failed to achieve the desired or expected level of impact, where impact is defined in terms of development and transfer of improved agricultural technologies to farmers, and institutionalization of FSR/E in research and extension systems. Specifically, the evaluations did not provide convincing evidence that these projects had made a major impact on technology development and transfer. Further, the review found that FSR/E projects generally were not successful in institutionalizing FSR/E in agricultural research organizations. It should be noted, however, that the reviewed projects typically were evaluated during implementation and did not provide information to assess institutionalization impact beyond the life of a project.

On a positive note, some projects were more successful than others, particularly in training research and extension personnel in the principles of FSR/E and providing them with opportunities to gain practical field experience in doing FSR/E. Participation in FSR/E not only has changed the attitudes of many researchers about small farmers as the clients of agricultural research but also influenced the way in which researchers define research problems, set research priorities, and carry out problem-oriented research at the farm level. In the final analysis, such changes may have a much longer-term impact on the institutionalization of FSR/E than short-term objectives (e.g., establishing a "FSR Unit" within a research organization).

The limited impact of the FSR/E projects reviewed prompts one to ask why these projects were not more successful. In other words, what factors operated as constraints to impede greater project impact on technology development and transfer and institutionalization of FSR/E? Generally, project impact was impeded by three general categories of constraints--core, operational, and generic, as follows.

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 the core characteristics of FSR/E as follows:

- o Farmer orientation
- o Farmer participation
- o Locational specificity of technical and human factors
- o Problem-solving approach
- o Systems orientation
- o Interdisciplinarity
- o Complementarity with commodity and discipline research
- o Technology testing in on-farm trials
- o Feedback to shape agricultural research priorities and agricultural policies

For example, in 7 or more of the 12 projects reviewed, the project's approach to FSR/E was found to be weak or lacking in "problem-solving" orientation and interdisciplinarity.[5] Five of the core constraints were present in five or more of the projects.

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

- o Stakeholder understanding of FSR/E
- o Agricultural research policy/strategy defining role of FSR/E
- o Long-term commitment of resources
- o Existing research capability and shelf technology
- o Consensus on FSR/E methodology
- o Capability to process farming systems data
- o Consensus on criteria for evaluating FSR/E
- o Links with extension
- o Links with agri-support services
- o Links with farmer organizations

For example, 7 or more of the 12 projects experienced difficulties in four of these areas--stakeholder understanding of FSR/E, agricultural research policy or strategy defining the role of FSR/E, consensus on FSR/E methodology, and links with extension. Seven of the operational constraints were present in five or more of the projects.

Generic Constraints -- A generic constraint is present when implementation of a FSR/E project is impeded by problems that can arise in any AID-funded project, regardless of the project's technical focus. Potential problems areas include:

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[5] Given that the study's sample was limited to 12 projects, a threshold of 7 is significant in the sense of being one more than half (6) of the 12 FSR/E projects reviewed. The specific set of 7 or more projects encountering problems in one constraint are not necessarily the same set of projects that encountered problems in any of the other constraints.

- o Project management structure
- o Government funding to meet recurrent costs
- o Staffing with trained manpower
- o Management of training
- o Management of technical assistance
- o Factors beyond a project's control

In two problem areas, staffing with trained manpower and government funding to meet recurrent costs, problems of one type or another were encountered in seven or more of the FSR/E projects reviewed. Five of the generic constraints were found in five or more of the projects.

The vignettes supporting these findings were drawn from case studies on 12 AID-funded FSR/E projects authorized between 1975 and 1984. At the decade's beginning, the concept of "farming systems research" (FSR) was neither well defined nor widely understood. As one observer put it:

> A major problem early on was the lack of a uniform definition of what farming systems was and was not. Confusing terminology proliferated, and many people assigned their own definitions, thereby adding to the confusion. The lack of clear definition and uniformity of terms meant that some projects and programs were doing farming systems type of work without acknowledging the label, while others were doing something else and calling its farming systems (Chapman and Castro, 1988:4).

In 1978, AID's Bureau for Development Support initiated the Farming Systems Research and Development Methodology (FSR&DM) Project (931-1006) to prepare guidelines for doing FSR. However, even as FSR&DM was being implemented, FSR/E projects were being launched by USAID Missions in Africa, Asia and the Near East, and Latin America and the Caribbean. In other words, FSR/E "practice" was proceeding even as FSR/E "theory" or guidelines were being developed.

Most of the 12 FSR/E projects reviewed were already underway or at least obligated when the FSR&D guidelines were published (Shaner, et al., 1982a, 1982b). Did these FSR/E projects use the guidelines to improve their concept of and/or approach to FSR/E? One may assume that the guidelines should have found a receptive audience in the four FSR/E projects (Gambia/MFP, Lesotho/FSRP, Tanzania/FSRP, and Honduras/ARP) in which technical assistance (TA) teams had been fielded by one of the universities affiliated with the Consortium for International Development, the organization that published the FSR&D guidelines. Yet none of the evaluations of any of the 12 FSR/E projects reviewed indicated that the guidelines had played any major role in ensuring that a project's TA team would indeed be doing FSR/E.

Despite the potential to use the guidelines to improve each project's concept of and approach to FSR/E, each TA team set out to do FSR/E based on that team's own perception of what FSR/E was or should be. In some cases, TA team members could not agree on what they should be doing under the "farming systems" banner. Indeed, as FSR/E projects were getting underway in the mid- to late-1970s, perceptions even varied about whether a project was a farming systems project or whether a project was to be evaluated as a "farming systems" project. As one evaluation team noted: "One of the things which this evaluation team became aware of at the beginning of this evaluation is that this project is a Malawi Agricultural Research Project, not a Malawi FSR project" (Baker, et al., 1983:36).

Yet the popularity of doing farming systems projects grew within AID during the late 1970s and early 1980s. Indeed, doing an FSR/E project became the "in" thing. The popularity of the term "farming systems research" even led to its use in several AID project titles, in part, to ensure rapid project approval. As one observer noted, the term "farming systems"

> proliferated in the development of new AID projects, mainly because project developers believed that using that label would assure rapid project approval. During the early 1980s, the number of AID-financed farming systems projects or projects with farming systems components being implemented worldwide increased significantly to the point where the majority of countries in which AID works now have or have had farming systems projects (Chapman and Castro, 1988:4).

However, by the time the Nepal/ARPP was authorized in 1984, use of the term "farming systems research" in project titles had fallen or begun to fall into disrepute in the Agency. Indeed, use of the term "farming systems research" in project titles came to be avoided to minimize the possibility that a project might not be approved. Yet, during the halcyon years of FSR in the Agency, AID-funded projects including a farming systems component played an important role in helping the Agency to gain experience in how agricultural research and extension projects could best strengthen the capabilities of developing country agricultural technology development and transfer systems. Looking back on the FSR years in AID, what stand out as the lessons learned from the Agency's experience with FSR/E projects?

7.2 Lessons Learned

Based on this study's review of AID's experience with 12 FSR/E projects and a recent "results inventory" of FSR/E projects and programs (Frankenberger, et al., 1988), the following appear as key "lessons learned."

Impact of FSR/E Projects -- Numerous problems are involved in assessing the impact of FSR/E on technology development and transfer. Such assessment is confounded by three factors (Baker and Norman, 1988: 12, as cited in Frankenberger, et al., 1988:1):

- The relative contributions of conventional agricultural research and FSR/E are not readily separable since they are complementary activities.
- Technology adoption depends upon numerous factors, including the performance of agri-support institutions (credit, production inputs, markets) that are not under the control of FSR/E teams; and
- Because FSR/E encompasses technological development and institutional change, significant results may only be achievable in a longer-time frame (e.g., 10-25 years).

Beyond these factors, advocates of FSR/E may have created unrealistic expectations about how quickly or the extent to which FSR/E could by itself contribute to increasing the productivity of a country's agricultural technology development and transfer system. For example, in many countries, as Baker and Norman (1988:28) point out, there is a lack of on-shelf technologies ready for location-specific, on-farm testing and adaptation to variation in the agro-ecological environment. The problem is particularly acute in marginal areas where FSR/E teams often have been assigned. Research payoffs under such conditions take considerable time to develop and, in the short run, will be limited. Compared with more favorable environments, fewer successful interventions are available for harsh agro-ecological zones; and even marginal improvement may require substantial modifications of existing farming systems.

Thus, it is not reasonable to assume that viable results can be achieved in the same time frame for both types of environment. Yet unfair comparisons may have reinforced the impression that FSR/E has not lived up to expectations. "The 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 FS approach has not lived up to expectations" (Baker and Norman, 1988:28).

In this light, the question of whether the FSR/E concept was <u>oversold</u> by practitioners or <u>overbought</u> by AID becomes a moot point. What should have been clear from the start is that FSR/E cannot by itself be expected to make a major impact. Progress in this respect, by the nature of the activity's research component, will take time and require coordination with other agri-support institutions. Thus, donors will need to take a long-term view and set more realistic objectives.

Finally, it is important to recognize that the gap between actual and desired levels of impact of FSR/E on technology development and transfer and institutionalization of FSR/E does not appear to be associated with any shortcoming in the FSR/E concept <u>per se</u> but rather with the failure to address more effectively the core, operational, and generic constraints that can impede implementation of a FSR/E project.

<u>Core Constraints</u> -- During the early years of FSR/E projects, the "farming systems research" concept was neither well defined nor widely understood. Further, <u>bona fide</u> FSR/E practitioners were few and far between; within AID probably even fewer understood the core characteristics required in doing FSR/E. Indeed, the record shows that simply forming a multidisciplinary team does not guarantee that the team's members will take an interdisciplinary or problem-solving approach to the problems faced by farmers. Similarly, placing a FSR/E unit in a research organization does not mean that the organization will understand FSR/E or have the resources needed to support FSR/E. Indeed, these organizations often have lacked adequate resources to carry out conventional on-station agricultural research.

Over the years, the FSR/E concept evolved as practitioners sought to apply the concept. During this time, and as a result of confusion and uncertainty about what FSR/E is or should be, many so-called FSR/E projects (or projects including a FSR/E component) were <u>not</u> doing FSR/E because their approaches to FSR/E failed to comply with the core characteristics of FSR/E. Indeed, some confused on-farm trials as being synonymous with FSR/E; such a conception failed to recognize that the other core characteristics need to be present to ensure that farming systems practitioners are doing FSR/E and to increase the chances that FSR/E will make an impact. By neglecting one or more of these core characteristics, FSR/E project personnel implemented approaches that fell short of being technically-sound FSR/E.

Operational Constraints -- FSR/E project designs did not systematically consider and provide means to address, the broad range of operational constraints that were found to impede implementation of these projects. Indeed, projects sought to introduce the FSR/E approach without fully realizing that "doing FSR/E" would quickly run into the same set of constraints that have traditionally plagued the efforts of donor agencies to strengthen agricultural research and extension systems in the developing countries. One could even argue that the introduction of FSR/E made matters worse to the extent that conventional agricultural research and extension systems saw FSR/E as competing for scarce resources.

Generic Constraints -- If lack of attention to 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 AID projects, regardless of their technical content. Where AID is still committed to providing development assistance for FSR/E via projects, this study identifies key generic constraints that merit greater attention during project design and implementation.

The Farmer in FSR/E -- FSR/E sees the farmer as playing a central role in the technology development and transfer process--one of being an active collaborator, not just a passive observer. Yet FSR/E practitioners often have had difficulty implementing the farmer participation concept because research and extension systems are geared to respond to the top-down lines of authority and responsibility characteristic of highly centralized and vertically structured organizations, rather than to farmer-identified needs and priorities (Frankenberger, et al., 1988). The ideal of farmer participation in FSR/E likely would 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, with little or no attention paid to the other commodities that many subsistence farmers produce for sale. Several evaluations raised the issue of whether FSR/E should place greater emphasis on cash crops and technologies to assist small commercial and subsistence farmers to raise higher-valued crops or animals. Subsistence farmers, as the evaluations noted, have little interest in increasing food production beyond the quantity needed to meet family subsistence, if increased production of a crop leads to a fall in the price of that crop in the market.

In short, the evaluations raised the question of whether FSR/E could play a greater role in designing farming systems that meet family subsistence requirements, while providing technological options that enable farmers to produce crops and animals having cash-earning potential. "Higher productivity to maintain better subsistence is not an adequate objective" (Haven North, personal communication).

Systems in FSR/E -- FSR/E projects have struggled with achieving a balance between doing systems analysis and developing improved technologies. While some FSR/E practitioners spend so much time studying the farm as a "system" that they never get around to testing potential technologies or institutional changes to overcome identified constraints, other FSR/E practitioners focus on one commodity (e.g., maize) of a farming system but fail to examine the commodity's interrelationships with the farm family and other components (e.g., livestock) of the farming system. Further, the increased attention now being paid to system components such as livestock, agro-forestry, gender, and consumption is often driven more by current fads and/or interest group advocacy than by the implications these components may have for the choice of technology options that will enhance the overall income of the farm family household.

A central issue in explaining the limited impact of FSR/E lies in how FSR/E practitioners have perceived and responded to the objective of FSR/E. While a systems orientation is a core characteristic of FSR/E, practitioners often have not gone beyond 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. In their haste to test technological alternatives in on-farm trials, the FSR/E practitioner has been overly driven by an emphasis on improving production technology, primarily for crops, as the end rather than a means.

Where the larger objective of increasing farm family income is not built into the design of FSR/E activities, the likelihood is increased that the approach will not focus adequately on the farm and farm family household as a system, thereby losing the concept of a system as a guiding rationale in FSR/E. Maintaining a focus on the farm and the farm family as a system is important because resource-poor farmers formulate management strategies and make decisions within the context of the mix of crop, livestock, and off-farm enterprises that comprise the whole economic system exploited by the farm family household. Thus, neither yield nor profit maximization is an appropriate criterion for assessing the potential utility and acceptability of a new technology in such farming systems. Yet FSR/E practitioners all too often have been obsessed with crop production technology, and failed to address the larger objective of providing small farmers with technology options to facilitate their climb up the economic ladder.

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 be careful that they do not focus so much on the trees (or crops) that they cannot see the forest (or other economic enterprises affecting farm management decisionmaking). As one AID official recalled:

> I am reminded of the model FSR farm I was shown in Mexico where the numerous production sub-systems were flourishing--pigs, chickens, cows, and numerous varieties of basic and other crops--all integrated in plantings and use of by-products and inputs.... Towards the end of the visit we talked with the farmer himself and found out that his wife and daughters did all the farm work. He was employed at a factory some distance away and his son was in medical school. The farm was not the main source of income (Haven North, personal communication).

The failure to implement a "systems" approach in FSR/E projects often may be traced to the staffing of these projects with technical assistance personnel who had little or no prior experience in doing FSR/E. They may have been experts in their own disciplines or university departments but were not accustomed to working together on an interdisciplinary team to solve farmer-relevant problems in a systems context. Clearly there is a certain dysfunctionality in training professionals in 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-related problem in FSR/E projects has been that on-station and on-farm technology testing place different emphases on establishing cause and effect relationships. On-station trials, which aim to establish such relationships, are highly controlled; on-farm trials are less controlled (Frankenberger, et al., 1988). While statistical analysis is crucial to the interpretation of on-station trials, 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 together 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 -- The emphasis in FSR/D on research aimed at developing technologies to relax production constraints often has resulted in a failure by FSR/E practitioners to address institutional constraints to farmer adoption and use of the technologies being developed. Such technologies frequently cannot be adopted by farmers unless they also have access to agri-support services (e.g., credit, production inputs, markets). Yet the institutions providing such services are characteristically weak in the developing countries. Research on improved technologies needs to be coordinated with research on the institutions that provide the agri-support services needed by farmers to adopt the improved technologies developed by FSR/E practitioners.

Social scientists can play an important role in developing research on institutional issues, characterizing farming systems, diagnosing socio-economic constraints, and monitoring and evaluation. However, few social scientists are brought into FSR/E programs. The problem is aggravated by a shortage of trained social scientists as well as agricultural scientists' perceptions of social scientists (Frankenberger, et al., 1988).

Extension in FSR/E -- Each of the FSR/E projects reviewed was located in an agricultural research organization, thereby raising the problem of how a project's research component was to be linked with extension. This problem is the obverse of that encountered by the World Bank in supporting institutionalization of the Training and Visit (T&V) System in many countries. While the Bank was fairly successful in establishing the T&V System in national extension organizations, T&V quickly ran up against the problem of accessing improved technologies that were ready for transfer to farmers. This led to a greater recognition of the need for extension personnel to be linked into site-specific adaptive research as the key to accessing improved technologies for dissemination through the T&V System.

While some FSR/E projects attempted to link research and extension by means of a Research Extension Liaison Officer, most FSR/E projects tended to view the "farming systems approach" as a research strategy, not as a strategy to integrate research and extension. This view assumes that improved technologies can be developed by researchers and then turned over to extension for dissemination to farmers. What this view fails to recognize is that extension's participation in on-farm research can enhance the responsiveness of a technology development and transfer (TD&T) system to farmers' needs.

A TD&T system, in a developing country context, resembles a chain with many weak links. While FSR/E is not a "missing link," it does focus on 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 <u>not</u> for new FSR/E projects but to strengthen FSR/E as an integral part of the 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., providing researchers with feedback on farm-level conditions that need to be taken into consideration in setting priorities for station-based experiments). Rather, the extension agent was seen only as a helper (e.g. locating farmers who are willing to provide land for the researcher's on-farm trials).

<u>Establishing the Link ("/") in FSR/E</u> -- Because improved agricultural technologies are rarely transferable directly from research to extension, FSR/E teams can play an important bridging role between research and extension, working with extension and farmers to test technologies from research and with researchers to provide feedback from farmers to establish research priorities (Frankenberger, et al., 1988). In other words, farming systems practitioners can form the core of a FSR/E program in individual ecological zones. Such a FSR/E program would integrate research and extension personnel within the region or zone in question.

Placing a FSR/E program administratively under research can facilitate access to research results and shelf technology, and enhance the ability of FSR/E to influence 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, linking research and extension in an effective manner continues to be a major challenge for implementing a FSR/E program that can impact on technology development and transfer.

The challenge is not made any less difficult by the fact that there are few, if any, professional rewards for interdisciplinary and interinstitutional collaboration to do FSR/E. Unless incentives are provided, it will be difficult for research and/or extension personnel to make a commitment to FSR/E, that is, to working together in a way that makes the link ("/") of research and extension a productive partnership. As long as career development is contingent on advancement in a centralized research or extension organization, it will be difficult or even 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 -- FSR/E's impact on technology development and transfer will be negligible as long as research and extension personnel fail to agree on a strategy for doing FSR/E. An effective strategy would outline the process and steps 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). An agreed upon strategy would also be useful in training new FSR/E practitioners entering a country's research and extension system.

A key contribution of AID-funded FSR/E projects has been provision of opportunity 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. The experience of FSR/E projects suggests that, while much progress has been made to date, much work yet needs to be done in developing a consensus on the "how to" of FSR/E. Areas in which methodological development is needed include diagnosis and analysis of system components, establishing 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 agri-support services (e.g., extension, credit, production inputs, markets, and policy).

Project Orientation to FSR/E -- Agricultural research is widely recognized as a long-term venture. Yet AID's support for FSR/E always has been cast in terms of short-term projects in which core, operational, and generic constraints hampered implementation and impact. While FSR/E projects often have been criticized for not living up to their promise, many projects really were not doing FSR/E or, if they were, were poorly funded and/or managed relative to the magnitude of the problems they faced. In this sense, one could argue that the farming systems approach (or FSR/E) has yet to be put to a crucial test in an AID-funded project.

On the other hand, it also can be argued that FSR/E would not be where it is today in many countries without the support AID and other donors provided for FSR/E projects. In spite of the progress that has been made, one hears of cases where a "farming systems approach" was just beginning to become institutionalized in a particular country when the donor who initially supported FSR/E in that county decided that FSR/E did not work and that it is time to shift gears and redirect resources to new priorities (e.g., sustainability). Forgotten in the shuffle has been the realization that the typical three- or five-year time frame of FSR/E projects provided too short a period to institutionalize FSR/E as an integral component of a country's technology development and transfer system.

Sustainability of Natural Resources -- Those now concerned with "new" issues such as sustainability may fail to see that FSR/E has a role to play in addressing sustainability issues in AID-funded projects. To be sure, the FSR/E projects reviewed were not unaware of the issue of sustaining the natural resource base; indeed, several of the FSR/E projects reviewed tried to develop technologies that would enhance the sustainability of farming systems. However, AID's current emphasis on sustainability suggests that FSR/E practitioners need to pay more attention to how FSR/E can contribute to enhancing sustainability of the farming systems for which improved technologies are being developed.

The problem is not one of throwing the baby (FSR/E) out with the bath water (i.e., the shortcomings of past FSR/E projects). The problem is to ensure that projects wrapping the baby (FSR/E) in a new blanket (i.e., sustainability) are not undermined by the same core, operational, and generic constraints that were nemeses in past FSR/E projects. Indeed, those advancing an agenda for a "sustainable agriculture" should heed the lessons learned in past FSR/E projects and ensure that the constraints that impeded those projects do not come back to haunt new projects that seek to accelerate the "transition to sustainable agriculture" (Committee on Agricultural Sustainability for Developing Countries, 1988).

Sustainability of FSR/E -- FSR/E initiatives implemented through richly endowed donor-funded projects will not likely to be sustainable given the limited resources of national agricultural research and extension systems (Frankenberger, et al., 1988). FSR/E cannot be sustained where local institutions are unable to provide sufficient funds to meet the recurrent operational expenses involved in carrying out farm-level activities (e.g., on-farm trials). FSR/E cannot proceed where salary-loaded research and extension budgets leave few, if any, resources for field operations. External support for FSR/E needs to be structured in a way that ensures:

-- that host country organizations develop a capability to assume an increasingly larger portion and eventually all of the recurrent costs of doing FSR/E; and

-- that the level of FSR/E supported by a country serves to complement conventional agricultural research and extension systems.

Evaluation of FSR/E Impact and Benefits -- 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, as Anderson (1985:226) notes, FSR/E personnel,

> 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] provide, in principle, a continuous harvest of impact information.

Ideally, impact and benefit assessment of FSR/E takes into account the extent to which FSR/E-produced farming systems better achieve the goals of farm families, and are socially desirable in terms of such criteria as sustainability, effects on landless laborers, etc. However, there are a number of conceptual problems involved in properly assessing the impact of FSR/E in terms of these two dimensions. Anderson (1985), who reviewed these problems, concluded that the feasibility of either *ex post* or *ex ante* assessment is impeded, if not precluded, by too many conceptual and data problems. Assessment of FSR/E impact and benefits is only possible in terms of simple criteria such as the speed and extent of adoption of recommended changes by farmers; and intuitive assessments of social desirability, guided where possible by empirical data on such effects as extent of soil loss, employment levels, and so on. Another factor in assessing FSR/E impact and benefits is the extent of institutionalization of FSR/E in agricultural research and extension systems. This will play an important role in determining how quickly innovations in biotechnology can be transformed into agricultural technology adapted to farming systems.

Readers interested in recent work to develop guidelines for evaluation of FSR/E projects may look at Farming Systems Support Project (1986), Lichte (1987); Ranaweera and Gonzaga (1988); and Zimet, et al., (1988).

*FSR/E Is No Panacea* -- The FSR/E projects reviewed were implemented during a time in which FSR/E "theory" and "practice" were being developed. FSR/E often proceeded by trial and error rather than being guided by any proven "theory" or methodology. Under pressure to implement FSR/E projects, implementors jumped into a murky river without knowing how deep the muddy water, how swift or turbulent the current, or what obstructions might lie below the surface. In many cases, technical assistance personnel charged with implementing FSR/E projects did not know how to swim and had to struggle to keep their heads above water.

But implementors were not totally at fault. Pressures in AID to develop projects and obligate funds, combined with expectations that funding of FSR/E projects would reap a bountiful harvest, led AID to support, particularly in Africa, research projects containing FSR/E components. Importantly, during this period, there were few bona fide FSR/E practitioners available to ensure that these projects' FSR/E components would be technically sound in design and implementation. Further, AID's own oversight capability to monitor and evaluate this new technical area was limited. As a result, expectations for FSR/E were raised far beyond what even proven FSR/E practitioners could deliver, given the core, operational, and generic constraints that prevailed in all of the projects reviewed. Matters were only made worse to the extent that implementation relied on university or contractor personnel who lacked adequate training in and orientation to FSR/E and/or the country in which they were to function.

In short, AID's experience with FSR/E projects should serve as a lesson to AID to exercise greater caution as the Agency now seeks to mount new attacks on old problems. Specifically, as AID turns its attention to "new" problems such as sustainability, the Agency should refrain from assuming that there are or may be "magic bullets" for developing agricultural research and extension. There are no "magic bullets" to get agricultural research and extension to focus on sustainability any more effectively than they focused on FSR/E. The solution does not lie in "magic bullets" (e.g., biotechnology) but rather in making a commitment to address systematically the problems of agricultural research and extension on a sustained, long-term basis.

Current Status of FSR/E in AID -- Why did AID not better anticipate core, operational, and generic constraints when FSR/E projects were designed? AID is involved in a "learning process," that is, learning how best to implement development assistance and, more particularly, how FSR/E can contribute to technology development and transfer and, more recently, sustainability. During the late 1970s and early 1980s, FSR gained popularity and became the "in" thing. The term's popularity even led to its use in several AID project titles, perhaps in part to ensure rapid project approval. However, by the mid-1980s, the FSR concept had fallen or begun to fall into disrepute in AID. Indeed, the use of the term "farming systems" in AID project titles came to be avoided to minimize the possibility that a project might not be approved.

No doubt AID-funded FSR/E projects encountered problems along the way, with projects failing, at least in the short run, to achieve desired levels of impact. Yet in the longer run, as recent FSR/E assessments and field studies of FSR/E projects and programs have suggested, FSR/E institutionalization has proceeded in many countries to an extent beyond that found when the projects reviewed in this study were evaluated (Baker and Norman, 1988; Collinson, 1988; Frankenberger, et al., 1988; Merrill-Sands, 1988; Breth, 1984; and Byrnes, 1988). Indeed, despite "declining support" for FSR/E among donors, "numerous countries around the world have reorganized their national research organizations to accomodate FSR/E" (Frankenberger, et al., 1988:4). Further, at least two regional networks, the Asian Farming Systems Network and the West African Farming Systems Network, have been established.

Despite these signs of institutionalization of FSR/E, the trend in AID funding away from FSR/E per se and toward other themes (e.g., biotechnology, non-traditional agricultural exports, and sustainability) has likely reduced the pace of institutionalization of FSR/E in many countries (Baker and Norman, 1988). Assessing the current state of institutionalization of FSR/E, Collinson (1988:2) concluded that:

> Progress...has been slow. ...of the many developing countries that have embraced FSR concepts, none has yet completed the nationwide build up of human and institutional capacity, nor the re-organization of research process, which the full exploitation of [FSR/E] concepts implies.

In spite the problems encountered in implementing FSR/E projects, AID does appear to recognize that FSR/E can contribute positively to strengthening agricultural research and extension systems. Key characteristics of FSR/E (e.g., on-farm trials) are now being designed, almost routinely, into AID-funded projects to strengthen agricultural research and extension. For example, current AID projects providing support for FSR/E include Burkina Faso Agricultural Research and Training Support (686-0270) and Bangladesh Agricultural Research Phase II (388-0051). However, the present study's scope precluded determining whether such newer projects address the core, operational, and generic constraints to FSR/E in a more effective manner than they were addressed in past FSR/E projects.

Further, a recent AID-sponsored survey of USAID Missions found a continuing concern about how to enhance FSR/E's impact on technology development and transfer and institutionalization of FSR/E in national agricultural research and extension systems. In the survey, USAID Missions were asked to identify which FSR/E activities would have high priority in their program and how they would rank each activity in order of importance. Potential activities were listed as follows:

A. Support of Ongoing Farming Systems Activities

1. Training
2. Networking/Newsletter
3. Farming Systems Symposium

B. New Directions in Farming Systems

1. Periodic Rapid Reappraisal
2. Linkages between Farming Systems and Policy
3. Technology Transfer

C. Evaluation of the Effectiveness of Farming Systems Work

1. Cost/Benefit Analysis
2. Integration of the Farming Systems Approach into Local Institutions

Table 3 summarizes the Missions' responses to the survey, listed in descending order of the percentage of Missions indicating that an item would have high priority in their programs (second column).

Although there are some apparent inconsistencies in the Missions' responses, as well as variations across regions, clear and consistent patterns are also apparent. First, the percent of Missions indicating that FSR/E activities would have high priority in their programs is greater among the Africa Missions (46%) than among the LAC Missions (29%) or ANE Missions (27%).

Second, all Missions, regardless of region, rated "training in FSR/E" (71%) as the activity that would have the highest priority. Beyond training research and extension personnel in FSR/E, the next concern is the question of "institutionalization of FSR/E" (48%). After training and institutionalization, the next concern is "technology transfer" (38%). In other words, the problem is not simply one of preparing individuals and organizations to do FSR/E; it also includes ensuring that improved technology is transferred to and adopted by farmers. Nearly a third (32%) of all Missions and half (50%) of the Africa Missions rated "policy linkages" (32%) as having high priority in this respect.

Third, considerably less priority was placed on "networking/newsletter" or "FSR/E symposium," although the latter was rated high in priority by half (50%) of the Africa Missions. It may be that such activities are recognized as of secondary importance compared with the primary tasks--training developing country researchers and extension personnel in FSR/E, institutionalizing FSR/E in developing country agricultural research and extension organizations, and transferring technology to small farmers.

Table 3. Percentage of USAID Missions Rating FSR/E Activities as Being of High Priority (and Rank Order of Importance of These Activities in Mission Programs as Rated by USAID Missions) (Chapman and Castro, 1988).

| Activity [6] | All Missions [7] n = 17-22 | | AFR Missions n = 6-7 | | ANE Missions n = 4-7 | | LAC Missions n = 7-8 | |
|---|---|---|---|---|---|---|---|---|
| | % | (R) | % | (R) | % | (R) | % | (R) |
| Training in FSR/E | 71 | (1) | 71 | (2) | 71 | (3) | 71 | (1) |
| Institution-alization of FSR/E | 48 | (4) | 57 | (4) | 33 | (5) | 50 | (2) |
| Technology Transfer | 38 | (2) | 57 | (1) | 27 | (4) | 29 | (3) |
| Policy Linkages | 32 | (3) | 50 | (3) | 17 | (1) | 29 | (4) |
| Cost/Benefit Analysis of FSR/E | 26 | (8) | 33 | (8) | 33 | (8) | 14 | (6) |
| FSR/E Symposium | 26 | (7) | 50 | (6) | 33 | (2) | 0 | (8) |
| Periodic Rapid Reappraisal | 24 | (6) | 17 | (7) | 0 | (6) | 43 | (5) |
| Networking/ Newsletter | 10 | (5) | 33 | (5) | 0 | (7) | 0 | (7) |
| AVERAGE | 34 | | 46 | | 27 | | 29 | |

Key

% = Percentage of USAID Missions Rating Designated FSR Activity As Being of High Priority

R = Rank Order of Importance of Designated FSR Activity in Mission Programs as Rated by USAID Missions

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[6] Percentage (%) and Rank (R) were measured separately but are listed together for comparative purposes.

[7] Some USAID Missions did not rank some or all of the activities.

Fourth, information exchange among FSR/E professionals across countries via such instruments as the "FSR/E symposium" and "networking/newsletter" is important. However, the problem of establishing linkages with agricultural policymakers whose policies currently constrain technology adoption by farmers may be perceived as having much greater importance.

Finally, the activities of "cost/benefit analysis of FSR/E" and "periodic rapid reappraisal" merit comment. These two activities have been described as follows:

> Cost/Benefit Analysis -- "It is believed by many researchers that the recurrent costs of farming systems research and extension are generally higher than those for on-station research. To test this assertion, a possible new initiative could be undertaken to examine whether the added benefits of a farming systems approach, in which the clients are heavily involved in the technology development process, compensates for the added institutional and financial costs. This issue could be explored using a case study approach to document costs and benefits, not only in financial terms but also in terms of the equity with which technological change benefits farmers as well as the effects of technology on the natural and cultural environments" (Chapman and Castro, 1988:A-4).

> Periodic Rapid Reappraisal -- "One of the drawbacks of the project approach to development is that once the project is designed and technical assistance is fielded, it is difficult to add activities to address unanticipated constraints that may arise preventing attainment of project goals. ... to address this problem, the new project could promote a periodic rapid appraisal approach to examine, besides farm-level technical and socio-economic constraints, conditions with respect to access and efficiency of agricultural markets, access and cost of credit, and the general price policy environment. This would be undertaken in specific regions of interest to AID Missions to determine whether there is scope for significant technological and productivity improvements and to assess whether or not changes in productivity would likely result in increased household incomes, enhanced availability of food, and better management of the existing natural resources base. Service in this regard would be provided to Missions in the form of multidisciplinary teams to perform the rapid appraisal and offer guidance as to which factors are most limiting and should be treated by establishing linkages among existing projects and activities (e.g., between a farming systems research project and an agricultural policy analysis project)" (Chapman and Castro, 1988:A-2, A-3).

These two activities also were rated by the Missions as low priority. Perhaps the Missions already recognize that FSR/E is likely to be more costly than conventional on-station research but that FSR/E will ultimately pay dividends far beyond what can be achieved if a country's research strategy is based largely on on-station research. In the case of "rapid reappraisal," perhaps the Missions recognize that FSR/E projects would benefit by being more responsive to the constraints that can arise during project implementation. However, bringing in yet another multidisciplinary team would hardly appear to be the solution. Rather, the solution entails finding ways to address the various constraints impeding agricultural research and extension personnel from doing FSR/E.

What is the connection between the aforementioned survey and the present study? The present study has documented a range of constraints--core, operational, and generic--that have plagued past FSR/E projects. In so doing, the paper sheds light on the constraints that AID must address more effectively if indeed the Agency continues to place high priority on such activities as training in FSR/E, institutionalization of FSR/E, and technology transfer. Thus, the challenge for current and future AID-funded agricultural research and extension projects is to address these multiple constraints in a much more effective manner.

## 7.3 Implications for AID Programming

In reviewing the core, operational, and generic constraints that have plagued AID-funded FSR/E projects, this paper has shed light on the constraints that AID must address more effectively if the Agency continues to place high priority on such activities as training in FSR/E, institutionalization of FSR/E, and technology transfer. The challenge for current and future AID-funded agricultural research and extension projects is to address these multiple constraints in a much more effective manner. There are three major implications for AID programming:

<u>Implication 1</u>: <u>AID can strengthen the contribution of agricultural research and extension systems to technology development and transfer (TD&T) by ensuring that FSR/E's nine core characteristics are systematically built into agricultural TD&T methodologies</u>.

If properly implemented, FSR/E can contribute to technology development and transfer. This requires that the core characteristics of FSR/E be systematically built into the TD&T methodologies of agricultural research and extension systems, and that none of the characteristics are neglected or overemphasized to the detriment of another. Box 1 provides a checklist of questions that may be used to assess whether an agricultural TD&T methodology addresses the core constraints to FSR/E.

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Box 1. A Checklist for Assessing an Agricultural Technology Development and Transfer Methodology: Core Constraints.

<u>Farmer orientation</u> -- Does the methodology target small-farm families as the client group, with the objective of generating technology relevant to the management conditions of this group? In other words, does the methodology provide for identifying the relevant conditions before proposing technological solutions, and for adapting technologies to local circumstances and needs?

<u>Farmer participation</u> -- Does the methodology provide for practitioners to work with and involve the farm family in the design, implementation, and evaluation of research and extension activities?

<u>Locational specificity of technical and human factors</u> -- Does the methodology identify, in specific agro-climatic zones, client groups in terms of relatively homogeneous domains or groups of farming systems?

<u>Problem-solving approach</u> -- Does the methodology 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?

<u>System orientation</u> -- Does the methodology view the total farm in a holistic manner (i.e., as a system of natural and human components), while focusing on a specific production subsystem in order to evaluate interactions between that subsystem and other subsystems, and the potential for and impact on the farm of introducing a change in the technology of the target subsystem?

Interdisciplinarity -- Does the methodology 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 methodology draw upon technologies and management strategies generated by discipline and commodity research and adapt this knowledge to specific agro-climatic environments and socioeconomic circumstances of a relatively homogeneous target group of farmers?

Technology testing in on-farm trials -- Does the methodology provide for farmers and practitioners to evaluate potentially improved technology under the environmental and management conditions in which it will be used, and to acquire knowledge about the farmer's decisionmaking criteria?

Feedback to shape research priorities and agricultural policies -- Does the methodology 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 test in the next, with trial results providing information useful in setting on-station research priorities as well as the formulation of agricultural policies?

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Each of these characteristics comprises a necessary but not sufficient condition for doing technically-sound FSR/E; if any characteristic is weak or missing in a technology development and transfer (TD&T) methodology, the methodology does not provide a technically-sound concept of FSR/E and the methodology's practitioners are not doing FSR/E. For example, a TD&T methodology that emphasizes "technology testing in on-farm trials" can easily fail to give adequate attention to other core charactertistics of FSR/E. Those who would practice FSR/E need to be careful that they do not neglect any of the core characteristics or overemphasize any characteristic to the detriment of the other characteristics. Technically-sound FSR/E requires that all nine core characteristics are systematically built into a TD&T methodology.

Implication 2: AID can strengthen the contribution of FSR/E to TD&T by ensuring that agricultural research and extension projects provide means to remove or relax the operational constraints that can impede implementation of FSR/E.

The present study demonstrates that FSR/E cannot by itself ensure that improved technologies will be developed and transferred to farmers. In each FSR/E project reviewed, one or more operational constraints impeded implementation of a project's approach to FSR/E and ultimately FSR/E's impact on technology development and transfer. Thus, FSR/E is not a substitute for conventional agricultural research nor can FSR/E by itself make a significant impact on TD&T. FSR/E needs to be part of a broader TD&T methodology that takes into account and provides means to address the operational constraints to FSR/E. Box 2 provides a checklist of questions that may be used to assess whether a TD&T methodology takes into account and provides means to assess the operational constraint to FSR/E.

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Box 2. A Checklist for Assessing an Agricultural Technology Development and Transfer Methodology: Operational Constraints.

Stakeholder understanding of FSR/E -- Does the methodology 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, namely, farmers).

Role of FSR/E in agricultural research and extension -- Does a country's agricultural research and extension system have an agricultural research policy and strategy that defines 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 -- Does 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 progress of the project in implementing FSR/E?

Links with extension -- Does the methodolgy provide an effective means of linking research and extension, whereby extension personnel are directly involved in developing FSR/E activities?

Links with agri-support services -- Does the methodology provide a means to leverage improved farmer access to the agri-support services required for adoption and continued use of the improved technologies being developed by FSR/E practitioners? Such services include, but are not limited to credit, production inputs, and markets.

Links with farmer organizations -- Does the project 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?

<u>Implication 3</u>: <u>AID can strengthen the contribution of FSR/E to technology development and transfer by ensuring that the core and operational constraints to FSR/E are systematically addressed on a sustained, long-term basis</u>.

AID-funded FSR/E projects encountered a variety of problems generic to any AID project, regardless of its technical content. These problems were classified in terms of six categories of generic constraints as follows:

- Project management structure
- Government funding to meet recurrent costs
- Staffing with trained manpower
- Management of training
- Management of technical assistance
- Factors beyond a project's control

Implementation of a FSR/E project and institutionalization of FSR/E are not facilitated by a project format that has only a three- to five-year life span. Success in agricultural research requires a longer time frame, and this is no less true in FSR/E. While FSR/E is not a substitute for conventional agricultural research, FSR/E can be instrumental in accelerating the speed with which agricultural technologies are developed and transferred to farmers. But this process is not aided by a "go-no go" orientation to supporting agricultural research in general or FSR/E in particular. Support needs to be sustained over the long-term.

If support for FSR/E is to be provided in a project format, AID must address generic constraints more effectively through improved project design, flexibility in implementation, and improved coordination of project staffing, training, and technical assistance. Also, care needs to be taken to ensure that projects including a FSR/E component are supported by an adequate management structure. Finally, implementation and institutionalization of FSR/E cannot proceed without funding to meet recurrent costs. In this area, AID needs to structure its support for FSR/E in such a way that incentives are provided to encourage greater public and private sector support for FSR/E in particular and agricultural research and extension in general.

## Annex A. Methodology of Study.

### Conceptual Model

The approach to developing the synthesis was initially based on a conceptual model of five cycles in the development of an AID project. These cycles are: concept, design, implementation, evaluation, and institutionalization. Each cycle focuses on a specific area of concern in project development and management, regardless of the project's specific technical area. The basic concern underlying each cycle may be stated as a question:

-- Concept (C) - What was the basic technical idea underlying the project?

-- Design (D) - How was this basic technical idea translated into a project? (Logical Framework)

-- Implementation (I) - How was the project managed by the host-country implementing agency, the technical assistance team, and USAID?

-- Evaluation (E) - How was the project's performance measured or assessed?

-- Institutionalization (I) - How did the project provide for the implementing agency to develop its capacity to continue to perform the types of activities supported by the project?

This simple CDIE/I model provided a framework for collecting information on individual AID-funded FSR/E projects (or projects including a major FSR/E component), and organizing that information into a case study of the project in question. In total, case studies were written on 12 projects. The procedure followed in selecting the projects on which case studies would be written is now summarized.

### Selection of Cases

The first task was to identify those AID projects that were FSR/E projects (or projects having a FSR/E component). A review of the Farming Systems Support Project's Farming Systems Research Project Directory (1987 Draft) and other sources revealed a total of 75 AID-funded FSR/E projects (or projects containing an FSR/E component). Because the review of AID-funded FSR/E projects was to be conducted as a desk review, it was important to identify not only which projects were AID-funded projects but also for which of these projects evaluation documentation was available in AID's Development Information System (DIS).

Of the 75 projects, 2 were "development support" projects--Farming Systems R&D Methodology (931-1066) and Integrated Systems for Small Farmers: Farming Systems Research & Extension, more popularly known as FSSP or Farming Systems Support Project (936-4099). Of the remaining 73 projects, 8 were in the development stage or were so young that evaluation documentation was not yet available. Of the remaining 65 projects, 23 had no evaluation documentation in AID's DIS. Of the remaining 42 projects, 25 were in Africa (including five regional projects), 10 in Asia and the Near East, and 7 in Latin American and the Caribbean (LAC).

A purposive sample was selected in consultation with AID officials and farming systems practitioners (including reference sources such as the Farming Systems Support Project's Farming Systems Research Project Directory, and representatives of the FSR/E Network Steering Committee established at the 7th FSR/E Symposium in 1987). In selecting the sample of projects, four criteria were followed:

1. Only projects were to be included that had a strong farming systems component, as identified by farming systems practitioners. By this criteria, some projects were not included in the sample simply because their farming systems component was weak (e.g., projects having a traditional institution building focus or an integrated rural development focus).

2. The sample was to include projects initiated at various points during the mid-1970s to mid-1980s.

3. The sample was to include representation of each of the three major regions--Africa, Asia and the Near East, and Latin America and the Caribbean.

4. Given the exploratory nature of the study and the quantity of documentation that would have to be reviewed by one person, the size of the sample was to be restricted to approximately a dozen cases.

Based on these criteria, a sample of 12 projects was selected, with the following country representation:

Africa — Botswana, Gambia, Lesotho, Malawi, Senegal, Tanzania, Zambia

Asia — Philippines and Thailand (later replaced by Nepal)

LAC — Guatemala, Honduras, and Ecuador (later replaced by a ROCAP-funded regional project based in Costa Rica)

In reviewing evaluation documentation, a decision was made to drop Thailand and Ecuador because the project evaluations for these two countries were of poor quality. As substitutes, Nepal and a ROCAP-funded regional project were added.

Table A-1 provides a regional breakdown of the FSR/E projects for which evaluation documentation was available in the DIS. The table indicates the relative proportion of projects from each region in the sample as compared with the relative proportion of the projects from each region in the population.

Table A.1. Regional Breakdown of Total Number of AID-funded FSR/E Projects and Number of Sampled Projects.

| Region | Total | Percent | Sample | Percent |
|---|---|---|---|---|
| Africa a/ | 25 | 60 | 7 | 58 |
| Asia | 10 | 24 | 2 | 17 |
| LAC b/ | 7 | 16 | 3 | 25 |
| Total | 42 | 100 | 12 | 100 |

a/ Includes 5 regional projects

b/ Includes 1 regional project

The specific projects included in the sample are summarized in Table A-2. Project description sheets are located in Annex E.

Table A-2. Sample of Projects Reviewed for CDIE Study of AID-funded FSR/E Projects.

| Country | Number | Project Title |
|---|---|---|
| Botswana | 633-0221 | Agricultural Technology Improvement |
| Gambia | 635-0203 | Mixed Farming and Resource Management |
| Lesotho | 632-0065 | Farming Systems Research |
| Malawi | 612-0202 | Agricultural Research |
| Senegal | 685-0223 | Agricultural Research and Planning |
| Tanzania | 621-0156 | Farming Systems Research |
| Zambia | 611-0201 | Agricultural Development Research & Extension |
| Nepal | 367-0149 | Agricultural Research and Production |
| Philippines | 492-0356 | Farming Systems Development |
| Guatemala | 520-0232 | Food Productivity and Nutritional Improvement |
| Honduras | 522-0139 | Agricultural Research |
| ROCAP | 596-0083 | Small Farmer Production Systems |

Writing of Case Studies

The data for the study were primarily drawn from the evaluation documentation (e.g., special evaluations, project evaluation summaries, and audit reports) for the 12 projects reviewed. The basic procedure for reviewing the projects was to read the documentation, noting therein specific content bearing on the conceptualization, design, implementation, and evaluation of the project's support for FSR/E; the project's progress toward institutionalization of FSR/E was also noted. Then a case study on each project was written, organizing the relevant information from the project documentation in terms of the five cycles of the aforementioned CDIE/I model.

Analysis of Case Studies

The case studies, once written, provided the primary data base for identifying, analyzing, and drawing conclusions about the experience of AID-funded FSR/E projects. The analysis of the case studies proceeded in an exploratory manner according to the following steps.

First, drafts of the synthesis (e.g., Section 2's overview, case studies, etc.) were periodically reviewed by and discussed with FSR/E practitioners or AID personnel experienced with FSR/E. This process was especially useful in identifying key constraints to the implementation of FSR/E projects. The author particularly acknowledges Dr. Tim Frankenberger (University of Arizona) who read all of the case studies and generated a preliminary listing of key constraints to the implementation of FSR/E projects.

Second, a word processing file was created for three of the CDIE/I model components (implementation, evaluation, and institutionalization). For example, the "implementation" file was a sequential listing of the text of the implementation sections of the twelve case studies. In this way, the case study information from all twelve projects relating most directly to implementation was brought together into one file.

Third, the author read through each file to identify key factors impacting on the model component addressed by the case study material in that file. For example, in the case of the implementation file, the author read through each of the twelve case study sections on implementation and attempted to identify key factors impacting on implementation. Thus, for the first project listed in the file, a set of factors was identified, and the relevant supporting information was grouped under that factor. This process of reading case study material, identifying key factors, and grouping supporting information was repeated for each of the remaining 11 cases. This process was repeated for the other two components (evaluation and institutionalization).

The net result was a listing of key factors impacting on each model component (e.g., implementation) and, for each factor, a set of supporting information across projects. For example, one of the listed key factors might be "lack of a linkage of research with extension." This factor would then be followed by a listing of the projects in which this factor was found to be a problem as well as the supporting information from each project.

Fourth, the process described in the preceding step produced a list of factors, many of which appeared as constraints for more than one model component (e.g., inability to meet recurrent costs of FSR/E is a constraint not only to implementing a FSR/E project but also to institutionalizing FSR/E). In view of the length of the list of factors, there was a concern about how to translate these factors into succinct conclusions on AID's experience with FSR/E projects. At this point, a CDIE/PPE colleague, Dr. Siew Tuan Chew, offered to read the files that had been generated by the third step. Dr. Chew observed that the case study materials brought to light two sets of constraints on FSR/E projects--one comprised of constraints generic to doing AID projects regardless of their technical focus, the other directly relating to the core characteristics of FSR/E as outlined in section 2.5.

Fifth, the author reclassified the case study material (from step three) into constraints generic to doing AID projects and constraints relating to the core characteristics of doing FSR/E. Based on this analysis, a generic constraint was defined as present when implementation of a FSR/E project is impeded by problems that can arise in any AID-funded project regardless of the project's technical focus. Potential problem areas include:

- Project management structure
- Government funding to meet recurrent costs
- Staffing with trained manpower
- Management of training
- Management of technical assistance
- Factors beyond a project's control

On the other hand, a core constraint was defined as present when a project's concept of and approach to FSR/E lacks or is weak in one or more of FSR/E's core characteristics, as follows:

- Farmer orientation
- Farmer participation;
- Locational specificity of technical and human factors
- Problem-solving approach
- Systems orientation
- Interdisciplinarity
- Complementarity with commodity/discipline research
- Technology testing in on-farm trials
- Feedback to shape agricultural research priorities and agricultural policy

In other words, the case study material illustrating core constraints to doing FSR/E suggested that, all too often, FSR/E practitioners were not practicing FSR/E because the so-called "farming systems research" activity lacked one or more of the core characteristics of FSR. For example, "lack of interdisciplinarity" appeared as a problem in a number of the projects reviewed; accordingly, the relevant case study materials across projects were grouped under this constraint.

Despite the progress achieved in classifying case study material in terms of core and generic constraints, a considerable amount of material remained that could not be classified in terms of either category. A careful review of this material suggested a third type of constraint, namely, an operational constraint. An operational constraint was defined as being present in a FSR/E project when the project's efforts to do FSR/E are impeded by problems in any of the following areas:

-- Stakeholder understanding of FSR/E
-- Agricultural policy or strategy defining role of FSR/E
-- Long-term commitment of resources
-- Existing research capability and shelf technology
-- Consensus on FSR/E methodology
-- Capability to process farming system data
-- Consensus on criteria for evaluating FSR/E
-- Links with extension
-- Links with agri-support services
-- Links with farmer organizations

Finally, the remaining case study material, not classifiable in terms of core, operational, or generic constraints, was found to focus on two important issues: (1) the impact of FSR/E on technology development and transfer; and (2) the impact of FSR/E projects on the institutionalization of FSR/E. In effect, looking back on this analytical process, it became clear that the case study material relating to the impact of FSR/E projects provided a general measure of the track record of AID-funded FSR/E projects. In other words, information on a project's impact in such areas as technology development and transfer and on institutionalization of FSR/E are indicative of the relative degree of success of FSR/E projects in strengthening the ability of agricultural research and extension systems to be responsive to the technological requirements of farmers.

Further, the case study material developed by this study--either the project-specific case studies or the reclassification of the case study material in terms of core, operational, and generic constraints--can help to improve our understanding of the range of factors that influenced the relative success or failure of past FSR/E projects. Improved awareness of these constraints and their debilitating impact on doing FSR/E and implementing FSR/E in agricultural research and extension projects in the developing countries should greatly facilitate improved conceptualization, design, implementation, evaluation, and institutionalization of these projects' FSR/E components.

## Presentation of Findings

Selected vignettes from the case studies are reported in the body of the report to illustrate how each factor operated as a constraint on technology development and transfer, and institutionalization of FSR/E. While no effort is made to rank the constraints by importance, Table 2 provides information on the frequency of negative and positive instances of each constraint, thereby permitting the discussion in the body of the report to shed light on which constraints appeared most frequently across the projects reviewed. Further, the Project Description Sheets in Annex E list the specific core, operational, and generic constraints that were found in each project.

Readers who are interested in examining the full data set on which this study's conclusions are based may wish to consult the individual case studies from which the vignettes were drawn. The reader should also bear in mind that space limitations precluded including the full set of vignettes corresponding to the list of constraints identified in the Project Description Sheets (Annex E).

Annex B. Types of FSR/E.

While 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 (FSCR as described below) places little (or no) emphasis on extension. Yet FSCR may be an important step in developing technology components that are subsequently tested by extension workers in on-farm trials as a central activity of another type of FSR/E, namely, farming systems adaptive research (FSAR as described below).

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

## 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*.

## Farming Systems Adaptive Research

Farming Systems Adaptive Research (FSAR) aims at increasing the farming system's productivity through the development of technology adapted to farmer's 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 and/or guided by Farming Systems Analysis and/or 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 CIMMYT (Byerlee, *et al*., 1982; Collinson, 1982) called On-Farm Research with a Farming Systems Perspective (OFR/FSP). This is the type of FSR/E most frequently conducted under the name of FSR, particularly by scientists in national agricultural research systems.

Farming System Component Research

Farming System Component Research (FSCR) refers to station-based, applied and adaptive research on farm subsystems or components designed to support Farming Systems Adaptive Research (FSAR). 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 cropping patterns typical of small farm systems 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 in isolating specific problems for more in-depth research and in establishing more relevant research priorities. The product of FSCR is prototype technology which becomes part of the "body of knowledge" upon which FSAR can draw.

Many farming systems research initiatives of the IARCs may be classified as FSCR. CIAT's Bean Program provides a good example. 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 IRRI 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 focused 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 then 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.

## Farming Systems Base-Line Data Analysis

Farming Systems Base-Line Data Analysis (FSBDA) aims at developing a classification of major types of farming systems in an agro-climatic 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 variation in climatic factors and resources affect agricultural production. Socioeconomic factors (e.g., population density, land tenure, etc.) 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 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 agro-climatic zone) is executed on a larger scale than FSAR (which focuses on the farming systems within an agro-climatic zone). The focus of analysis is on the environment and the general configuration of farming systems rather than on the internal organization of a specific type of farming systems. Greater emphasis is placed on biological and physical rather than socio-economic variables.

IARCs having regional mandates (for example, ICRISAT, ILCA, and IITA) have used FSBDA extensively.

## New Farming Systems Development

New Farming Systems Development (NFSD) aims to generate a broad-based technology designed to overcome major constraints in a large agro-climatic 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 Farming Systems Analysis, Farming System Component Research, and/or Farming Systems Base-Line Data Analysis may provide supplementary data.

IITA's program to develop a more stable and productive agricultural system to replace shifting cultivation in the humid and sub-humid 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 semi-arid 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, major farmer acceptability problems emerged in on-farm trials.

This development is not surprising given NFSD's lack of attention to socioeconomic factors during the technology design stage. While the research program defined the watershed management units in physical and biological terms, establishment of these units requires that dispersed, individually-owned landholdings be consolidated into a single resource management unit. However, 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.

## 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 or 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 a technology, while technically improved, can be rendered useless because of the lack of adequately developed agricultural support institutions. Rather than treating such institutions as given or fixed, as is usually done in FSAR, 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).

A summary listing of these different types of FSR/E is presented in Table B-1.

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Table B-1. Types of FSR/E.

* Farming systems analysis (FSA)
  (farming systems research sensu stricto)

* Farming systems adaptive research (FSAR)
  [on-farm research with a farming systems perspective (OFR/FSP)]

* Farming systems component research (FSCR)

* Farming systems base-line data analysis (FSBDA))

* New farming systems development (NFSD)

* Farming systems research and agricultural development (FSRAD)
  [similar to the so-called Francophone approach to FSR in Africa or the farming systems approach to infrastructural support and policy (FSIP)]

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Annex C. Emerging Trends in FSR/E.

Donor interest in FSR/E has not been restricted to AID. For example, Andrew Ker of the International Development Research Centre (IDRC) stated that "IDRC has been very strongly committed to FSR for the past 15 years....it will stay committed for the next 50." (cited in Poats, et al., 1986:76). While the World Bank has supported the Training & Visit System (T&V System) as an extension model in many countries, the Bank in recent years has begun to take a greater interest in FSR (Simmonds, 1985). One may anticipate that future 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.

## Client-Oriented FSR/E

Further 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 (RPF) and farmer participatory research (FPR) in the agricultural innovation and technology management process. As Farrington and Martin (1987:1) have observed:

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

The seeds for the emerging emphasis on farmer participatory research (FPR) 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-type mode have formulated what are, in effect, FPR models. 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" (FBTF) model developed at the International Potato Center (CIP) (Rhoades and Booth, 1982). A third example is the "farmer-first-and-last" (FFL) model proposed by Chambers and Jiggins (1986). Common to all of these models is the recognition of the need to orient research to the farmer as the client, hence the term "on-farm client-oriented research" (OFCOR) in a study of national agricultural research systems being conducted by the International Service for National Agricultural Research (ISNAR) (CGIAR, 1987:42). Thus, the emphasis on farmer participatory research (FPR) and on-farm client-oriented research (OFCOR) suggests a variant of FSR/E which may be called "client-oriented FSR/E" (CO FSR/E).

## Market-Driven FSR/E

The emergence of the "client-oriented FSR/E" concept is an important step in the evolution of the FSR/E concept. Indeed, this steps opens the door to finding new ways to direct, manage, and fund agricultural research and extension. In several countries, AID 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, AID is assisting the Honduran Agricultural Research Foundation (FHIA). FHIA is a private-sector organization that conducts research aimed at developing Honduras' potential to compete in non-traditional agricultural export markets. In the Dominican Republic, AID is assisting the newly-created Agricultural Development Foundation to build its endowment, the income from which will be used to fund agricultural research on non-traditional agricultural export crops.

The growing emphasis on stimulating private-sector participation in agricultural research and technology transfer for non-traditional agricultural export crops helps to bring into relief that FSR/E could play a more active role in assisting farmers to identify market opportunities that provide incentives for farmers to grow new non-traditional market and export crops. A greater level of activity of FSR/E practitioners in helping farmers to develop their ability to produce a range of marketable crops implies another front along which the FSR/E concept could evolve, namely, in the direction of what may be termed "market-driven FSR/E" (MD FSR/E).

## Client-Directed FSR/E

The emergence of the concepts of "on-farm client-oriented research" and "market-driven FSR/E" will create a dynamic that further shapes the definition of FSR/E as an evolving concept. Indeed, resource limitations and efficiency considerations will likely create pressure to find ways, across heterogeneous agro-climatic 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 assume greater responsibility for designing, implementing, and evaluating FSR/E in particular and agricultural research and extension in general.

In this respect, innovative approaches 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., AID/Bolivia's Private Agricultural Producer Organization Project). There would appear to be great potential for farmer organizations to play a more active role in funding, designing, managing, participating in, and reaping the benefits of agricultural research, particularly where such research is carried out in a FSR/E mode. Where farmer organizations begin to play a more active role in agricultural research and extension, not only participating in agricultural research (i.e., FPR) but also setting the direction and priorities of such research, one may envision that the FSR/E concept will evolve in the direction of what may be termed "client-directed FSR/E" (CD FSR/E).

The FSR/E concept will likely evolve along the "new" lines identified in the preceding section, with increased attention being placed on specific issues (gender, livestock, income, food consumption, sustainability, natural resource management, policy linkages, methodology development, etc.). But it is also likely that AID-funded projects involving an FSR/E component will continue to face "old" constraints to implementation and impact. Are these "old" constraints, be they core, operational, or generic, of concern to AID?

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

Annex D. Project Description Sheets of Farming Systems Research and Extension Projects Reviewed by CDIE.[1]

This annex provides a project description sheet (PDS) for each of the twelve FSR/E projects reviewed. The PDS for a given project includes a listing of the negative and/or positive instances of core (C), operational (O), and generic (G) constraints found in the project. Unless noted as positive (+), all instances are negative (-).

Core Constraints (C)

C.1 Farmer Orientation
C.2 Farmer Participation
C.3 Locational Specificity of Technical and Human Factors
C.4 Problem-Solving Approach
C.5 Systems Orientation
C.6 Interdisciplinarity
C.7 Complementarity with Commodity and Discipline Research
C.8 Technology Testing in On-Farm Trials
C.9 Feedback to Shape:
 a. Agricultural Research Priorities
 b. Agricultural Policies

Operational Constraints (O)

O.1 Stakeholder Understanding of FSR/E
O.2 Agricultural Research Policy/Strategy Defining Role of FSR/E
O.3 Long-Term Commitment of Resources
O.4 Existing Research Capability and Shelf Technology
O.5 Consensus on FSR/E Methodology
O.6 Capability to Process Farming Systems Data
O.7 Consensus on Criteria for Evaluating FSR/E
O.8 Links with Extension
O.9 Links with Agri-Support Services
O.10 Links with Farmer Organizations

Generic Constraints (G)

G.1 Project Management Structure
G.2 Government Funding to Meet Recurrent Costs
G.3 Staffing with Trained Manpower
G.4 Management of Training
G.5 Management of Technical Assistance
G.6 Factors Beyond a Project's Control

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[1] See Annex F for Summary of Funding for Farming Systems Research and Extension (FSR/E) Projects Reviewed by CDIE.

Botswana/ATIP - 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 sub-purposes included:

-- 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 which 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; and
4. Botswana Agricultural Marketing Board seed production unit completed and functioning.

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

TA Contractor: Mid-America International Agricultural Consortium (MIAC), with Kansas State University as lead university.

Evaluations: Two -- an external evaluation in 1984 (Francis, et al., 1984); and an external evaluation in 1986 (A.I.D., 1986).

Constraints: C.4, C.6, C.9.a (+), C.9.b, O.1, O.2, O.4, O.5, O.6, O.6 (+), O.8, G.2, G.3, G.4, G.5, G.6.

Gambia/MFP - 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: MFP was not conceived, designed, or initially implemented as a FSR/E project. MFP 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 socio-economic characteristics of small farmers; and
7. Training Government of The Gambia personnel to enable them to implement a mixed farming policy; and
8. Increasing Gambian production and use of maize for human and animal consumption.

The objective of MFP's fifth component (Socio-Economic Unit) was to plan and evaluate projects, not to participate in and support the development of FSR/E. However, during implementation, MFP 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 (MANR), and the Socio-Economic Unit thereof.

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

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

Constraints: C.4, C.6, C.8, O.3, O.6, O.7, O.9, O.10, G.1, G.2, Lesotho/FSRP - 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: 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 (FS) program;
3. Strategies for reaching farmers;
4. Trained Basotho personnel;
5. Research and information data base; and
6. Agricultural research library

Implementing Agency: Research Division, Ministry of Agriculture

TA 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: C.1, C.3, C.4, C.7, O.1, O.2, O.3, O.4, O.5, O.6, O.7, O.8, O.9, O.10, G.2, G.3, G.4, G.5.

Malawi/ARP - 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 Department of Agricultural Research (DAR) within the Ministry of Agriculture "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."

Outputs: Not a FSR project *per se* but did provide support for two new DAR sections: Farming Systems Analysis (FSA) and Agricultural Economics. Outputs included strengthening of quality and quantity of research programs in crop, livestock, and technical areas relevant to smallholders; and field trials completed by TA team and counterpart staff, and technology packages developed.

Implementing Agency: Department of Agricultural Research (DAR) Ministry of Agriculture.

TA Contractor: University of Florida.

Evaluations: Two -- a mid-term evaluation in 1981 (Thorne, 1981) when most of the TA team members were arriving at post; and a second evaluation in 1983 (Baker, et al., 1983).

Constraints: C.3, C.4, C.6, C.9, O.1, O.2, O.3, O.5, O.7, O.8, G.1, G.2, G.3, G.4, G.5.

Senegal/ARPP - Agricultural Research and Planning Project (685-0223)

Initial Authorization: 1981 (for 5 years)

Goal: "To increase the capacity of the Government of Senegal (GOS) to more effectively plan and evaluate agricultural development policies and projects."

Purpose: The project's purpose contained three sub-purposes:

-- "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 productions systems research and macroeconomic research programs."

-- "To carry out macroeconomic research on food, nutrition and agricultural policies...to provide guidance to policy makers 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 social acceptable."

Outputs:
1. Production systems studies, on-farm trials of improved technical packages for "recommendation domains;"
2. Macro-economic studies of the agricultural sector;
3. Upgraded technical and professional skills for researchers;
4. Expanded collection of socio-economic documents in the Senegalese Agricultural Research Institute's Documentation and Information Service, including the improvement of the documentation in two research stations; and
5. Improved computer capacity for the Production Systems Research (PSR) and macro-economic programs.

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

TA Contractor: Michigan State University.

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

Constraints: C.2 (+), C.3, C.4, C.9.b (+), O.1, O.4, O,5, O.6, O.7 (+), G.1, G.2, G.3, G.4 (+), G.5 (+), G.6.

Tanzania/FSRP - 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"

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 GOT institutions serving agriculture;
2. Agronomic research recommendations for maize, legumes, and/or sorghum/millet in each of the Central, Norther, and Western agro-ecological zones in Tanzania;
3. Five-year plans for major food crops implemented and coordinated by Tanzanian researchers;
4. Improved physical facilities at Ilonga Agricultural Research Institute;
5. Crop trials program expanded;
6. Crop genetics improvement program continued; and
7. Short- and long-term training continued.

Specific FSRP 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; and

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

Implementing Agency: Tanzania Agricultural Research Organization (TARO).

TA 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: C.4, C.4 (+), O.2, O.3, O.8, G.3, G.6.

Zambia/ZAMARE - Agricultural Development Research & Extension Project (611-0201)

Initial Authorization: 1980 (for 5 years)

Goal: "to assist the GRZ in improving the welfare of small farmers and increasing national food production through the development and adaptation of relevant technology."

Purpose: "to help the GRZ 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 (ARPT) 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; and
4. Upgrading of the professional and technical skills in agricultural research and extension within MAWD through selected academic and practical training in Zambia, the U.S., in other African countries, and at international institutions.

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

TA 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, et al., 1983); and in early 1985 (Yohe, et al., 1985; and Sutherland and Warren, 1985).

Constraints: C.2, C.7, C.9 (+), O.1, O.2 (+), O.8, O.9 (+), G.4 (+), G.5 (+).

Nepal/ARPP - 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 GON 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. Improve research administration;
2. Improved research information and documentation system;
3. Expanded socio-economic research program;
4. Improved farming systems program;
5. Improved commodity program and discipline division research;
6. Hill production program;
7. National seed development board; and
8. Hill seed production program.

The improved farming systems program included a Farming Systems Research and Development Division (FSRDD), while the expanded socio-economic research program included a Socio-Economic Research and Extension Division (SERED).

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

TA Contractor: Winrock International Institute for Agricultural Development.

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

Constraints: C.2, C.3, C.5, C.6, C.9.a, C.9.b, O.1, O.2, O.4, O.7, O.9, G.1, G.2, G.3, G.4

Philippines/FSDP - 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 multi-locational trials completed; (c) farmers trained and participating in research; (d) Ministry of Food and Agriculture (MAF) staff trained; and (3) physical facilities completed;

2. Improved capacity of the Visayas State College of Agriculture (VISCA) 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) VISCA conducting training in farming systems; (d) VISCA staffed trained; and (e) physical facilities completed; and

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

Implementing Agency: Region VIII/Ministry of Food and Agriculture, and Visayas State College of Agriculture (VISCA).

TA Contractor: Cornell University.

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

Constraints: C.2, C.3, C.4, C.5, C.6, C.8, C.9.a, O.4, O.5, O.8, O.9, O.10 (+), G.1, G.2, G.4, G.5

Guatemala/FPNI - 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 GOG'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 underway;
5. Trained professional research and extension staff will be developed and on-board in ICTA; and
6. Data on nutritive content of basic food products will be developed.

Implementing Agency: Agricultural Science and Technology Institute (ICTA).

TA 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: C.2 (+), C.4, C.5, C.6, C.8, O.1, O.3 (+), O.5, O.7 (+), O.8, G.2 (+), G.3, G.4 (+), G.5 (+)

Honduras/ARP - 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 underway on a small scale."

Outputs:
1. Multidisciplinary teams trained and work;
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 [Programa Nacional de Investigaciones Agricolas (PNIA)], Ministry of Natural Resources. PNIA was later renamed the Department of Agricultural Research [Departamento de Investigacion Agricola (DIA)].

TA Contractor: Consortium for International Development, with New Mexico State University as lead university.

Evaluations: Three -- The first evaluation (A.I.D., 1980), scheduled for November 1979, was not conducted until February 1980, 19 months after the Project began and approximately midway through the anticipated LOP. The second evaluation (Beausoleil, et al., 1981), an annual progress evaluation, was conducted 14 months later in April 1981. The third evaluation (Hansen, et al., 1984) was conducted in January 1984, almost three years after the second evaluation, one year after HARP's Contract TA team arrived in Honduras, and six months before the PACD of July 1984.

Constraints: C.6, O.2, O.3, O.5, O.8, G.1, G.2, G.3, G.5.

ROCAP/SFPS - Small Farmer Production Systems (596-0083)

Initial Authorization: 1979 (for 4 years)

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

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

Outputs:
1. Methodology for development of crop, animal, and mixed farming systems recommendations;
2. Crop, animal, and mixed farming systems recommendations for 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 tech-packs to small farmers;
6. Formal training through short courses and graduate training;
7. In-service training through direct participation in field research; and
8. Institutional capacity to continue technical assistance for production and transfer of recommendations.

Implementing Agency: Tropical Agricultural Research and Training Center (CATIE).

TA Contractor: Tropical Agricultural Research and Training Center (CATIE).

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

Constraints: C.2, C.2 (+), C.4, C.5, C.8, C.8 (+), C.9, O.2, O.2 (+), O.5, O.8, O.9, G.2, G.3.

Annex E. Summary of Funding for Farming Systems Research and Extension (FSR/E) Projects Reviewed by CDIE.

(IN THOUSANDS OF DOLLARS)

| Country | Proj. Number | Proj. Title | Init. Oblg. | Finl. Oblg. | LOP Authd. | Obligation a | Expenditure b | Estimated FY 88 Expenditure | Proposed FY 89 Expenditure | Total to FY 89 Obligation | Total to FY 89 Expenditure |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Botswana | 633-0221 | ATIP | 1981 | 1987 | 8,980 | 8,980 | 5,125 | 1,143 | 1,450 | 8,980 | 7,718 |
| Gambia | 635-0203 | MFP | 1979 | 1984 | 9,000 | 9,000 | 8,414 | 586 | -- | 9,000 | 9,000 |
| Lesotho | 632-0065 | FSRP | 1978 | 1985 | 10,028 | 10,028 | 9,950 | 78 | -- | 10,028 | 10,028 |
| Malawi | 612-0202 | ARP | 1979 | 1982 | 9,000 | 9,000 | 8,780 | 220 | -- | 9,000 | 9,000 |
| Senegal | 685-0223 | ARPP | 1981 | 1985 | 5,350 | 5,350 | 4,670 | 680 | -- | 5,350 | 5,350 |
| Tanzania | 621-0156 | FSRP | 1982 | 1982 | 3,000 | 3,000 | 2,614 | 386 | -- | 3,000 | 3,000 |
| Zambia | 611-0201 | ZAMARE | 1980 | 1984 | 12,515 | 12,515 | 10,339 | 1,176 | 1,000 | 12,515 | 12,515 |
| Nepal | 367-0149 | ARPP | 1985 | 1989 | 10,000 | 8,051 | 2,394 | 2,500 | 3,000 c | 10,000 | 7,894 |
| Philippines | 492-0356 | FSDP | 1981 | 1987 | 4,803 | 4,803 | 2,450 | 739 | 570 | 4,803 | 3,759 |
| Guatemala | 520-0232 | FPNI | 1975 | -- | -- | 1,730 | 1,730 | -- | -- | 1,730 | 1,730 |
| Honduras | 522-0139 | ARP | 1978 | 1983 | 2,750 | 2,628 | 2,628 | -- | -- | 2,628 | 2,628 |
| ROCAP | 596-0083 | SFPS | 1979 | 1985 | 8,155 | 8,155 | 8,155 | -- | -- | 8,155 | 8,155 |
| TOTAL | | | | | | | | | | 85,189 | 80,777 |

Key:

| | | |
|---|---|---|
| AFRICA | Botswana/ATIP | Agricultural Technology Improvement Project |
| | Gambia/MFP | Mixed Farming and Resource Management Project |
| | Lesotho/FSRP | Farming Systems Research Project |
| | Malawi/ARP | Agricultural Research Project |
| | Senegal/ARPP | Agricultural Research and Planning Project |
| | Tanzania/FSRP | Farming Systems Research Project |
| | Zambia/ZAMARE | Agricultural Development Research & Extension Projec |
| ASIA & NEAR EAST | Nepal/ARPP | Agricultural Research and Production Project |
| | Philippines/FSDP | Farming Systems Development Project-Eastern Visayas |
| LATIN AMERICA & CARIBBEAN | Guatemala/FPNI | Food Productivity and Nutritional Improvement Project |
| | Honduras/ARP | Agricultural Research Project |
| | ROCAP/SFPS | Small Farmer Production Systems Project |

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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 of $375)
Honduras (expenditure through FY 86)
ROCAP (expenditure through FY 86 + estimated FY 87 expenditure of 4)
c Includes proposed FY obligation of $1,949 for Nepal.

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

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| Year | Volume | Document No. |
|---|---|---|
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