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Identification of Results of Farming Systems Research & Extension Activities: *A Synthesis*

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IDENTIFICATION OF RESULTS OF FARMING SYSTEMS RESEARCH AND EXTENSION ACTIVITIES: A SYNTHESIS

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I. Introduction

The purpose of this study was to review, analyze, and document the results of Farming Systems Research and Extension (FSR/E) projects/programs that have been implemented worldwide. Funded by the United States Agency for International Development, this study focused on the factors that affect sustainability of FSR/E within national agricultural research and extension systems. Emphasis was given to the degree to which externally funded FSR/E projects have assisted in institutionalizing the FSR/E approach into these systems, and the extent to which governments will support these activities. The study relied on field case studies in Indonesia, Guatemala, Botswana, and Costa Rica, and a secondary review of FSR/E programs in 23 other countries. Overall, this review covered 16 countries in Africa, 7 countries in Latin America, and 4 countries in Asia. Countries included in the secondary review were Brazil, Burkino Faso, Ethiopia, Gambia, Honduras, Lesotho, Mali, Malawi, Nepal, Niger, Nigeria, Panama, Paraguay, the Philippines, Somalia, Swaziland, Thailand, Tanzania, Sudan, Zaire, Zambia, and Zimbabwe. The FSR/E activities of the Caribbean Research and Development Institute were also reviewed. Key topics addressed in this study within the context of institutional sustainability included: organizational structure, training content of FSR/E programs, process of technology assessment, linkages with commodity research programs, extension, agricultural support systems, facilities of agriculture and other government programs, networking, and information dissemination. The information presented in this study was derived from interviews with government administrators, agricultural scientists, technical assistance teams, USAID personnel, and consultants, as well as from field observations and secondary data. Approximately 120 interviews were conducted.

This paper outlines some of the major institutional impacts of FSR/E projects/programs as well as constraints to implementation and major lessons learned. It is complimentary and builds upon the AID/PPC/CDIE study conducted by Kerry J. Byrnes entitled, "A Review of AID Experiences: FSR/E Projects, 1975–1987." Before proceeding with this discussion, it is necessary to first provide a general overview of the FSR/E concept used for the purposes of this study.

II. General Overview of the FSR/E Concept

Farming Systems Research and Extension (FSR/E) is an approach to agricultural research and extension that deals more effectively with the problems of low resource agriculturalists. This approach was developed in the 1970s in response to the observation that groups of small–scale farm families were not benefiting from mainstream agricultural research. Although a number of terms and concepts have been used over the last 15 years to describe this approach (e.g., FSR, FSR and D, FSR/E, FSIP, FSAR, and OFR/FST), there is now general consensus on the basic assumptions, methodologies, and objectives. FSR/E is used here because it explicitly addresses the need for linkages among researchers, extension workers, and farming systems (Poats, 1986).

A good definition of FSR/E has been provided by Shaner et al.:

"...an approach to agricultural research and development that views the whole farm as a system and focuses on: 1) the interdependencies between the components under control of members of the household, and 2) how these components interact with the physical, biological, and socioeconomic setting and by the farm families'

goals and other attributes, access to resources, choice of production activities and management practices (1982:13)."

Key Attributes of Farming Systems Research and Extension

The major attributes and basic assumptions embodied in the FSR/E approach are the following (mostly taken from Merrill-Sands, 1985 and Frankenberger et al., 1987).

1. FSR/E is farmer oriented – FSR/E targets small-farm families as the clients for agricultural research and technology development. It involves an emphasis on farmers' priorities and tapping the "body of knowledge" possessed by farmers.

2. FSR/E is holistic – FSR/E views the farm in a holistic manner and focuses on interactions between components. A comprehensive view is taken of both human and natural environments of the farm. Research focuses on production subsystems, but the connections with other subsystems are recognized and evaluation of research results explicitly takes into account linkages between subsystems (Baker and Norman, 1986).

3. FSR/E is a dynamic, iterative and problem solving approach – FSR/E first identifies technical, biological, and socioeconomic constraints at the farm level and then proposes technologies or practices that are feasible for targeted farming households to adopt to alleviate constraints. Adjustments are made in technology design as understanding and communication with small farmers improves.

4. FSR/E is interdisciplinary – Collaboration among agricultural scientists of various disciplines and social scientists is needed to understand the conditions and constraints under which small farmers operate and to develop or introduce improved technologies suitable to those conditions.

5. FSR/E compliments mainstream commodity and disciplinary agricultural research; it does not replace it – FSR/E draws upon the body of knowledge of technologies and management strategies generated by basic and commodity research programs and adapts them to specific environments and socioeconomic circumstances. FSR/E also provides a feedback mechanism for shaping priorities for basic and commodity research programs.

6. FSR/E recognizes the locational specificity of the technical and human factors – Farmers are often grouped on the basis of ecological and technical differences to facilitate technology transfer (Lightfoot, 1980). These groupings are often called recommendation domains. Once grouped, the constraint most limiting to each group becomes the focus of research.

7. FSR/E tests technologies in on-farm trials – On-farm experimentation allows for farmers and researchers to collaborate, provides a deeper understanding of the farming system among researchers, and allows for the evaluation of the technologies under the environmental and management conditions that will be used.

8. FSR/E provides feedback from farmers – FSR/E provides feedback from farmers regarding their goals, needs, priorities, and criteria for evaluating technologies. This feedback is directed to station-based agricultural researchers as well as to national and regional policymakers.

Stages of Farming Systems Research and Extension

There are four generally recognized stages involved in the FSR/E approach that can be delineated as follows (taken from Norman and Collinson, 1985).

1. The descriptive or diagnostic stage – During this stage, the farming systems are examined in the context of the total environment. Researchers determine the constraints farmers face and ascertain the potential flexibility in the farming system in terms of timing, slack resources, etc. An effort is also made to understand the goals and motivations of farmers that may affect or influence efforts to improve the farming system. During diagnosis, various methods of informal, formal, quantitative, and qualitative data collection are used.

2. The design or planning stage – During this stage, a range of alternative intervention strategies are identified which may be appropriate in dealing with the constraints delineated in the descriptive or diagnostic stage (Gilbert, Norman, and Winch, 1980). At this stage, heavy reliance is placed on obtaining information from the "body of knowledge" of past research. This information is derived from experiment–station–based research, researcher–managed and –implemented type on–farm trials, and the knowledge of farmers. This stage involves ex ante evaluation of a technology or practice with regards to technical feasibility, economic viability, and social acceptability for a targeted area.

3. The testing stage – During this stage, a few potential recommendations derived from the design stage are examined under actual farm conditions. This is done to evaluate the suitability and acceptability of the improved practices in the existing farming system. This stage usually consists of two steps: 1) researcher–managed but farmer–implemented tests, and 2) testing totally under the control of the farmers.

4. The recommendation and dissemination (extension) stage – During this stage, successfully tested technologies or practices are made available to other farmers with similar circumstances.

In practice, there are no clear boundaries between the various stages nor are the stages necessarily linear. The research process is recognized as being dynamic and iteractive, with linkages in both directions. Research staff will be designing some technologies and testing others, while new problems will need to be diagnosed as our understanding of the farming system becomes more fine–tuned.

Relationship Between Farming Systems Research/Extension and Farming Systems Approach to Infrastructural Support and Policy (FSIP)

The primary objective of FSR/E is to improve the well–being of farm families by increasing the overall productivity of the farming system in the context of both private and societal goals, given the constraints and potentials of existing farming systems (Norman and Collinson, 1985). Productivity can be improved by the development of relevant technology (FSR/E), or the implementation of appropriate policy and support systems (FSIP). It is important to understand the differences, interrelationship and complementariness of these two approaches. FSR/E is a research strategy that is often project focused, and usually involves the development and dissemination of improved agricultural practices and/or technologies at the farm level (Norman, 1982). Thus, the principal product of FSR/E is technology and the primary clients are limited–resource farmers (Hildebrand and Waugh, 1983). FSIP, on the other hand, is an approach to

small-farm development planning which operates at a more macro level than FSR/E, and attempts to analyze and influence policy and/or the progress of institutions that may affect small farmers (Norman, 1982). The principal product of FSIP is information and the primary clients are policymakers and managers of services and infrastructure (Hildebrand and Waugh, 1983).

Operating with this conceptualization of FSR/E, the study attempted to measure the impact of this approach in 27 countries. These findings are discussed below.

III. Impact of FSR/E

There are numerous problems associated with measuring the technical impact of FSR/E's contribution to small farmer development. As Baker and Norman (1988) point out, there are three boundary issues that confound such assessments:

1. The relative contributions of conventional research and FSR/E are not separable since they are complimentary activities.

2. The adoption of technologies depends upon a wide range of circumstances, including the performance of support systems which are not under control of the FSR/E teams.

3. Because FSR/E approaches encompass technological developments and institutional change, significant results are not realized for 10 to 25 years.

Many donor-funded FSR/E programs define their project goals in terms of an increasing flow of benefits to the low-resource farm sector. However, farm-level and household-level impacts of the FSR/E approach are not easily measurable. The process of generating, testing, and disseminating technological alternatives is time consuming and usually exceeds the temporal boundaries of any given FSR/E project. Due to these problems, this study has chosen to concentrate on major issues associated with the institutionalization of FSR/E programs in national agricultural research and extension systems. A fundamental assumption underlies this synthesis: namely, that the FSR/E methodology must generate institutional innovation before technical innovation and small farmer development can occur. Technical change on small farms is a direct result of successful implementation and incorporation of the FSR/E approach into national research and extension organizations. The process of institutionalization is dynamic and can take many forms. On the other hand, the adoption of basic FSR/E principles is a measurable impact that can be assessed within the time frame of specific projects. Therefore, although technology transfer -- with its positive implications for national and household development goals -- should be seen as a long-term, given effect of an FSR/E approach to research and extension, the incorporation of the methodology within national organizations is the measurable, shorter-run impact of both national and donor-financed investment in the agricultural sector, especially with regard to small, resource-poor farms.

The following discussion presents a common evaluational framework for assessing the impacts of FSR/E programs. The theme of institutionalization is systematically examined in terms of concrete, manifested FSR/E components in national agricultural bureaucracies. "Institutionalization" is defined as the process of integration of FSR/E methods and principles into the national research and extension system. The individual criteria, or themes, discussed here represent what Deborah Merrill-Sands (1988) has called "intermediate products" of FSR/E integration. These "products" are the institutional innovations that have occurred at the level of agricultural bureaucracies and should be

seen as indicators of the total gradual process of agricultural change. In those cases where the FSR/E experience has had some time depth to develop a more solid institutional foundation, it is expected that the methodology will have yielded concrete benefits at the farm level, such as the identification and diffusion of improved technologies.

We have identified nine distinct themes of FSR/E institutionalization, each of which is examined within the context of specific country national agricultural research and extension systems. These include: the organizational integration of FSR/E; cost sharing in the FSR/E program; commonality of approach; differential components application of the FSR/E approach; short-term and long-term training; institutional and international linkages; farmer participation; information dissemination and public policy; and impacts of technology transfer. The findings pertaining to each of these themes are presented below, summarized by region.

1. Organizational Integration of FSR/E

A major difficulty in the integration of the FSR/E approach into national research and extension organizations is that it does not fit well within existing organizational structures. That is, rearrangements must be made within a national agricultural bureaucracy in order to accommodate the interdisciplinary, cross-institutional, and farmer-focused orientation of FSR/E. To obtain optimal impacts, the FSR/E activities would be incorporated into all the departments of the existing research and extension structure. For example, commodity-based applied research programs would have an FSR/E component that both identified research priorities and selected among technological alternatives at farm level. In reality, national organizations have shown great variation in their respective types of structural adaptation to the FSR/E approach. This variation can be interpreted as a continuum of effective integration ranging from the least incorporated, virtually isolated FSR/E programs to the fully institutionalized. Some points along this continuum -- starting with the least integrated -- are identified as follows:

- an FSR/E project within a Ministry of Agriculture or national research service that represents a parallel activity to ongoing research and extension programs;
- an FSR/E division or department within the national research or extension service, that carries out an FSR/E agenda as an isolated part of the national research or extension program;
- an FSR/E program with a regional focus, in which a geographic section of the country comes under an FSR/E orientation;
- a thorough integration of FSR/E as the major orienting principle of research and extension activities.

This distinction between different types of FSR/E integration is critical because the specific structural relationship is a strong indicator of the likelihood that the FSR/E program will continue beyond the life of individual donor-funded projects.

a. Asia

The agricultural research in most Asian countries has been organized around a well-defined commodity focus, reflecting in part the impact of Green Revolution successes. For example, in Indonesia the commodity-focused structure of agricultural research is

strong, and FSR/E activities have been located primarily in the food crops institute (McArthur and Rerkasem, 1988). Alternative strategies for the structural organization of FSR/E activities have been followed in Nepal and the Philippines. In Nepal, the government created a separate division of farming systems research and a division of socioeconomic studies and extension. In the Philippines, regionally focused FSR/E activities have been promoted (e.g., East Visayas Project).

b. Latin America

As in Asia, Latin American countries have followed a diversity of organizational structures in their integration of FSR/E approaches. In Guatemala, the FSR/E orientation pervades the total national agricultural research program through efforts pioneered by the Instituto de Ciencia Tecnologia Agricolas (ICTA) (DeWalt and Hudgens, 1988). In Honduras, project-focused FSR/E activities have made it difficult to integrate the approach effectively into the national agricultural research system. Similar problems have been encountered by the Centro Agronomico Tropical de Investigation y Ensenanza (CATIE) in the regional FSR/E activities. In Brazil, the FSR/E philosophy has been compartmentalized into a specific minor division of EMBRAPA rather than integrated throughout the research system.

c. Africa

In many of the African countries reviewed, FSR/E has been integrated into the national research bureaucracy. By the mid-1980s, nine African countries had reorganized to accommodate FSR/E (Baker and Norman, 1988). The organizational structure of the integration has taken many forms. For example, in Zambia, Malawi and Senegal, the FSR/E teams are well integrated into the national agricultural research systems. In Botswana, FSR/E efforts are evolving out of a project mode into the Department of Agricultural Research (Frankenberger and Mitawa, 1988). In Zaire, FSR/E activities are still primarily carried out under the auspices of donor-funded projects (e.g., the Zaire Agricultural Productivity Project).

2. Cost Sharing in the FSR/E Program

Another indicator of the degree of institutionalization of the FSR/E approach is extent of budgetary support the national bureaucracy allocates to the FSR/E program. In most LDCs, the bulk of national research and extension programmatic efforts are financed by outside donor agencies. National budgets cover staff salaries and some operational funds, but major projects must depend on other funding sources. In view of the scarcity of domestic resources, the use of national funds to support FSR/E activities relative to other research and extension programs indicates a strong commitment to small-farm agriculture. FSR/E programs comprised totally of donor-funded projects show a lesser degree of institutionalization relative to those in which the national government assumes responsibility for the recurrent operational and training costs of the FSR/E program.

a. Asia

In all the countries reviewed for the Asian region, the major projects of the FSR/E program are funded by outside donors. The national agricultural research organizations usually pay the salaries of their researchers (the Philippines, Nepal, Indonesia), but the bulk of the operational costs and capital items are covered by donor funds. The Asian examples suggest that governments are ready to allocate their available resources such as

manpower toward FSR/E activities, but that programmatic funds are scarce for any set of research activities.

b. Latin America

In Latin America, similar problems regarding operational support are widespread. National research organizations can contribute manpower to FSR/E projects, but rely on donor funding of programmatic expenses. Guatemala is one of the few countries that contributes substantially to the operational budgets of its national agricultural research organization (i.e., ICTA).

c. Africa

As in Asia and Latin America, African countries continue to have problems providing operational support to their FSR/E activities. Donors continue to fund most of the programmatic expenses while national agricultural research organizations provide the manpower (i.e., Zambia, Senegal). Funding for agricultural research in Africa has received low priority in many countries, making it difficult to compete for scarce funds.

3. Commonality of Approach

The FSR/E methodology is evolving in both its concepts and its applications in practice. Many conceptual nuances have been subsumed under the "farming systems approach" banner which may differ greatly in strategies of action (Merrill-Sands, 1985). In any given country, several FSR/E projects – funded by several different donor agencies – may be carried out simultaneously within a single national research or extension organization. The effective coordination of these projects under a single FSR/E philosophy and definition is a positive indicator of institutionalization. Adversely, if each project adopts its own version of the farming systems approach, confusion is quite likely and the probability of long-term impact may be diminished.

a. Asia

Conceptual consistency within the FSR/E program is related to the structural organizational theme. In countries where FSR/E approaches are integrated primarily into existing commodity programs, heavy emphasis is given to adaptive research and on-farm testing (e.g., Indonesia). In countries where FSR/E activities have a regional focus, more emphasis may be given to multidisciplinary, resource-based approaches (e.g., the Philippines). Some countries employ both approaches (e.g., Indonesia).

b. Latin America

In Guatemala, ICTA has maintained a constant and consistent conceptual model for its research activities, emphasizing multidisciplinary teams, adaptive research and farmer participation (DeWalt and Hudgens, 1988). In CATIE, however, the term FSR/E is not readily embraced by the staff, which prefers to regard its own methodology as unique. Although several types of systems-oriented, adaptive research are found in Latin America, most of these variations share the basic criteria of the FSR/E methodology.

c. Africa

A multitude of FSR/E approaches have been implemented in Africa due to donor biases, the institutional mandate followed by the International Agricultural Research Centers that are promoting FSR/E (e.g., CIMMYT, IITA, ICRISAT), the placement of

donor–funded projects under different administrative umbrellas (e.g., research vs. extension), and the availability of trained researchers (e.g., social scientists). For example, in Botswana, four farming systems projects funded by four different donors were not following the same approach. Efforts are currently being made to coordinate these efforts under a single FSR/E philosophy.

4. Differential Components Application of the FSR/E Approach

As stated earlier, the FSR/E methodology is comprised of identifiable components, or stages, each of which is necessary to the successful application of the approach. The imperfect integration of FSR/E into national agricultural research systems may result in placing an undue emphasis on an individual component of the total process. When institutional linkages are weak, it is quite easy to view FSR/E as primarily doing diagnostic surveys or implementing on–farm trials. For example, an institution can have a strong multidisciplinary diagnostic group who gathers increasing quantities of farm–level information that remains essentially unanalyzed and provides little input into succeeding stages of research. Associated with this theme is the tendency to divide the different FSR/E functions by discipline. Thus, the social scientists come in to do the diagnostic phase, the technical scientists conduct the on–farm research, and the extensionists disseminate the new technology. The full potential of multidisciplinary interaction is not achieved in this situation, and the systems approach of the methodology is lost.

a. Asia

When an FSR/E project resides within a commodity division of the national agricultural research organization (e.g., Indonesia), the on–farm testing component of the FSR/E approach is likely to be emphasized. Projects that are regionally focused or are located in cross–disciplinary divisions of the research bureaucracy tend to be more equally balanced across the different FSR/E components (e.g., Nepal and the Philippines).

b. Latin America

In the Latin America countries reviewed in this study, the diagnostic component of FSR/E has received heavy emphasis. For example, in Guatemala, the amount of field data collected by ICTA on the farming systems far surpasses the analytical capacity of the staff.

c. Africa

In the early years of FSR/E implementation in Africa, heavy emphasis was placed on describing the farming systems in place (e.g., Nigeria, Mali, and Senegal). This bias was probably due to a combination of factors, such as the lack of information that existed for project target areas and the limited number of appropriate interventions available for these harsh production environments. Presently, the emphasis is shifting, greater emphasis being placed on the testing stage and extension (e.g., Botswana) (Baker and Norman, 1988).

5. Short–Term and Long–Term Training

Training of national agricultural research personnel is a critical element and important indicator of the degree of adoption of the FSR/E methodology. The lack of adequately trained personnel can be the greatest potential constraint to FSR/E institutionalization. The impact of training on national organizations and their ability to

adopt the FSR/E methodology depends upon both quantitative and qualitative factors. Maintaining a critical mass of human capital trained in FSR/E techniques assures that the methodology is properly implemented and forms an integral part of the planning process. A proper balance in training is also needed among the different levels of the bureaucracy to ensure program continuity. The ability to retain highly trained individuals is also a strong indicator of the strength of the program.

In general, long- and short-term training of professional staff has been one of the most visible and effective impacts of the worldwide investment in FSR/E programs. The support of both degree training and short-courses by USAID, the regional farming systems networks, and the IARCs have helped strengthen systematic approaches to agricultural research.

a. Asia

In all of the Asian countries reviewed for this synthesis, a portion of the national research staff had received either degree training in a particular discipline or had attended short-courses that provided training in the FSR/E methodology. The regional Asian Farming Systems Network and IRRI were particularly active in either offering or sponsoring training for FSR/E practitioners.

b. Latin America

Training also has been an important contribution of FSR/E programs in Latin America. CATIE provides both degree training and short-courses in systems methodology and adaptive research. ICTA in Guatemala introduces all incoming staff members to an intensive orientation to the FSR/E philosophy and techniques. Opportunities for degree training through FSR/E projects have attracted high-quality staff members. However, retention of trained staff within the FSR/E projects has been problematic throughout Latin America (e.g., Guatemala, Honduras, Panama).

c. Africa

As in other regions, training has been a very important aspect of FSR/E projects implemented in Africa. Degree training and short courses have been an essential ingredient of USAID-funded projects as well as some other donor projects, and the IARCs like IITA, CIMMYT and ICRISAT have been quite active in providing training to FSR/E practitioners. Retention of trained manpower has also been difficult for FSR/E programs (e.g., Botswana, Senegal). This is due to the fact that national research organizations often have to fill other posts with trained personnel due to manpower shortages and because trained staff are not keen on living in rural areas where access to facilities, services, and opportunities for career advancement are limited.

6. Institutional and International Linkages

Another dimension of institutionalization is the creation of regular institutional ties among different units of the national agricultural research system. At one level, institutional linkages should be established between the FSR/E components and the commodity-focused research component. The FSR/E methodology clearly emphasizes the interdependence and complementariness of on-station research and on-farm research. However, in practice, the linkages between the two are not easily established.

Another important linkage must exist between research and extension if FSR/E programs are to be successful. In many countries, these two units within the Ministry of

Agriculture compete for the same scarce resources. In most cases research and extension are physically isolated units within the Ministry.

The FSR/E theoretical focus on the system of interrelated farm activities requires a similar systemic approach to problem-solving at the institutional level. Multi-stranded linkages between researchers and extensionists, among the specialty disciplines and between social and technical scientists are necessary components of the institutionalization of FSR/E. Consequently, the presence or absence of these linkages serve as illuminating indicators of the degree to which the approach has been incorporated into the national research and extension system.

The theme of linkages also can be approached from a perspective of expanding international networks. The practical application of the FSR/E methodology has exposed national agricultural research and extension services to the international flow of ideas in both the public and private sector. Regional farming systems networks and the system of international agricultural research centers provide regular input on technology development as well as information on FSR/E projects in other countries. The degree of integration into these networks can reflect the level of institutionalization of the FSR/E methodology.

a. Asia

Intra-institutional research linkages have been varied in the Asian case studies. In Indonesia, such linkages appear to be strong whereas in Nepal, Bangledash, and the Philippines, these ties have been difficult to establish (Merrill-Sands and McAllister, 1988). The inter-institutional linkages between research and extension have been effective in most of the FSR/E Asian programs. This is especially true in regionally focused FSR/E projects where staff members are seconded from their home institutional units to work in teams at regional locations. Such regional programs have also promoted effective interdisciplinary research activities. International collaboration has been strengthened through the efforts of the Asian Farming Systems Network. Similarly, IRRI's involvement in adaptive research and training has provided a rich resource for inter-communication among FSR/E practitioners.

b. Latin America

Intra-institutional linkages between on-farm and on-station research have been strengthened within the context of FSR/E projects, but such ties have not become formalized elements of the research process for many programs. In Guatemala ICTA has not been totally effective in getting farmers' problems translated into on-station research priorities. In Honduras, Ecuador and Panama, there is not formal integration between commodity researchers and on-farm researchers, although commodity researchers are more aware of the value of on-farm research. As for inter-institutional linkages, the integration of research and extension is the most difficult to formalize. The tendency has been for FSR/E researchers to perform what effectively is an extension role. Interdisciplinary collaboration between social and technical scientists has been strengthened by FSR/E programs. However, social scientists are only minimally involved in the technology validation teams (DeWalt and Hudgens, 1988). International linkages have been strengthened through the efforts of organizations like CIMMYT, CIAT, CATIE and the USAID-funded Farming Systems Support Project.

c. Africa

Intra-institutional relationships between on-farm and on-station research have been strengthened by FSR/E activities in some countries; but full integration has not been achieved. Reasons for this include: 1) the view that FSR/E work was competing for limited funds and resources that would otherwise be available to commodity-focused research; 2) the desire of donor-funded projects for quick results, which is inconsistent with ongoing research programs conducted on-station; and 3) the reluctance of on-station researchers to fully accept farmer assessments of technology as adequate justification for technology recommendations. Research and extension integration has also been difficult to achieve in most African countries. Interdisciplinary collaboration has been good where adequate trained personnel are available. Social scientists are in short supply for many programs. International linkages have been enhanced by the IARCs (IITA, CIMMYT, ICRISAT) and other regional networks such as the West African Farming Systems Network and the Southern African Development Coordinating Council.

7. Farmer Participation

The nature of farmer contacts reveals an important dimension of the success of a given FSR/E program. The ability or willingness of researchers and extensionists to develop and maintain steady interaction with small and resource-poor farmers has generally been a problematic issue. In addition, research designs for on-farm experiments may not fully integrate farmers, especially if they are devised centrally. Farmers may not be included in the planning of on-farm trials or in the evaluation of the results. In this respect, farmer participation is an important measure of the true FSR/E integration into national agricultural research programs.

a. Asia

Farmer participation in the planning of on-farm experiments and the evaluation of alternative technologies has been mixed. Regional FSR/E projects have been designed to incorporate this input but they have not been totally successful in this regard (e.g., Philippines).

b. Latin America

In Guatemala, farmer participation has been a core feature of ICTA's philosophy. However, CATIE has been criticized for the poor quality of interaction with local farmers in their on-farm trials. As elsewhere, effective incorporation of farmers into all the FSR/E process often requires the bridging of serious class and social status constraints.

c. Africa

Farmer participation in the FSR/E process has recently become very important to projects and programs in Africa. In the early 1980s, most FSR/E projects focused on evaluating the technical feasibility and economic viability of production practices and varieties (Baker and Norman, 1988). Currently, farmers are playing a greater role. For example, in Botswana farmer participation in FSR/E activities has been facilitated by the promotion of farmer groups for testing technologies (Norman et al., 1988).

8. Information Dissemination and Public Policy

The FSR/E methodology is information-intensive. In many countries, the diagnostic stage provides an unprecedented wealth of knowledge about the composition and the

variability of rural society. At regional and national levels, policymakers are involved in the ongoing task of directing agricultural policy toward national goals. The information feedback from the FSR/E approach usually gives these policymakers a better ability to foresee who benefits and who loses from a given policy set. Target populations ("recommendation domains") are discerned more clearly in terms of their particular problems and respective access to resources. How effectively FSR/E-generated information is channeled to and used at policymaking levels is a further indication of institutionalization.

The importance of information dissemination cannot be underestimated. An important objective of farmer-oriented, on-farm research is to promote communication in both directions, so that resource-poor farmers become more aware of the wider context of which they are a part. The systems focus of the FSR/E methodology implies that technology innovation is also a function of such factors as pricing policies, input distribution, and marketing infrastructure; knowledge of these relationships helps farmers to make more effective decisions.

a. Asia

FSR/E approaches have increased farmer awareness of their sociocultural environment, and farmers have gained access to more technical and economic information (e.g., Indonesia, Nepal, the Philippines). However, none of the case studies indicated that information from the FSR/E diagnostic studies was being used by policymakers.

b. Latin America

As in Asia, there was no evidence in the cases reviewed for Latin America that government decision makers are utilizing FSR/E information in policy formation. Policy decisions in Latin America in general have tended to favor larger farmer interests and strong political groups. FSR/E activities have improved information flow to farmers in many of the countries.

c. Africa

As with the other two regions, FSR/E activities in Africa have not had a significant impact in policy formulation. Policy decisions have tended to be based on political interests which do not encompass small-farm development (Collinson, 1988). FSR/E projects have also used the wrong format to present research findings to policymakers (e.g., Botswana). However, information transfer to farmers has been an important result of FSR/E activities in Africa. Such information has enhanced farmer confidence in research, stimulated farmer-initiated activities, and influenced farmers' demand for technology (Moluizi, et al., 1988).

9. Impacts of Technology Transfer

The long-run impacts of institutionalization of the FSR/E methodology are assumed to be welfare increases for small-farmer households and possible increases in national production. These impacts -- as stated above -- are seldom measurable in the earlier stages of FSR/E programs; the benefits of FSR/E efforts are gradually rather than discreetly realized. In some countries -- for example, those with ten years experience or so -- the local impacts begin to be manifested. One measurable impact is the spread of technological alternatives. Superior crop varieties or specific technological "packages" may have appeared as a result of FSR/E projects; they are in the process of being disseminated and adapted to further regions. National production figures on given

commodities or on the structure of production may indirectly point to the benefits of FSR/E gradually spreading throughout rural society. The absence of such indicators in countries of briefer FSR/E experience should not be interpreted pessimistically.

a. Asia

It is clear that throughout Asia, FSR/E activities have produced several technological alternatives, especially those that involve variety use and an intensification of purchased inputs. It is impossible to isolate the influence of FSR/E efforts in the process of technology transfer, but this review indicates that positive impacts have been brought about in Indonesia, the Philippines, and Nepal.

b. Latin America

There has been ample documentation that the FSR/E approach in Guatemala has generated technological alternatives involving more productive crop rotations, improved seed varieties and different input packages. CATIE has also promoted technology transfer in the area. However, these technologies have not always reached the small-farm sector as thoroughly as desired.

c. Africa

One of the main limitations for FSR/E projects with regard to technology transfer in Africa has been access to good on-shelf technologies. Although successes have been documented (e.g., Gambia and Tanzania), the environmental constraints have often limited research payoffs in the short run (e.g., Botswana).

Summary of Impacts

This review of select FSR/E programs in different regions of the world suggests that the FSR/E methodology is an appropriate and effective mechanism to channel resources to the small-farm sector. The success of the program, however, is a function of two critical elements, both of which can be somewhat influenced by external funding and donor support. The first is time. Technical change and improvements in small-farmer welfare will follow from the institutionalization of FSR/E methods into national research bureaucracies. This process of institutionalization is gradual and time-consuming because it requires quite a revolutionary change in how bureaucracies define problems in their national agriculture as well as how they frame solutions.

The second element is investment in human capital. Training has made the most significant impact on the institutionalization of FSR/E, and it is this component of the program that is most cost-effective. Both degree training and orientation short-courses are essential to sustain FSR/E efforts in national research organizations. With this investment in human capital bolstered by a dynamic and vibrant international network of practitioners, the positive impacts of the FSR/E methodology will continue.

IV. Constraints to FSR/E Project/Program Implementation

Overall, the major constraints to FSR/E program implementation across countries were: 1) competition with other institutions in the research organization, and 2) weak links between research and extension (see Table 2). For Africa, the major constraints were: 1) competition with other institutions; 2) the environment; 3) access to trained manpower; 4) staffing of field teams; 5) cost of technology and access to inputs; 6) poor linkages with policymakers; 7) weak links with research and extension; 8) on-farm

experience of research staff; and 9) the role of extension. For Latin America, the major constraints were: 1) competition across institutions; 2) weak links between research and extension; 3) budget constraints; 4) cost of technology and access to inputs; 5) poor linkages with policymakers; and 6) agricultural prices and marketing. For Southeast Asia, the major constraints were: 1) weak links between research and extension; 2) project design; 3) design of on-farm trials; and 4) involvement of farmers in the research process.

V. Lessons Learned

A number of important lessons can be drawn from this review. These are listed below.

1. The lack of cooperation between research and extension is common in national agricultural research and extension systems. FSR/E can play an important bridging role between extension and agricultural research. FSR/E teams test technology from research, and provide researchers with feedback from farmers and extension to help set research priorities. Technologies are not always directly transferable from research to extension.

2. All FSR/E projects within a country should be placed under one administrative umbrella. Placing FSR/E programs under research rather than extension may be the preferred mode. FSR/E teams placed under research divisions have better access to research results and can influence priorities more easily than those placed under extension. Linkages with extension are more likely to develop due to the location of FSR/E teams in the field.

3. As research programs decentralize, FSR/E teams could form the core of regional research teams working in different ecological zones.

4. Unless incentives are provided, it will be difficult to retain trained manpower in the field as long as career advancement is contingent on placement in a centralized research organization. Consequently, there is also little professional reward for interdisciplinary and inter-institutional collaboration. Despite this, human capital development is essential to the success of viable FSR/E programs.

5. The reluctance of commodity-focused researchers to test and disseminate technologies and practices on farmers' fields until final solutions are reached is limiting potential production improvements unnecessarily. There is a need to test best-bet alternatives so that farmers can participate in the assessments.

6. FSR/E activities carried out on a project basis independent of on-station research programs are usually not conducive to long-term research. This leads to a failure to develop credibility among planners, on-station researchers, and extension agents. In addition, the scale of projects may be the biggest barrier to national sustainability of externally funded development initiatives. Thus, serious consideration should be given to initiating FSR/E activities in a project mode.

7. Impact on agricultural policy is one area where FSR/E programs have not fulfilled their potential. The way results are presented is often the key. An honest assessment must be made as to what extension can use, what research can use, and what policymakers will read. Executive summaries that highlight major points could have significant impacts, especially if the information is packaged appropriately to address policy issues.

8. A well-prepared plan or strategy that outlines the process of technology assessment could help improve the linkages between commodity-focused researchers, FSR/E teams, and extension. Such a plan would specify disciplinary responsibilities, methodological stages, and feedback channels. This plan could then be used to orient new researchers who come into the research or extension program.

9. One of the main limitations for FSR/E has been access to good on-shelf technologies for immediate agro-ecological adaptation. This is especially true for marginal areas under harsh conditions, often where FSR/E teams are assigned to work. Under such conditions, research payoffs are often limited in the short run, and may take considerable time to develop. FSR/E programs have always been more successful in more favorable environments. In harsh climates, fewer successful interventions are available and it is often necessary to substantially modify the existing farming system. Thus, it is inappropriate to assume that viable results can be achieved in the same time frame for both types of environments. Such comparisons may have led to the impression that FSR/E approaches have not lived up to expectations (Baker and Norman, 1988).

10. A major difference between on-station testing of technology and on-farm testing is the value placed on cause-and-effect relationships. On-station trials focus on such relationships, whereas on-farm trials are less controlled. Farmer assessments play a key role in such trials, which are not necessarily considered valid to on-station researchers. This can influence the speed at which research recommendations are passed on to extension. In addition, the need of some researchers to determine cause-and-effect relationships in on-farm trials has influenced the emphasis placed on farmer-managed technology validation.

11. Successful FSR/E programs tend to have sufficient capital for operating expenses. An appropriate ratio of expenditures for staff and operations will ensure that on-farm testing is feasible. Expenditures of 90 percent of the budget for salaries will significantly limit research opportunities.

12. Expatriate technical assistants should be directly incorporated into the structure of the research organization and extension system. They should not be placed in richly endowed projects that have little resemblance to the working realities of national scientists and extension workers. Attempts should be made to work within the existing resource base.

13. Past experience with systems research can facilitate the successful integration of FSR/E programs into the national agricultural system.

14. Farmer participation in bottom-up planning and research is difficult to achieve within a research system that requires lines of authority and responsibility to be clearly defined by the central office. Adapting a flexible and dynamic bottom-up development process to a highly centralized and vertically structured research organization is a difficult task. In the same way that farmers select and modify technologies to fit the particular farming system and resource base, governments are attempting to adjust and incorporate the FSR/E process within the national agricultural structure (McArthur and Rerkasem, 1988).

15. Projects that focus on short-term technology generation and/or production objectives may impede rather than reinforce the long-term goal of integrating the concept and methods of the FSR/E process into the national agricultural system (McArthur and Rerkasem, 1988).

16. Networking is a key activity for overcoming methodological stagnation. The training aspects of meetings are extremely valuable.

17. Many FSR/E projects/programs have not effectively used social science input. Despite the importance of characterization of areas, anticipating sociocultural problems, and the need for baseline studies to be used as comparisons for evaluations, very few social scientists are brought into FSR/E programs. This is due both to a shortage of trained personnel as well as perceptions of social scientists on the part of technical scientists. Consideration should be given to how social science input can be useful to ongoing research activities after the diagnostic phase.

18. In spite of the fact that support for FSR/E programs has increased among national planners in low-income countries during the 1980s, USAID and other donors began shifting their emphasis away from farming systems research. This declining support dramatically reduced the pace of FSR/E institutionalization after 1985 (Baker and Norman, 1988). Despite such reductions, numerous countries around the world have reorganized their national research organizations to accommodate FSR/E. Regional networks have been established such as the Asian Farming Systems Network and the West African Farming Systems Network to allow scientists to share experiences and learn new ideas. In addition, more than 10 universities in the United States have established programs focused on American agriculture (Baker and Norman, 1988). In light of these developments, USAID played a significant role in establishing FSR/E programs around the world. As a development agency responsible for its past initiatives, backstopping the FSR/E programs in the form of support for training and networking is a necessary obligation.

VI. Possible Trends

Baker and Norman (1988) have outlined a number of directions that the FSR/E approach has evolved and speculate on future directions. These include the following:

1. A narrowly focused FSR/E approach which was developed at the IARCs has given rise to a more comprehensive, longer horizon systems approach.

2. Farmer participation in FSR/E activities has increased through time.

3. The domination of FSR/E programs by donor agencies and expatriate technical assistance has given way to localized programs.

4. There is declining interest in describing farming systems, and increasing interest in pushing technologies through the testing stage and extension.

5. The evolution of FSR/E has been heavily influenced by the expanding number of academic professionals representing several disciplines. These academics have shown interest in expanding the focus of FSR/E and have placed emphasis on farmer-first perspectives.

6. Bureaucrats in donor agencies and National Agricultural Ministers are questioning the viability and affordability of decentralized, bottom-up approaches to development. They would like to see the emphasis shift to commodity-focused programs that address national planning goals in high payoff environments.

VII. Conclusion

In most developing countries, the national agricultural research and extension service is heavily dependent on donor–funding sources. Domestic budget funds are expended in salaries and some operations, but any investment in research and extension is often tied to the specific projects financed by outside donors. Almost without exception, this bilateral or multilateral financing is tied to a specific development strategy or concept. This situation ties the national agricultural research and extension structure to the current trend in research and development. Seldom are national structures able to apply outside funding to their existing program of research and extension. This fact bodes poorly for the future of FSR/E in terms of continued support. The sustainability of the advances made through the range of FSR/E programs will be insured only if sustaining investment is made. National agricultural bureaucracies must have a place to solicit assistance in upholding the vitality of their FSR/E programs. Spot investment in training and in maintaining international linkages is a possible strategy that might be coordinated among the various funding sources.

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TABLE 1

AFRICA FSR/E PROJECTS/PROGRAMS

IMPACTS	Botswana	Burkina Faso	Gambia	Ethiopia	Lesotho	Malawi	Nigeria	Mali
1. Organizational Integration of FSR/E								
a. FSR/E integrated into National Ag. Division	X			X	X	X	X	X
b. Influence on research design/ priorities	X						X	X
c. Interdisciplinary teams created				X			X	
2. Cost Sharing in the FSR/E Program	X	X		X	X	X	X	X
3. Short and Long-Term Training								
a. Long-term training of research and extension	X							X
b. Training rural artisans	X							
c. In-service training for extension								
d. FSR training at universities								
e. Short-term training								X

TABLE 1

AFRICA FSR/E PROJECTS/PROGRAMS

IMPACTS	Botswana	Burkina Faso	Gambia	Ethiopia	Lesotho	Malawi	Nigeria	Mali
4. Institutional and International Linkages								
a. Improved research/ extension links	X		X	X		X		
b. Improves links with other institutions				X			X	
c. Improved research links	X	X						X
d. Established links to IARCs		X					X	
5. Information, Dissemination and Public Policy								
a. Policy Input	X							X
b. Use of Media								
c. Description of farming systems								

TABLE 1

AFRICA FSR/E PROJECTS/PROGRAMS

IMPACTS	Botswana	Burkina Faso	Gambia	Ethiopia	Lesotho	Malawi	Nigeria	Mali
6. Farmer Participation								
a. Improved farmer confidence	X							
b. Feedback from farmer used		X		X	X		X	X
c. Farmer awareness of government programs	X							
d. Farmer participation in research	X				X			
7. Impacts on Technology Transfer								
a. Technology tested and adapted	X		X	X	X		X	
b. Increased role of women			X		X	X		
c. Food production increases								
d. Increased number of on-farm trials							X	

TABLE 1

AFRICA FSR/E PROJECTS/PROGRAMS

IMPACTS	Somalia	Swaziland	Tanzania	Zaire	Zambia	Zimbabwe	Sudan
1. Organization Integration of FSR/E							
a. FSR/E integrated into National Ag. Division			X		X	X	X
b. Influence on research design/ priorities					X		X
c. Interdisciplinary teams created					X		
2. Cost Sharing in the FSR/E Program	X	X	X	X	X	X	X
3. Short and Long-Term Training							
a. Long-term training of research and extension			X	X			
b. Training rural artisans							
c. In-service training for extension					X	X	
d. FSR training at universities							
e. Short-term training		X					X

TABLE 1

AFRICA FSR/E PROJECTS/PROGRAMS

IMPACTS	Somalia	Swaziland	Tanzania	Zaire	Zambia	Zimbabwe	Sudan
4. Institutional and International Linkages							
a. Improved research/ extension links	X	X	X		X	X	X
b. Improved links with other institutions			X	X		X	
c. Improved research links	X		X		X	X	X
d. Establised links to IARCs							
5. Information, Dissemination and Public Policy							
a. Policy input			X			X	
b. Use of Media		X					
c. Description of farming system					X		

TABLE 1

AFRICA FSR/E PROJECTS/PROGRAMS

IMPACTS	Somalia	Swaziland	Tanzania	Zaire	Zambia	Zimbabwe	Sudan
6. Farmer Participation							
a. Improved farmer confidence					X		
b. Feedback from farmer used					X		
c. Farmer awareness of government programs			X		X		X
d. Farmer participation in research							
7. Impacts on Technology Transfer							
a. Technology tested and adapted	X	X	X	X	X		X
b. Increased role of women				X			
c. Food production increases						X	
d. Increased number of on-farm trials		X	X				

TABLE 1

SOUTHEAST ASIA FSR/E PROJECTS/PROGRAMS

IMPACTS	Indonesia	Nepal	Philippines	Thailand
1. Organizational Integration of FSR/E				
a. FSR/E integrated into National Ag. Division	X	X	X	X
b. Influence on research design/ priorities	X		X	
c. Interdisciplinary teams created			X	X
2. Cost Sharing in the FSR/E Programs	X	X	X	X
3. Short and Long-Term Training				
a. Long-term training of research and extension			X	
b. Training rural artisans			X	X
c. In-service training for extension			X	
d. FSR training at universities		X	X	
e. Short-term training				

TABLE 1

SOUTHEAST ASIA FSR/E PROJECTS/PROGRAMS

IMPACTS	Indonesia	Nepal	Philippines	Thailand
4. Institutional and International Linkages				
a. Improved research/extension links	X		X	X
b. Improved links with other institutions	X		X	
c. Improved research links				
d. Established links to IARCs				
5. Information, Dissemination and Public Policy				
a. Policy Input	X		X	
b. Use of Media				
c. Description of farming systems			X	

TABLE 1

IMPACTS	SOUTHEAST ASIA FSR/E PROJECTS/PROGRAMS			
	Indonesia	Nepal	Philippines	Thailand
6. Farmer Participation				
a. Imporved farmer confidence				
b. Feedback from farmer used		X	X	X
c. Farmer awareness of government programs				
d. Farmer participation in research		X		
7. Impacts on Technology Transfer				
a. Technology tested and adapted	X	X	X	
b. Increased role of women			X	X
c. Food production increases		X		
d. Increased number of on-farm trials			X	

TABLE 1

LATIN AMERICA FSR/E PROJECTS/PROGRAM

IMPACTS	Brazil	Costa Rica/ CATIE	CARDI	Guatemala	Honduras	Panama	Paraguay
1. Organizational Integration of FSR/E							
a. FSR/E integrated into National Ag. Division	X			X			
b. Influence on research design/ priorities	X			X			
c. Interdisciplinary teams created	X			X			
2. Cost Sharing in the FSR/E Program	X		X	X	X	X	X
3. Short and Long-Term Training							
a. Long-term training of research and extension		X		X			
b. Training rural artisans							
c. In-service training for extension		X	X	X			X
d. FSR training at universities		X	X				
e. Short-term training							

TABLE 1

LATIN AMERICA FSR/E PROJECTS/PROGRAM

IMPACTS	Brazil	Costa Rica/ CATIE	CARDI	Guatemala	Honduras	Panama	Paraguay
4. Institutional and International Linkages							
a. Improved research/ extension links	X		X	X	X		X
b. Improved links with other institutions	X		X	X			
c. Improved research links			X		X		
d. Established links to IARCs			X	X			
5. Information, Dissemination and Public Policy							
a. Policy Input							
b. Use of Media							
c. Description of farming systems							

TABLE 1

LATIN AMERICA FSR/E PROJECTS/PROGRAM

IMPACTS	Brazil	Costa Rica/ CATIE	CARDI	Guatemala	Honduras	Panama	Paraguay
6. Farmer Participation							
a. Improved farmer confidence							
b. Feedback from farmer used				X		X	X
c. Farmer awareness of government programs	X					X	
d. Farmer participation in research				X			
7. Impacts on Technology Transfer							
a. Technology tested and adapted	X		X	X		X	
b. Increased role of women				X			
c. Food production increases						X	
d. Increased number of on-farm trials				X	X		

TABLE 2

AFRICA FSR/E PROJECTS/PROGRAMS

CONSTRAINTS	Botswana	Burkina Faso	Gambia	Ethiopia	Lesotho	Malawi	Nigeria	Mali
1. Environmental	X	X	X	X			X	X
2. Staffing of Field Team	X			X	X	X		
3. Target Focus to Narrow	X							
4. Visibility of Project/Project Format	X							
5. Access to Trained Manpower	X			X	X	X		
6. Competition across Institutions	X			X		X		X
7. Information Dissemination	X					X		
8. Cost of Technology Access of Inputs				X			X	
9. Poor Linkages with Policy Makers	X			X		X		
10. Weak Links between Research and Extension	X				X			X
11. Project Design						X		
12. Participation of On-station Researchers				X			X	

CONSTRAINTS	Botswana	Burkina Faso	Gambia	Ethiopia	Lesotho	Malawi	Nigeria	Mali
13. Budget Constraints								
14. Design of On-farm Trials	X	X						X
15. Post Production Systems								
16. On-farm Experience of Staff	X			X			X	
17. Time Frame of Project						X		
18. Role of Extension				X		X		
19. Agricultural Prices/Marketing								
20. Management Support							X	
21. Legacy of Past Approaches								
22. Data Management and Analyses								
23. Involvement of Farmers in Research Process						X	X	
24. Non Equitable Distribution of Benefits								

TABLE 2

AFRICA FSR/E PROJECTS/PROGRAMS

CONSTRAINTS	Botswana	Burkina Faso	Gambia	Ethiopia	Lesotho	Malawi	Nigeria	Mali
25. Extension of Technologies								
26. Lack of Technologies	X				X			
27. Use of Socio-Economic Data								
28. Inappropriate Technology								

TABLE 2

AFRICA FSR/E PROJECTS/PROGRAMS

CONSTRAINTS	Somalia	Swaziland	Tanzania	Zaire	Zambia	Zimbabwe	Sudan
1. Environmental	X			X			
2. Staffing of Field Team			X				
3. Target Focus to Narrow			X				
4. Visibility of Project/Project Format							
5. Access to Trained Manpower			X		X		
6. Competition Across Institutions	X	X	X		X		
7. Information Dissemination							
8. Cost of Technology Access of Inputs		X		X		X	
9. Poor Linkages with Policy Makers			X	X		X	
10. Weak Links between Research and Extension		X	X				
11. Project Design							
12. Participation of On-Station Research			X				

TABLE 2

AFRICA FSR/E PROJECTS/PROGRAMS

CONSTRAINTS	Somalia	Swaziland	Tanzania	Zaire	Zambia	Zimbabwe	Sudan
13. Budget Constraints		X	X		X		
14. Design of On-farm Trials		X				X	
15. Post Production Systems		X					
16. On-farm Experience of Staff		X	X				
17. Time Fram of Project			X				
18. Role of Extension		X	X	X			
19. Agricultural Prices/Marketing		X		X	X	X	
20. Management Support			X				
21. Legacy of Past Approaches	X						
22. Data Management and Analyses							
23. Involvement of Farmers in Research Process							
24. Non Equitable Distribution of Benefits							

TABLE 2

AFRICA FSR/E PROJECTS/PROGRAMS

CONSTRAINTS	Somalia	Swaziland	Tanzania	Zaire	Zambia	Zimbabwe	Sudan
25. Extension of Technologies							
26. Lack of Technologies							
27. Use of Socio-Economic Data							
28. Inappropriate Technology							

TABLE 2

LATIN AMERICA FSR/E PROJECTS/PROGRAMS

CONSTRAINTS	Brazil	Costa Rica/ CATIE	CARDI	Guatemala	Honduras	Panama	Paraguay
1. Environmental							
2. Staffing of Field Team							
3. Target Focus to Narrow							
4. Visibility of Project/Project Format							
5. Access of Trained Manpower				X			
6. Competition Across Institutions	X	X	X			X	
7. Information Dissemination							
8. Cost of Technology Access to Inputs	X						X
9. Poor Linkages with Policy Makers		X			X		
10. Weak Links between Research and Extension	X	X					X
11. Project Design							
12. Participation of On-Station [illegible]							

TABLE 2

LATIN AMERICA FSR/E PROJECTS/PROGRAMS

CONSTRAINTS	Brazil	Costa Rica/ CATIE	CARDI	Guatemala	Honduras	Panama	Paraguay
13. Budget Constraints	X		X	X			
14. Design of On-Farm Trials				X			
15. Post Production Systems							
16. On-farm Experience of Staff							
17. Time Frame of Project							
18. Role of Extension							
19. Agricultural Prices/Marketing			X				X
20. Management Support			X				
21. Legacy of Past Approaches				X			
22. Involvement of Farmers in Research Process							
23. Data Management and Analyses							
24. Non Equitable Distribution of [illegible]				X			

TABLE 2

LATIN AMERICA FSR/E PROJECTS/PROGRAMS

CONSTRAINTS	Brazil	Costa Rica/ CATIE	CARDI	Guatemala	Honduras	Panama	Paraguay
25. Extension of Technologies							
26. Lack of Technologies							
27. Use of Socio-Economic Data				X			
28. Inappropriate Technologies							

TABLE 2

SOUTHEAST ASIA FSR/E PROJECTS/PROGRAMS

CONSTRAINTS	Indonesia	Nepal	Philippines	Thailand
1. Environmental				X
2. Staffing of Field Team				X
3. Target Focus to Narrow			X	
4. Visibility of Project/ Project Format				
5. Access of Trained Manpower			X	
6. Competition Across Institutions				
7. Information Dissemination			X	
8. Cost of Technology Access to Inputs				
9. Poor Linkages with Policy Makers	X		X	
10. Weak Linkages between Research and Extension	X			
11. Project Design	X		X	X
12. Participation of On-station Researchers	X		X	
13. Budget Constraints	X			

TABLE 2

SOUTHEAST ASIA FSR/E PROJECTS/PROGRAMS

CONSTRAINTS	Indonesia	Nepal	Philippines	Thailand
14. Design of On-farm Trails	X		X	
15. Post Production Systems				
16. On-farm Experience of Staff				
17. Time Frame of Project			X	
18. Role of Extension				
19. Agricultural Prices/ Marketing	X			
20. Management Support			X	
21. Legacy of Past Approaches	X			
22. Involvement of Farmers in Research	X		X	
23. Data Management and Analyses	X			
24. Non Equitable Distribution of Benefits	X			
25. Extension of Technologies				
26. Lack of Technologies				
27. Use of Socio-Economic Data	X			
28. Inappropriate				