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A GUIDELINE FOR THE DESIGN OF FARMING SYSTEMS PROJECTS: A CASE STUDY FROM THE EASTERN CARIBBEAN

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A GUIDELINE FOR THE DESIGN OF FARMING SYSTEMS PROJECTS:

A CASE STUDY FROM THE EASTERN CARIBBEAN

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National agricultural institutions in the Third World have recently begun to shift their emphasis from commodity-oriented research and extension programs to production systems-oriented projects. These research projects approach agricultural production from the farmers' perspective and farmer involvement is imperative. Since the research unit is usually a complex crop or livestock production system, a multidisciplinary systems approach is required.

Donor and technical assistance institutions have begun to refer to these production system-oriented research projects, where farmers are directly involved in identifying and testing technology, as Farming Systems Research and Development (FSR/D) projects. Although considerable progress has been made in FSR/D methodology development, many of the general design and implementation procedures that are needed to apply the research methodology have not been developed, and many institutional issues have not been adequately resolved. In short, there are many unanswered questions with regard to the best procedure to follow in both the design and implementation of an FSR/D project.

In this paper, we present a general FSR/D project design guideline that we have synthesized from our experience in the design of an FSR/D project in the Eastern Caribbean. The sociological, socioeconomic, and institutional situation of the Eastern Caribbean is unique, but we feel

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that the general project design guideline could be used in other countries. After describing the general design sequence, we present an outline of the specific procedure we followed in the design of the Eastern Caribbean project, and a summary of some of the key aspects of the project that was designed.

FSR/D PROJECT DESIGN

The design of a nFSR/D project is similar in many ways to the design of any research and development project. For example, clear objectives must be defined, a procedure must be identified that will produce the desired objectives when implemented, an institutional structure that will facilitate implementation must be in place, and resources (human and financial) must be adequate. However, it is recognized that the implementation of an FSR/D project requires a multidisciplinary systems approach and an emphasis on farmer-targeted adaptive research, and this makes the design of FSR/D projects quite different from traditional research and development projects.

Perhaps the most important difference between the design of an FSR/D project and a traditional commodity-oriented project is that it is extremely difficult, if not impossible, for a single individual to design an FSR/D project. Even a multidisciplinary team will find it difficult to design an FSR/D project, if it does not include individuals with first-hand experience with the production systems currently used by farmers and an understanding of the socioeconomic environment in which farms function.

Project design begins when all participating institutions agree on a design process and form a design team. A design team is defined, in this case, as an ad hoc group of individuals brought together for a specific time period with the specific task of developing a document (or documents) that describes how an institution (or institutions) is going

to use a set of resources to achieve a set of objectives. After the team is brought together, the next step is to agree on the basic concepts that will be used by working groups with responsibilities for different components of the project. Since the different components of an FSR/D project are usually mutually dependent, a workshop format where groups work separately, report back to other team members, and form new groups to work on other components of the project, is an ideal mechanism to use in designing this type of project. The general steps that can be followed to bring together a multidisciplinary team and design an FSR/D project using a workshop format are listed below and then described in detail.

1. Development of a design plan
2. Formation of a design team
3. Definition of a common conceptual framework
4. Definition of the project objectives
5. Definition of the general project strategy
6. Definition of institutional structures
7. Identification of resource requirements
8. Documentation of the project design results

1. Development of a Design Plan

When the administrators of the institutions that are likely to be involved in the implementation of an FSR/D project have made the decision to develop a project, the first step is to agree on a sequence of activities that will lead to the design of an FSR/D project. Since project design requires both human and financial resources, the availability of qualified scientists, time, and money will be a key consideration. If an institutional arrangement acceptable to the donor institution (providing financial support) and the implementing institution (responsible for conducting research) is likely, it will often be

possible to obtain financial and technical support from the donor institution for design activities. When all participating institutions have agreed in general terms how the project will be designed, a design team can be brought together.

2. Formation of a Design Team

An FSR/D design team should include individuals with the following types of expertise:

a. Experience with the farmers who will participate in the project.
b. Experience conducting on-farm and field station research with the same type of biological production systems (e.g., multi-species intercrop systems, irrigated vegetable production systems, cut-and-carry livestock systems) that will probably be the focus of the project research activities.
c. Experience in a wide range of biological disciplines, social sciences, and research management.
d. An understanding of the structure and function of the institution or institutions that will be implementing the project.
e. An understanding of the structure and function of the institution or institutions that will be financing the project (if the project is not financed directly by the implementing institution).

Although potentially a complicated issue, leadership of the design team can be simplified if donor, implementing, and technical assistance institutions can agree on the design procedure prior to bringing the team together. When the design procedure is clearly understood, technical authority is delegated to working groups, and the role of the team leader or leaders becomes team management rather than dictatorial leadership.

When a design team is composed of individuals from donor, implementing, and technical assistance institutions, a key question is, which institution should provide the team leader? In many cases, a collective leadership, with a steering committee representing the interests of all participating institutions, may be the best leadership mechanism. If two institutions have potentially conflicting management objectives and procedures, as often occurs between donor and implementing institutions, a third party (such as a technical assistance institution) may be asked by both parties to take a stronger leadership role.

3. Definition of a Common Conceptual Framework

The first problem faced by an FSR/D project design team is how to achieve consensus on basic concepts. This is not simply a problem of communication among team members; all team members must not only be able to communicate, they must also agree to use a common set of concepts (conceptual framework) in the design of the project.

The easiest way to approach team consensus is to begin with concepts, not semantics. For example, rather than discussing what the words "cropping system" mean to everyone, it is best to agree that crops are often planted in different arrangements in space and time and that different inputs are applied and outputs produced. The name that is assigned to a recognized phenomenon is undoubtably important for communication, but it is not a key issue and most team members will be willing to agree to use a common terminology during the project design activity. Team members from the implementing institution will have a long-term interest in the terminology that is adopted, and should be the individuals who decide on the "names" that will be assigned to different phenomena.

During the last 50 years, systems science has developed into a discipline with a considerable body of theory, concepts, and terminology. It

has only recently been applied to agricultural research and many FSR/D practitioners have not taken advantage of "systems" concepts in defining the physical, biological, and socioeconomic phenomena that are the subjects of farming systems research. If a team applies the basic concept of a system (an arrangement of components that function as a unit processing inputs and producing outputs) to reality and identifies different types of systems, many semantic and conceptual problems can be overcome. If terms like "farming systems," "livestock production systems," and "marketing systems" are going to be operationalized, the individuals using the terms must be able to clearly identify the components, inputs, and outputs of each system.

Since FSR/D projects address both development and research and bring together a wide variety of biological and socioeconomic disciplines, it is important to construct a conceptual framework that allows individuals from different disciplines to see how their specialty fits into the whole. Systems science uses the concept of system hierarchy as a conceptual framework to tie together the microscopic with the astronomic. An example of a system hierarchy in biology is the population-organism-organ-tissue-cell hierarchy; a cell is a subsystem of a tissue, that is a subsystem of an organ, etc. When the concept of hierarchical systems is applied to the domain of agriculture, a hierarchy of agricultural systems can be identified (for example, region-community-farm-crop production system, etc.). This hierarchy is illustrated diagramatically in figure 1. Scientists can identify the system level within the hierarchy where their discipline operates and can design activities that can contribute to the general research strategy developed by the design team.

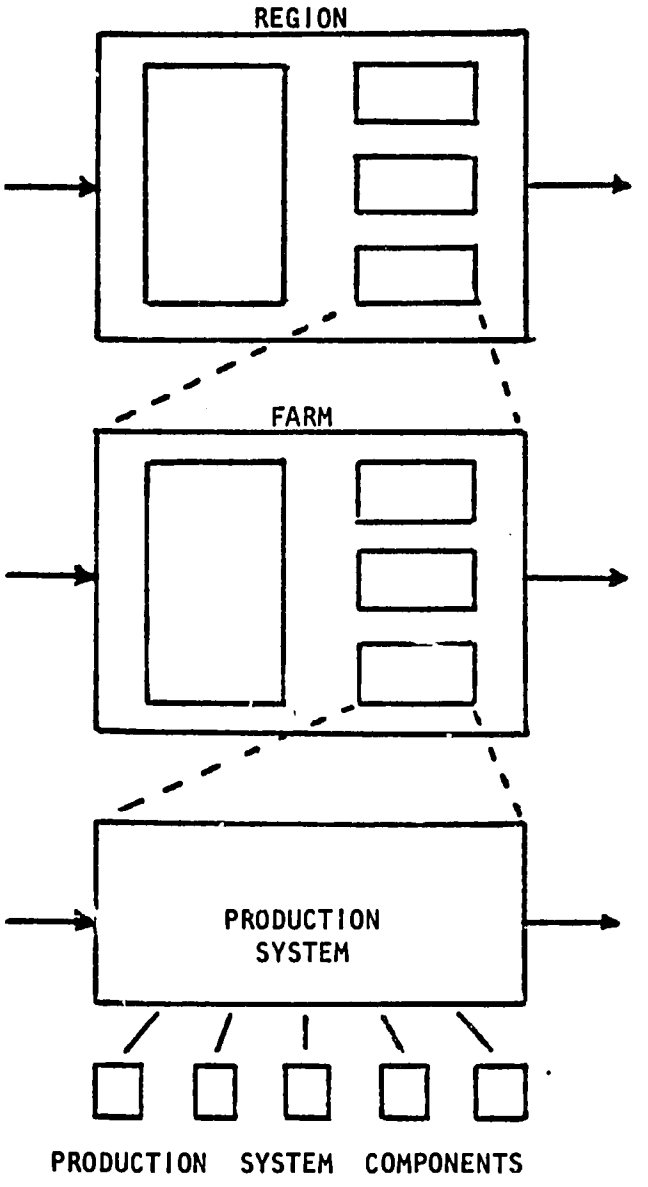

Figure 1. The hierarchical relationship among regions, farms, production systems, and production system components that can be used as a conceptual framework for farming systems research and development.

4. Definition of the Project Objectives

In most cases, the general objectives of an FSR/D project will have been identified by senior administrators of the implementing institutions prior to bringing together the project design team. A decision will usually have been made regarding the general geographic area, the type of farmer, and the system level (community, farm, production system, etc.) that will be targeted by the project. The job of the design team will be to:

a. Identify specific project outputs within the framework of the general objectives.
b. Identify the phenomena within the conceptual framework (developed during the conceptual consensus stage of the project design) that directly influence these outputs.

If, for example, an implementing institution and a donor institution have agreed that the general objective of an FSR/D project should be to increase producer income from the small farm sector of a specific region of a country by conducting applied biological research, the job of a design team will be to identify the agricultural production systems that should be the target of the research (e.g., sheep production) and specific project outputs (e.g., alternative feed, herd management, animal health, and breeding practices that will increase the economic efficiency of wool production and increase income). If enough information is not available to specify target production systems and types of alternatives likely to be emphasized by research teams, the project design will have to identify the point in time within the implementation procedure when these decisions will be made.

5. Definition of the General Project Strategy

The general strategy of an FSR/D project should exhibit the following key characteristics:

a. It should lead directly to the project objectives.
b. It should include only activities that contribute to reaching the objectives.
c. It should be efficient in the use of financial and human resources.
d. It should be composed of activities that are discrete with identifiable inputs and outputs, and that are directed at specific real physical, biological, or social phenomena.

With the definition of clear objectives and the definition of a conceptual framework, the next step for the design team is to outline a general research strategy. A general strategy, in this case, is defined as a set of interacting activities that are directed at different agricultural systems, that are linked together in space and time, and that will produce the desired project objectives.

While FSR/D projects use different terminology, most projects include the following steps: a) a preliminary descriptive phase (often called "characterization"); b) an analytical phase, where descriptive information is synthesized; c) a design phase, where constraints and hypotheses as to how to resolve these constraints are identified; d) a testing or evaluation phase (often called "validation"), where the hypotheses are accepted or rejected; and e) a technology transfer phase, where the technology is communicated to farmers who have not participated in the first four phases.

Usually the activities that form an FSR/D research strategy can be related chronologically to the characterization, analysis, design, testing, and transfer phases mentioned above. However, in some cases, more than one activity will be needed for one phase; for example, characterization may require a rapid appraisal activity, a farm survey activity, and a market and credit analysis activity. In other cases, a

single activity may produce information that relates to more than one phase; for example, an on-farm experimental trial may produce needed characterization information about a specific production system as well as information needed to evaluate a hypothesis.

Specific activities or sets of activities will often be associated with specific disciplines. For example, marketing studies will usually be conducted by economists and on-farm trials will usually be conducted by agronomists and(or) animal scientists. Activities associated with one discipline usually can clearly be seen to be directed at one of the agricultural systems that form the project conceptual framework (for example, the community, farm, or production system). However, some activities that must be included in FSR/D projects are not the obvious responsibility of one discipline, and why it should be studied, or how it should be studied, is not always clear. For example, an initial characterization activity requires equal leadership and participation from biological and social scientists; what information is needed, and when and at what level of precision the information is required are often difficult questions.

The analysis of a farm as a system is not a major interest of most major social or biological scientists, but it is a key FSR/D activity. Traditionally, economists, sociologists, agronomists, and animal scientists have studied economic, social, plant, and animal processes that occur on a farm, but have seldom done whole-farm analyses. A design team will usually find it easy to identify activities associated with specific disciplines, but will often overlook the activities that are multidisciplinary in scope. Special attention needs to be directed at these activities.

Linkage among activities is a key to a successful research strategy. The output from a specific activity should serve as an input to at least one other activity or the activity probably should not be part of the

strategy. Planning sessions that will ensure linkage among activities should be held when the outputs from many activities become available as inputs to other activities. For example, if a climatology study, a farm survey, and field station experiments have been planned because they will produce outputs needed to design on-farm technology evaluation trials, then it is obvious that a workshop must be planned to link the on-farm evaluation trials with the other activities. One of the reasons FSR/D projects recently have placed less emphasis on large baseline surveys is that the output from this type of activity was not available as an input for the design of on-farm experiments when it was needed. Rapid appraisal techniques, while often producing less information with less precision, produce outputs at the time when information is needed to design experiments.

Figure 2 summarizes a general FSR/D research strategy that ties together the activities associated with characterization, analysis, design, evaluation, and transfer. Figure 2 also indicates the agricultural system (region, farm, etc.) that is usually the target of these activities. A key activity set in this strategy is "design of alternative technology". All activities conducted prior to this stage are directed towards producing the necessary inputs for this activity; all activities conducted after this stage are directed at evaluating and communicating the outputs from this activity.

FSR/D project management is essentially of moving information through the process summarized in figure 2. One management tool that can be used to move information through the process is a continuously updated filing system. The file can include: a) a description of the predominant agricultural systems in a target area (outputs from "characterization" and "analysis") b) alternative technology for these systems (output of "design"), and c) the technical justification for recommending the alternative technology (output of "evaluation"). The file can be used to move information from research to extension and as a project output that can be inspected by donor institutions.

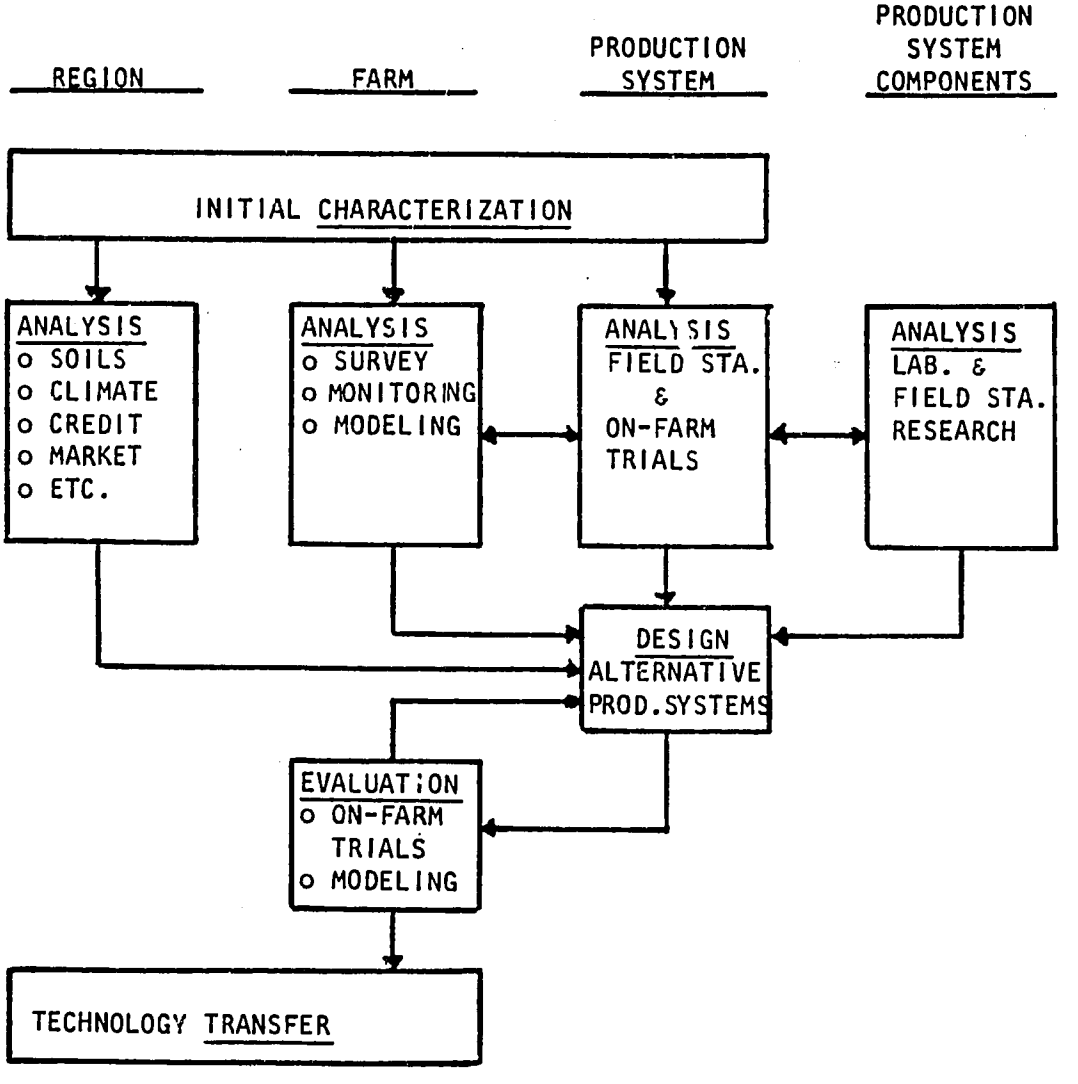

Figure 2. A general farming systems research and development strategy consisting of different activity sets directed at different agricultural systems that are related hierarchically.

6. Definition of Institutional Structure

In designing the general FSR/D project strategy, the members of the design team will undoubtedly subjectively take into consideration the organizational structure of the implementing institution. However, after a general strategy has been developed, the next step is to objectively address the issue of institutional structure. The project design team should:

a. Objectively analyze the present structure of the implementing institution(s).
b. Determine if an existing unit within the present structure is organized in such a way that if more resources were made available it could implement the project.
c. If an existing unit is not structured to implement the project, design an institutional arrangement that will be able to carry out the research strategy.

The question of what is an "adequate" institutional structure to implement an FSR/D project is a difficult one. The unit that implements the project must either have staff members from biological and social science disciplines or be able to hire individuals from a broad range of disciplines. The unit should include a program that would logically accept a mission-oriented project with a geographic focus.

The most critical institutional issue for FSR/D projects is probably the relationship with commodity-oriented basic research units and extension units. In order to bridge basic research and extension processes the FSR/D project should, ideally, be located within a unit that is "higher" in the institutional structure than either extension or research (assuming both are in the same institution). This is seldom a possibility at the central office of an agricultural research institution (such as a Ministry of Agriculture) without a major reorganization, but often in a regional office of the same institution, a project office can be located at least at the same level as extension and research.

The bridge between extension and research formed by FSR/D projects is essentially based on the management of agricultural information. Research needs to know what production systems farmers are presently using and what their constraints are. Extension needs to know what technology is available to reduce these constraints. Because of the information management role played by FSR/D projects, the relationship with the agricultural information unit within the implementing institution is a key issue that must be considered by the FSR/D project design team.

7. Identification of Resource Requirements

After the design of a general research strategy that will produce the desired objectives, and the design of the institutional arrangements necessary to carry out the research strategy, the next step is to identify the financial, technical, and human resources that are required. In most cases, the availability of these resources from the implementing institution and an estimate of the financial resources a donor institution is willing to commit to the project will be known prior to the design workshop. But these resources are usually only promised in general terms (x person days of technical assistance, y dollars, etc.). The design team will usually be asked to calculate specific quantities of resource requirements.

The most important resource limitations for FSR/D projects are usually people and vehicles (including parts and fuel). These resources usually represent a high percentage of an FSR/D project budget and are probably the best place to start when calculating resource requirements.

The team be responsible for implementing research activities in a specific geographic area is usually the key operational unit in most FSR/D projects. One way to calculate resource requirements for an FSR/D project is to begin by identifying the number of individuals and disciplines needed for a field team. For example, an FSR/D project in an

irrigated rice-growing area may require a field team composed of a rice specialist, a plant protection specialist, an irrigation specialist, and an agricultural economist; a FSR/D project in a small mixed-farm hillside area may require a field team composed of a soil conservation specialist, a livestock specialist, two agronomists with specialties in the predominant types of crops, and an agricultural economist. The number of vehicles (including motorcycles, etc.), the number of field assistants, and the amount of money needed to maximize the efficiency of the team in conducting research can then be calculated.

If the available financial resources make it possible to have two or more field teams, a coordinating unit will probably be needed. If the number of field teams is large (five or more), the coordinating unit should probably be multidisciplinary. The disciplines represented in this coordinating unit will often be complementary to the disciplinary expertise of the field teams. For example, if none of the field team members is a specialist in agricultural statistics, a statistician could be included in the coordinating team; if the field teams have production economics expertise, the coordinating unit could include a marketing economics expert.

Since many agricultural research institutions have limited experience implementing FSR/D projects, technical assistance and training are often identified as a means of obtaining the required expertise and of improving national institution capabilities. This assistance and training is often contracted on an institutional basis rather than on an individual basis, and when that is the case, the role of that institution (usually based in a different country) must be considered within the institutional arrangement considered previously.

Some donor institutions tend to be paternalistic and often incorrectly assume that technical assistance institutions in "developed" countries are inherently more capable of implementing an FSR/D project than a

Third World institution. While this is not usually true, technical assistance institutions can, however, often provide key human resources and FSR/D design teams need to carefully consider where technical assistance personnel fit into the national institution's structure. Since expatriate technical assistance personnel are usually paid by an outside institution, they usually cannot have line authority (for example, head of a field team) and often an advisory or counterpart position must be created within the institutional structure. However, donor institutions often contract technical assistance institutions directly, asking them to accept responsibility for project outcome, not just provide technical assistance and this responsibility is more compatible with "authority" than "advisory" roles. How to use technical assistance expertise in FSR/D projects is a difficult question that must be addressed.

8. Documentation of the Project Design Results

The responsibility of an FSR/D project design team is not over until it has documented the results of the design process. If the design process is done in a workshop format, working groups that have been assigned different responsibilities can write draft reports to be distributed to other team members for comments and revisions. For example, a small group can be asked to write a chapter on "project objectives," another on "general research strategy," etc. These draft reports can then be combined and edited by a small group or by the leaders of the design workshop.

The project document produced by the design team will often be the basis of a project proposal, usually to be presented to a donor institution for funding. For this reason, responsibility, authorship, and institutional affiliation of all the members of the design team should be clearly stated in the document produced by the FSR/D design team.

A CASE STUDY FROM THE EASTERN CARIBBEAN

The eight steps of the general FSR/D project design guideline described in the first section of this paper were used to design a project in the Eastern Caribbean. The implementing institution is the Caribbean Agricultural Research and Development Institute (CARDI). At the time of the project design activity, the United States Agency for International Development (USAID) was committed to provide financial support for the project, and in July 1983, CARDI and USAID signed a project agreement in which USAID agreed to provide approximately US$7 million over a 5-year period. CARDI will contribute approximately US$6 million and the six countries that will participate in the project will contribute slightly less than US$1 million. The University of Florida (Gainesville, Florida, USA), through its Farming Systems Support Program (FSSP), and Winrock International (Morrilton, Arkansas, USA), provided technical assistance during the project design process.

The ecological and socioeconomic situation of the Eastern Caribbean is unique in many ways. For example, islands are quite different from geographic regions within continental countries. CARDI has had 3 years of experience conducting cropping systems research and has done extensive description and analysis of the predominant farming systems on the six islands that are participating in the project. The six islands (Antigua, Montserrat, St. Kitts-Nevis, Dominica, St. Lucia, and St. Vincent) are very different ecologically and in terms of economic and institutional development. The fact that CARDI acts as a regional institution (serving 11 member countries of the English-speaking Caribbean) and as a national research institution in countries that do not have research institutions makes CARDI's institutional structure quite different from most Third World agricultural research institutions.

To illustrate the eight steps in the general project design guideline described in the first section of this paper, we have described below the key characteristics of the specific design process followed in designing an FSR/D project to be implemented by CARDI.

1. Development of a Design Plan

Figure 3 is a diagram summarizing the design procedure followed by CARDI, USAID, and the University of Florida to produce a CARDI project document and a USAID project paper (an internal USAID document that must be approved before a contract can be signed and money can be released). The dates of the events that took place during this procedure are noted on the diagram. These key events were:

a) After discussions with CARDI, USAID/Barbados requested assistance from the United States Department of Agriculture (USDA) to write a Project Identification Document (PID). This internal USAID document is, in essence, the USAID mission's proposal to USAID/Washington that funds be set aside for a project. When this was approved, USAID/Barbados could tell CARDI that it had financial support for a project that met their approval and agreed to provide technical assistance in the preparation of a project proposal.

b) The University of Florida and Winrock International were contracted to provide technical assistance to assist CARDI in the design of an FSR/D project.

c) Representatives from USAID, CARDI, and the University of Florida met and agreed on a workshop procedure that would be followed to develop a CARDI project document.

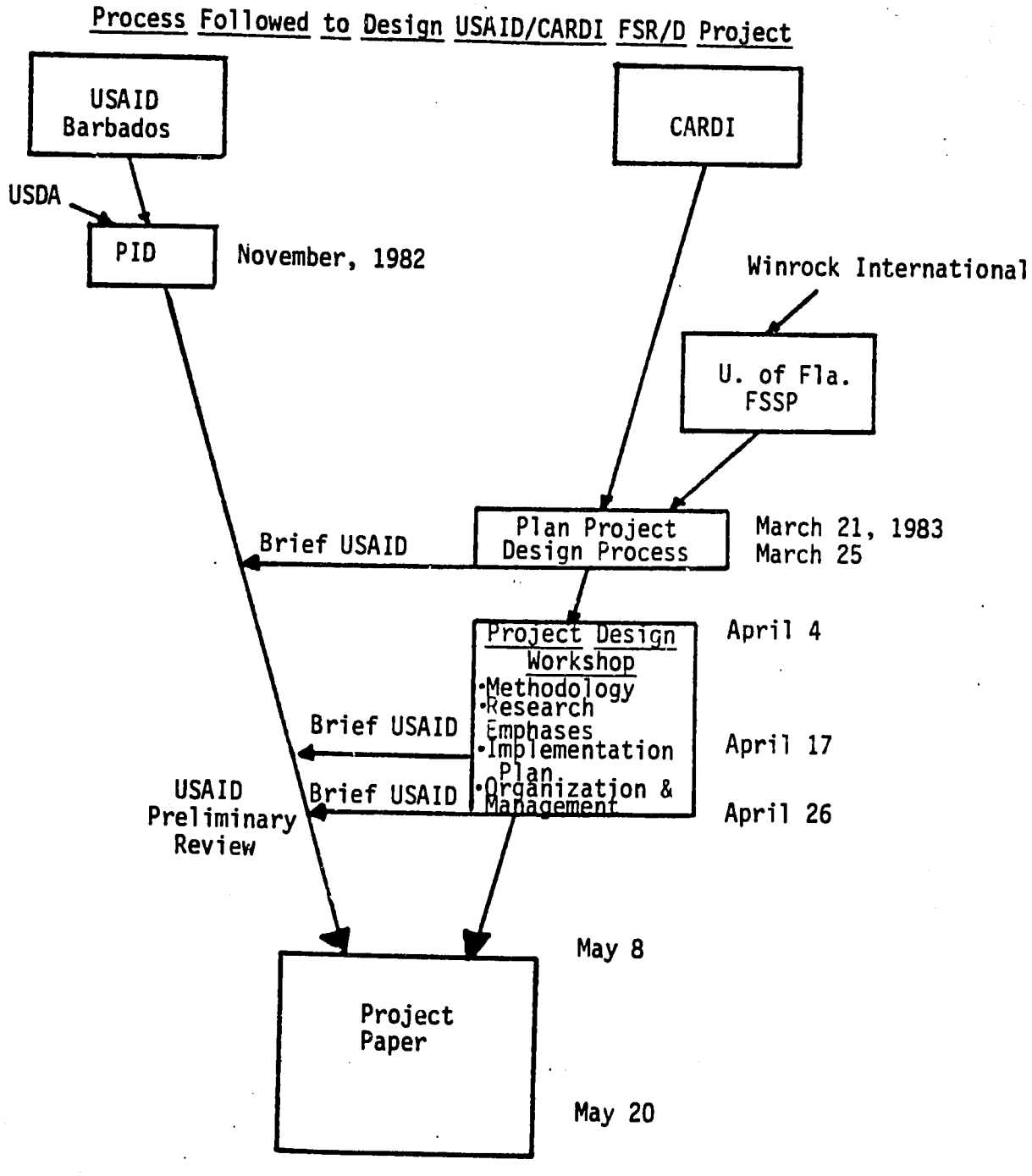

Figure 3. The process followed to design a Farming Systems Research and Development Project to be funded by USAID and implemented by CARDI.

d) A 2-week workshop was organized in St. Lucia. At this workshop, eight CARDI scientists and three technical assistance scientists formed the core team, but individuals from USAID attended periodically, and representatives from other institutions were invited to participate for short periods. For example, representatives from the University of the West Indies/USAID extension project were invited to describe their activities and to critique the project being designed. During the course of the workshop, small work groups (two to four people) were assigned responsibility for different topics, such as project objectives, general research strategy, linkages among participating institutions, etc. Leadership was informal, since after the entire group had agreed on the general workshop procedure, the task of the leaders was primarily to encourage work groups to write draft reports, call general sessions and organize new work groups. At the end of the formal workshop in St. Lucia, a small group traveled to CARDI headquarters in Trinidad to discuss organizational and management issues.

e) The document written at the St. Lucia workshop was presented to USAID. After a preliminary review, individuals from USAID/Barbados, USAID/Washington, USDA, CARDI, and the University of Florida (under the coordination of USAID/Barbados) developed a USAID Project Paper. Most of this paper was taken directly from CARDI's project document, but some analyses (such as economic, institutional, and social soundness analyses), were not addressed in the CARDI document to the satisfaction of USAID, and had to be expanded and revised for the project paper.

f) USAID approved the FSR/D project as described in the USAID Project Paper, and CARDI and USAID signed a contract obligating CARDI to produce certain outputs (such as crop, livestock, and crop/livestock production system technological improvements) over a 5-year period, and obligating USAID to provide US$7 million for CARDI to implement an FSR/D project on six islands of the Eastern Caribbean.

2. Formation of a Design Team

The 12 individuals that formed the project design team represented CARDI (including country team representatives, technical backstop staff, and central office management), USAID, University of Florida (an agricultural economist and an organization and management specialist), and Winrock International (an FSR/D specialist). The CARDI project leader and the Winrock FSR/D specialist (the authors of this paper) were the team leaders.

3. Definition of a Common Conceptual Framework

The project design team agreed that CARDI's Farming Systems Methodology required an analysis of the following agricultural systems:

a) Island agricultural system. This system is composed of the farms that process natural resource inputs and agricultural chemicals, seeds, fertilizer, labor, credit, etc., and produce agricultural commodities; commodity processing components, such as mills and packaging plants; and services such as private sector suppliers of inputs and public sector institutions such as credit, agricultural research, extension and marketing boards.

b) Farm system. A farm system is a key subsystem of an island agricultural system. It is composed of a household and a set of agricultural production systems that are controlled by the household. In addition to natural resources input that do not require economic transactions, a farm system sells agricultural commodities produced directly on the farm, agricultural commodities that are processed on the farm (for example, copra made from coconut produced on the farm) and family labor. Using the cash obtained from selling these outputs, or cash from a credit source of in-kind exchange, a farm system buys the inputs required for the function

of its agricultural production systems and the household. Aspects that have not been included as farm system components in the above definition, but are important factors that affect farm function, are off-farm labor and nonagricultural activities (such as running a small store) that may occur within the physical limits of the farm.

c) Agricultural production system. This system is a subsystem of a farm system. It is composed of physical components (soil, nutrients, etc.) that interact in space and time. Inputs can include precipitation, solar radiation, agricultural chemicals, seed, labor, machine, energy, animal energy, management, etc. Outputs include desirable commodities such as grain, roots and tubers, fruits, meat, milk, etc., and undesirable products such as soil erosion or pesticide runoff. A crop production system is an agricultural production system that includes one or more crop populations that interact in space and(or) time; a crop/livestock production system is an agricultural production system that includes one or more crops and one or more livestock populations that interact in space and(or) time. All crops and livestock on a farm interact in that they compete for labor, land and capital resources, but sets of crops and(or) livestock are grouped together to form a system when they compete biologically (such as for sun or soil nutrients, or for the same feed resource) and when farmers manage them as a unit (such as small plots of different vegetables planted in one field in which a farmer allocates labor without regard to vegetable species).

4. Definition of Project Objectives

The goal of the CARDI FSR/D project is to enable the countries of the Eastern Caribbean to assure continuing food security to their populations from a combination of domestic production and importations of food at commercial terms paid from foreign exchange earnings.

The project's purpose is to increase agricultural productivity and production by institutionalizing a sustainable Farming Systems Research and Development Program at CARDI that responds to the agricultural needs of participating Eastern Caribbean countries. The purpose therefore, has both a productivity and an institutional focus. To achieve the productivity objectives, CARDI will concentrate its efforts on selected crops of major importance or potential on each participating island, thereby avoiding dissipation of effort across too wide a range of crops. Institutionally, the project will build upon CARDI's current capacity so that by project-end CARDI will have the management and organizational resources to sustain its overall small farming research program.

Three interrelated types of outputs will result from the project:

- Technological generation. CARDI will develop a number of economically viable farm-tested and validated technological improvements in crops, livestock, and crop/livestock combinations.

- Technology transfer. CARDI will establish a system of close research/extension and private sector linkages whereby technological improvements can be transferred rapidly to small- and medium-scale farmers.

- Institutional strengthening. CARDI will be strengthened to a point where it can sustain a productive Farming Systems Research and Development Program.

5. Definition of a Project Strategy

The project design team developed a FSR/D methodology that can be divided into the following six phases:

a) Area and target farmer selection. The selection of geographic area and type of farmers that will receive the attention of the project is usually done on the basis of political and policy criteria, cost-effectiveness, potential impact of the research, and policy objectives.

b) Description. After identifying the geographic area and target farmers, different information gathering techniques (such as key informant interviews, surveys, etc.) are used to describe the existing situation.

c) Analysis. After summarizing the information gathered during the descriptive state, different analytical techniques are used to identify constraints that affect farmer production and opportunities to improve the existing production systems.

d) Design. After identifying constraints and opportunities, hypotheses on alternative technologies that could overcome existing constraints are formulated. The synthesis of information and formulation of hypotheses usually require a multidisciplinary team approach.

e) Testing. After identifying technology that could potentially overcome constraints, these technological alternatives are systematically tested with a subset of the target farmers to determine if the proposed alternatives are biologically, socially, and economically viable.

f) Transfer. After identifying viable technological alternatives, a transfer process is begun. This process begins with extensive validation of the technological alternatives done by extension agents with a subset of the target farmers and ends with mass media information dissemination by extension institutions.

When the six phases described above are applied to island agricultural systems, the farming systems that are components of the island systems, and the production systems that are components of the farming system, the result is the general FSR/D methodology described in figure 4. The general strategy outlined in figure 4 includes 11 sets of activities that are arranged chronologically and by agricultural system. A key activity is that of "design of alternatives." The first seven activities come together to allow the design of alternatives. The last three activities involve the testing and transfer of the alternatives that are produced during the design activities.

Because of CARDI's experience conducting cropping systems research on the same six islands that will participate in the FSR/D project, extensive information has already been collected and analyzed. In many of the subregions of the different islands, the research team is already at the "design" stage of the general strategy. For this reason the CARDI FSR/D project document (see step 8) describes the research emphases for each island, and justifies these decisions on the basis of island, farm, and production system opportunities and constraints. For example, on-farm testing of technological improvement for onion and tomato production (step 9 in the general methodology) in St. Lucia is justified on the basis of island-level opportunity due to wet-season import of these commodities (import substitution) and production system opportunities due to the availability of varieties to overcome plant-pathology constraints that have discouraged farmers from planting onions and tomatoes during the wet season.

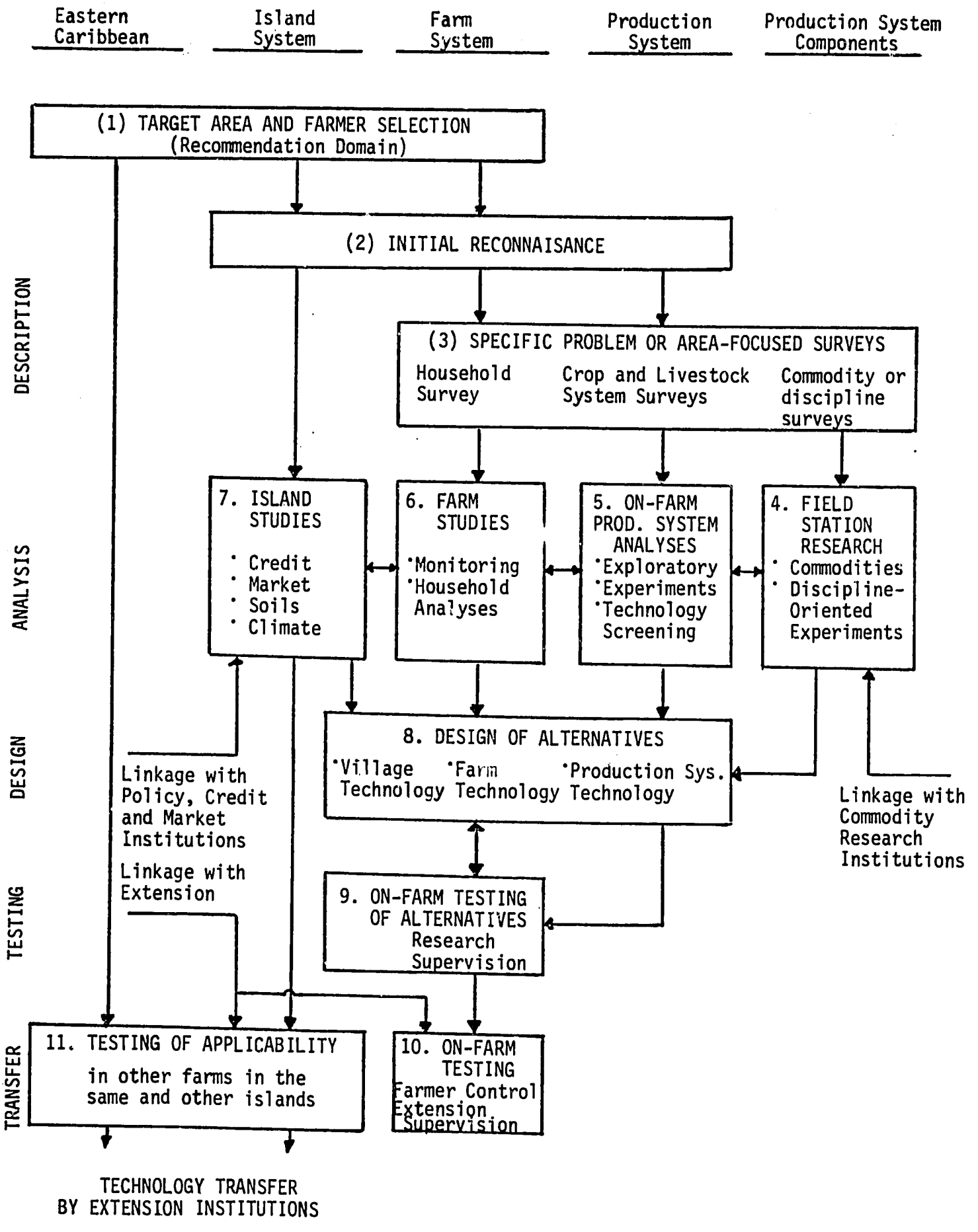

Figure 4. CARDI's GENERAL FARMING SYSTEM RESEARCH AND DEVELOPMENT METHODOLOGY

6. Development of an Institutional Structure

The institutional arrangements for implementing the project include a three-person team on each of the six islands, a technical support and coordination unit in St. Lucia, commodity and discipline-oriented backstopping from CARDI headquarters in Trinidad, and a technical assistance contract with a U.S. institution. Formal institutional linkages will also be sought with extension institutions and private sector institutions such as WINBAN (a banana research and development group linked to an export company).

7. Identification of Resource Requirements

The implementation of the project described above will require approximately US$14 million. One half of this amount will be provided by the implementing institutions (CARDI and the governments of six Eastern Caribbean countries) and one half by the donor institution (USAID). Approximately 50% of the funds will be needed to pay for personnel costs. To assist CARDI in the implementation of the project, approximately US$1 million will be used to obtain technical assistance from other institutions with experience in farming systems research.

8. Documentation of the Project Design Results

The 12-person team that worked together to design the FSR/D project described above produced a document with the following chapters:

a) The role of CARDI in the Eastern Caribbean
b) Project overview
c) CARDI's FSR/D methodology
d) Analysis of constraints and opportunities
e) Research priorities
f) Institutional linkages

g) Technical assistance, training, and professional improvement
h) Organization and management
i) Implementation plan
j) Resources

As mentioned previously, this document was used as the basis for writing a second document, a USAID Project Paper. It also is being used by the CARDI implementation team as a guideline for the development of the workplans for each of the six countries involved in the project.

CONCLUSIONS AND ACKNOWLEDGMENT

The FSR/D project design guidelines and the case study resulting from applying these guidelines in the Eastern Caribbean has been described in very general terms in this paper. Just as a key characteristic of the FSR/D approach is that the direction of the research is determined with farmer participation, we feel that the strategy and institutional arrangements of an FSR/D project must evolve to fit indigenous conditions and cannot be imported. The purpose of this paper has not been to suggest a recipe or a rigid model; rather the intent has been to share insights gained through practical experiences.

We wish to acknowledge the inputs from all the FSR/D project design team members from CARDI, University of Florida, Winrock International, USDA and USAID that participated in the design of the CARDI project. In alphabetical order, the team included: E. Birgells, R. Carew, J. Cropper, L. Daisley, R. Francis, C. George, J. Hammerton, M. Ingle, R. Hart, V. Narendrum, W. McPherson, R. Pilgrim, and R. Waugh. These individuals contributed ideas not only to the project itself, but also as to how it should be designed. Although the ecological, socioeconomic, and institutional situation of the Eastern Caribbean is unique, we feel that the design process described in this paper could be used by other institutions interested in the design of farming systems research and development projects.