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UNCLASSIFIED

**UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D. C. 20523**

CARIBBEAN REGIONAL

PROJECT PAPER

**CARDI: FARMING SYSTEMS RESEARCH
AND DEVELOPMENT**

AID/LAC/DR:144

Project Number:538-0099

UNCLASSIFIED

AGENCY FOR INTERNATIONAL DEVELOPMENT PROJECT DATA SHEET		1. TRANSACTION CODE <input type="checkbox"/> A = Add <input type="checkbox"/> C = Change <input type="checkbox"/> D = Delete Amendment Number _____	DOCUMENT CODE 3
2. COUNTRY/ENTITY REGIONAL DEVELOPMENT OFFICE/CARIBBEAN		3. PROJECT NUMBER <input type="text" value="538-0099"/>	
4. BUREAU/OFFICE LATIN AMERICA/CARIBBEAN <input type="text" value="05"/>		5. PROJECT TITLE (maximum 40 characters) CARDI: FARMING SYSTEMS RESEARCH AND DEVELOPMENT	
6. PROJECT ASSISTANCE COMPLETION DATE (PACD) MM DD YY <input type="text" value="06"/> <input type="text" value="30"/> <input type="text" value="88"/>		7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4) A. Initial FY <input type="text" value="83"/> B. Quarter <input type="text" value="4"/> C. Final FY <input type="text" value="87"/>	

8. COSTS (\$000 OR EQUIVALENT \$1 =)

A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total						
(Grant)	(600)	(500)	(1,100)	(2,315)	(4,685)	(7,000)
(Loan)	()	()	()	()	()	()
Other U.S.	1.					
	2.					
Host Country						5,100
Other Donor(s)						
TOTALS			1,100			12,100

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1 Grant	2 Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) ARDN	100	080				1,100		7,000	
(2)									
(3)									
(4)									
TOTALS						1,100		7,000	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

11. SECONDARY PURPOSE CODE

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code _____ B. Amount _____

15. PROJECT PURPOSE (maximum 480 characters)

To develop an effective and sustainable Farming Systems Research and Development Program in CARDI that responds to the agricultural needs of the Eastern Caribbean.

14. SCHEDULED EVALUATIONS

Interim MM YY Final MM YY

15. SOURCE/ORIGIN OF GOODS AND SERVICES

000 941 Local Other (Specify) _____

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a _____ page PP Amendment.)

17. APPROVED BY

Signature: William B. Wheeler
 Title: WILLIAM B. WHEELER, DIRECTOR

Date Signed: MM DD YY

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION

MM DD YY _____

PROJECT AUTHORIZATION

Name of Entity: Caribbean Agricultural Research and
Development Institute
Name of Project: CARDI Farming Systems Research and
Development
Number of Project: 538-0099

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961 as amended, I hereby authorize the Farming Systems Research and Development Project for the Caribbean Agricultural Research and Development Institute (CARDI) involving planned obligation of not to exceed Seven Million Dollars (\$7,000,000) in grant funds over a five year period from date of authorization subject to the availability of funds in accordance with the AID OYB/Allotment process, to help in financing foreign exchange and local currency costs for the project. The planned life of the project is five years from the date of initial obligation.

2. The Project consists of developing an effective and sustainable Farming Systems Research and Development Program in CARDI that is responsive to the agricultural needs of CARDI member countries.

3. The Project Agreement which may be negotiated and executed by the office to whom such authority is delegated in accordance with AID regulations and Delegations of Authority shall be subject to the following essential terms and conditions, together with such other terms and conditions as AID may deem appropriate.

a. Source and Origin of Commodities, Nationality of Services.

Commodities financed by AID under the Project shall have their source and origin in the United States or in the member countries of CARDI, except as AID may otherwise agree in writing. Except for ocean shipping, the suppliers of commodities or services shall have the United States or the member countries of CARDI as their place of nationality, except as AID may otherwise agree in writing.

Ocean shipping financed by AID under the Project shall, except as AID may otherwise agree in writing, be financed only on flag vessels of the United States.

b. Conditions Precedent to Disbursement

1. Initial Disbursement

Prior to the first disbursement under the Grant or to the issuance by AID of documentation pursuant to which disbursement will be made, the Grantee will, except as the parties may otherwise agree in writing, furnish to AID, in form and substance satisfactory to AID:

a. An opinion of counsel acceptable to AID that the Agreement has been duly authorized and/or ratified by, and executed on behalf of, the Grantee, and that it constitutes a valid and legally binding obligation of the Grantee in accordance with all of its terms; and

b. A statement of the name of the person holding or acting in the office of representative of the Grantee and of any additional representatives, together with a specimen signature of each person specified in such statement.

c. Evidence that a Project Manager, has been designated, with appropriate delegations of authority to effectively implement the Project.

2. Disbursement For Expenses Other Than Technical Assistance and Financial Management Staff

Prior to disbursement under the Grant for activities other than technical assistance and financial management staff or to the issuance by AID of documentation pursuant to which disbursement will be made, the Grantee will, except as the Parties may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

a. Evidence that a suitable accounting system is in place to handle Project funds; and

b. A first year workplan for each component of the Project. The workplan should contain a detailed implementation plan, staffing arrangements, specifications for equipment, operating and research expenses, and budget, including CARDI and Host Government contributions.


William B. Wheeler
Mission Director

Date: July 14, 1983

CARDI FARMING SYSTEMS RESEARCH AND DEVELOPMENT PROJECT

TABLE OF CONTENTS

	<u>PAGE</u>
PROJECT AUTHORIZATION	i
I. SUMMARY PROJECT DESCRIPTION	1
A. Project Summary	1
B. Summary Financial Plan	3
II. PROJECT BACKGROUND AND RATIONALE	4
A. Agriculture In The Eastern Caribbean	4
B. Country Development Strategy	5
C. The Small Farm Multiple Cropping Systems Research. Project	6
D. Relation To Agency and Mission Strategy	7
E. Relationship to other AID Projects	12
F. Relationship With other Donor Activity	13
G. The Project Design Process	14
III. DETAILED PROJECT DESCRIPTION	16
A. Major Constraints To Be Addressed	16
1. Introduction	16
2. Agronomical and Organizational Constraints	16
3. CARDI Institutional Constraints	17
B. CARDI: Farming Systems Research and Development Project (FSR/D)	17
C. Project Objectives	18
1. Goal And Purpose	18
2. End Of Project Status	19
3. Outputs	19
D. Detailed Project Description	20
1. CARDI Farming Systems Research Methodology	20
2. Technology Generation and Transfer	21
a. Technology Generation	21
b. Technology Transfer	26
c. Research Activities	27
3. CARDI: Institutional Strengthening	34

	<u>PAGE</u>
a. Project Activities	36
4. Project Training and Technical Assistance	40
5. The Project Organization	45
IV. COST ESTIMATES AND FINANCIAL PLAN	48
V. IMPLEMENTATION PLAN	55
A. Detailed Project Schedule	55
1. Project Start-Up Activity Schedule	55
2. Project Operation Schedule	56
B. Project Management	58
C. Procurement Arrangements	59
VI. MONITORING, REPORTING AND EVALUATION PLAN	60
A. Monitoring Plan	60
1. CARDI's Project Monitoring Activities	60
2. AID's Monitoring Activities	60
3. Contractor Monitoring Activities	61
B. Reporting Plan	61
C. Project Evaluation Plan	61
1. Key Evaluation Issues And Decision Makers	62
2. Detailed Evaluation Research Design	63
VII. PROJECT SPECIFIC ANALYSES	64
A. Technical Analysis	64
B. Economic Analysis	67
C. Social Soundness Analysis	70
D. Financial Analysis	76
E. Environmental Analysis	81
F. Institutional Analysis	83
VIII. CONDITIONS AND COVENANTS	90
 <u>ANNEXES</u>	
A. Logical Framework	1-4
B. PID Guidance Cable	5-7
C. Letter of Application	8-11

	<u>PAGE</u>
D. Statutory Checklist	12-22
E. Technical Analysis	23-63
F. Social Analysis	64-95
G. Financial Analysis	96-118
H. Administrative Analysis	119-149

ANNEXES

TABLE OF CONTENTS

	<u>PAGE</u>
A. <u>Logical Framework</u>	1 - 4
B. <u>PID Guidance Cable</u>	5 - 7
C. <u>Letter of Application</u>	8 - 11
D. <u>Statutory Checklist</u>	12 - 22
1. Project Checklist	12 - 19
2. Standard Item Checklist	20 - 22
E. <u>Technical Analysis</u>	23 - 63
I. CARDI's Farming Systems Research and Development Methodology	23 - 40
II. Research Priorities For the CARDI FSR/D Program	41 - 63
F. <u>Social Analysis</u>	64 - 95
I. Social Cultural Setting of Small Farm Agriculture in the Eastern Caribbean	64 - 87
II. Social Soundness of FSR/D Project	88 - 95
G. <u>Financial Analysis</u>	96 -118
H. <u>Administrative Analysis</u>	119 -149
I. Assessment of Current Institutional Capacity and Performance	119 -134
II. Feasibility of FSR/D Project Organization and Management Plan	135 - 138
Appendix I - Statement of Recommendations For Improvement of Procedures	139 - 144
Appendix II - CARDI Management Audit: Executive Summary	145 - 149

I. SUMMARY PROJECT DESCRIPTION

A. Project Summary

The CARDI Farming System Research and Development Project (FSR/D) is a five year \$12,100,000 Project which will assist the Caribbean Agricultural Research and Development Institute to develop an effective Farming System Research Program in the Eastern Caribbean. The FSR/D Program will eventually encompass all CARDI member states. AID grant funds amounting to \$7,000,000 will be used to fund local currency and foreign exchange costs of developing the program in six LDC states of the Eastern Caribbean: St. Vincent and the Grenadines, St. Lucia, Dominica, Antigua, St. Kitts/Nevis and Montserrat. Barbados will participate in certain crop/livestock programs

The Project will address the principal agronomic, and organizational constraints to increased agricultural production in the Eastern Caribbean. In addition, the Project will address the major institutional constraints in CARDI. The farming systems approach has been selected because available evidence suggests it to be the most cost effective means of technology generation and diffusion in the complex milieu of the Eastern Caribbean small farmer. Traditional agricultural research has taken a commodity and disciplinary approach and has proven time consuming and elusive in producing acceptable results. This Project is part of a comprehensive RDO/C agricultural strategy which encompasses, marketing, extension, input distribution and policy dialogue to address the principal constraints and to foster the agricultural development in the Region.

The goal of the Project is to improve the economic and social well-being of small and medium size commercial farm households in CARICOM countries through an increase in the production of agricultural commodities and the generation of agricultural employment.

The purpose of the Project is to develop an effective and sustainable Farming Systems Research and Development Program in CARDI that is responsive to the agricultural needs of Eastern Caribbean countries.

The Project will have outputs in three comprehensive and mutually reinforcing areas:

1) Technology Generation: CARDI will produce economically viable farm level technological improvements in selected crops, livestock and crop/livestock combinations. CARDI will generate, farm-test and farm-validate these improvements.

2) Technology Transfer: CARDI will develop methods to systematically transfer these improvements to extension agents, private enterprises and farmers participating in applicability testing.

3) Institution Building: CARDI will further develop and strengthen its decentralized Farming Systems Research Programs, along with strengthening the administrative systems at its headquarters required to support and sustain the FSR/D and other technical programs.

The Project will be headquartered in St. Lucia, with an additional sub-regional office located in Antigua.

Based on the analysis done under the Small Farm Multiple Cropping Systems Project (538-0015), this Project will focus on the design, testing and validation of potential technological improvements. It is expected that CARDI will develop at least forty-two economically viable farm tested improvements by the end of the Project. In addition, CARDI, working with public and private sector extension organizations, and with the Caribbean Agricultural Extension Project will develop systematic approaches to transfer technological improvements. As a result of these linkages, by the end of the Project, extension organizations are expected to conduct mass technology transfer campaigns for the CARDI technological improvements.

Finally, based on detailed analyses of the institutional constraints in CARDI the Project will: 1) assist CARDI to analyze and implement essential organizational management systems crucial to the support of its FSR and other agricultural research programs; 2) assist CARDI to establish Project related administration and management systems; 3) assist CARDI to establish a Research Advisory Board to guide its long-term research activities and instill a higher degree of professionalism among CARDI staff.

To assist CARDI to implement the FSR/D activities, the Project provides for a major technical assistance contract with a U.S. institution under the Title XII program. In addition to selected short-term assistance in organization and management.

CARDI research programs will be developed and evaluated yearly and will be based on yearly planning sessions involving CARDI staff, national ministry staff, and members of the agricultural, banking and marketing sectors. Crucial to effective implementation will be country teams, comprised of CARDI and host country personnel, who will have primary responsibility for carrying out country research activities. The Project provides for adequate technical, administrative and operational support to effectively backstop country teams.

B. Summary Financial Plan

The total cost of the Project is \$12,100,000. AID will provide \$7,000,000 in grant funds. In addition to all foreign exchange costs, AID will fund certain local currency costs. AID will fund certain personnel and operational costs on a decreasing scale over the five year life of the Project. CARDI will contribute \$4,220,000 to the Project and will assume all personnel costs and administrative expenses by the end of the Project. Host governments will contribute \$880,000 to Project activities.

Summary Financial Plan
(US\$000)

	<u>AID</u>	<u>CARDI</u>	<u>HOST COUNTRY</u>	<u>TOTAL</u>
I. Personnel Costs	1,890	3,240	770	5,900
II. Equipment Supplies	1,110	-	-	1,110
III. Operating Expenses	950	880	110	1,940
IV. Regional Travel	400	100	-	500
V. Technical Assistance	1,960	-	-	1,960
VI. Training	390	-	-	390
VII. Evaluation	300	-	-	300
TOTAL	7,000	4,220	880	12,100
	*****	*****	*****	*****

II. PROJECT BACKGROUND AND RATIONALE

A. Agriculture In The Eastern Caribbean

Agriculture is a major economic activity in all the countries of the Eastern Caribbean as demonstrated by the number of people employed, its contribution to GDP, and value of export earnings. This is particularly true for the LDC's^{1/}. With the exception of Antigua, the agricultural sector in the LDC's accounts for employment of at least 20% of the labor force, more than 20% of the GDP, and is responsible for more than 50% of foreign exchange earnings from exports.

Notwithstanding the social and economic importance of the agricultural sector in the Region, each country is concerned about the performance of the agricultural sector in the recent past. This concern is directed in the first place to the dominance of two export crops, i.e. bananas in the Windward Islands and sugar in St. Kitts, that have encountered worsening terms of trade. In addition, the production and productivity of food crops, secondary export crops and livestock have shown relatively little growth in relation to incomes and increased demand. As a result, most LDC's have experienced substantial increases in trade deficits. While most of the LDC's continue to have positive net agricultural trade balances, the margin of this surplus is diminishing rapidly.

The production, marketing and distribution of agricultural commodities in the Region are performed primarily by independent farmers and private merchants. Only in the case of bananas and sugar do large parastatal organizations play major roles. For most commodities, especially food crops, the agricultural sector is characterized by thousands of small and medium farmers, market traders, and merchants. The role of public sector services has largely been focused on provision of support services in research, extension, and training. Public sector development banks have achieved modest success in providing agricultural credit; and public sector marketing boards for non-traditional export crops have been universally ineffective in stimulating production or in achieving more orderly marketing arrangements.

^{1/} LDC's consist of: Antigua, St. Kitts/Nevis, Montserrat, Dominica, St. Lucia, St. Vincent and the Grenadines, and Grenada.

The problems underlying the apparent stagnation in the agricultural sector of the Region are both multi-faceted and inter-related. Problems include production technology, marketing, roads and other infrastructure, input availability, public policies (including land tenure), and social attitudes toward agricultural work.

The key fact that warrants fostering production technologies in the Region is that traditional agriculture is characterized by low levels of production per acre, reflecting poor use of existing agricultural technology. Varieties of many crops that are grown are not well adapted to local soil and climatic conditions. Except for bananas and sugar cane, modern agricultural inputs, such as fertilizer, are seldom used and when used are often inefficiently applied. Increased production and productivity per unit of land are absolutely essential if agriculture is to make a significant contribution to the countries' economic development and also essential if investments in rural infrastructure and institutions are to become self-sustaining. At the same time, labor productivity must be increased while opportunities for productive employment are expanded.

B. Country Development Strategy

The LDC island states of the Region are looking toward agriculture to provide a major contribution to economic development. With no significant mineral deposits, few forest reserves, and relatively unskilled labor forces, the LDC's must depend on agricultural activity to exploit the modest land base. Thus, agriculture together with tourism and light manufacturing have become the three key sectors for attention by most Eastern Caribbean countries.

The states of the Region are committed to maintaining small and medium-scale farmers as the central factor of the agricultural sector. The generation of farming technology to increase agricultural production per unit of land and per unit of time is seen as a high priority need. However, the research effort required to generate or to adapt improved technology for the states of the Region presents a dilemma to decisionmakers. On the one hand, the need for agricultural research efforts that focus on national priorities is widely recognized; while on the other hand, individual island states simply cannot afford the cost required to maintain the highly trained professional staff necessary to establish creditable research programs. The best available solution to this dilemma is to cooperate with other islands to support a regional agricultural

research capacity. This option was elected in 1975 with the establishment of the Caribbean Agricultural Research and Development Institution (CARDI).

CARDI is a regional agricultural research center with an established agricultural research and development capacity to service the LDC's. CARDI operates under three mandates established by the Standing Committee of Ministers of Agriculture in Belize in June 1976. These are:

i) to improve the productivity of the agricultural sector and to minimize the dependence of the Region on foreign food imports;

ii) to seek additional sources of funding from external donor agencies;

iii) to decentralize its operations.

Since its inception, due to a large part to AID support under the Small Farm Multiple Cropping Systems Research Project (SFMCP), CARDI has:

i) conducted research geared at increasing productivity;

ii) broadened its funding base;

iii) decentralized its operations;

iv) attracted new, highly qualified staff.

A detailed analysis of the role of CARDI and its activities is contained in Annex H (pp. 120-128).

C. The Small Farm Multiple Cropping Systems Research Project (SFMCP)

In 1978 AID provided CARDI with \$2.2 million in grant assistance to initiate the SFMCP in order to develop a cooperative CARDI/Country on-farm research capability on eight states in the Eastern Caribbean. The purpose of the Project was to develop recommendations for improved farming systems through adaptive, farm-based research which farmers can and will use, extension agents can explain and credit institutions will finance.

The central feature of the Project was its emphasis on on-farm based research, which was part of a broad program of

agricultural research and policy analysis designed to improve the production and economies of small farmers. This approach differed radically from that utilized by CARDI previously.

An indepth evaluation conducted in April, 1982 brought to focus many weaknesses inherent in both the design and implementation of the Project. Conceptually, the Project was over-ambitious in expecting CARDI to develop a functioning on-farm research program in a number of states in a four-year period. This process normally requires a much greater period of time to achieve. Many false starts were encountered in implementation as CARDI attempted to transform itself from a traditional research organization to one capable of performing on-farm adaptive research. CARDI, prompted by political concerns attempted to move too swiftly in establishing its programs. In addition, during this period crucial management and financial control systems were not adequately developed or were critically over-extended due to the large amount of external funding received by CARDI. These fundamental weaknesses have been described in detail in the Project evaluation and the comprehensive management audit that has recently been completed. An executive summary of the audit is contained in Annex H (pp 145-149).

RDO/C is fully aware of the weaknesses of CARDI as an institution and has incorporated a major institutional strengthening activity into the Project design. RDO/C is also cognizant of the positive results that CARDI has accomplished and is capable of accomplishing with adequate well focused support. Building on these results and realizing the strengths and weaknesses of CARDI, RDO/C believes that additional AID support will bring measurable impact on agricultural production to the Region.

The central feature that gives the Project a very high probability of success is that CARDI is fully committed to continued on-farm adaptive research in its on-going work. One of the lessons learned from the SFMCP is that CARDI has the capability to do "hands-on" farming systems research. CARDI is therefore, far advanced, compared with many other third-world regional agricultural research institutions at similar stages in their development. The operational key to future CARDI assistance is to focus assistance in areas which it can manage well, and thus deliver productive accomplishments.

D. Relationship to Agency and Mission Strategy

The CARDI Farming Systems Research and Development Project is based on the conviction that improved on-farm adaptive research

is a key factor in improving agricultural production and productivity in the Region. The key elements of the Project are: 1) assistance to CARDI to develop economically viable technological improvements; 2) develop approaches and linkages to effectively transmit these technologies; 3) to strengthen its institutional capacity to develop and sustain this effort in the long-term. The proposed Project is consistent with Agency and Mission strategies regarding agricultural development.

1. Relation to Agency Strategy

The objectives of U.S. food and agricultural development assistance, as stated in the Food and Agricultural Development Policy Paper, are to enable countries to become self-reliant in food, to assure food security to their populations and to contribute to a broadly-based economic growth.

Emphasis is given to four major, inter-related elements to accomplish these development objectives:

1. improve country policies to remove constraints to food and agricultural production, marketing and consumption;
2. develop human resources and institutional capabilities, especially to generate, adapt and apply improved science and technology for food and agricultural development, and to conduct research on developing country food and agricultural problems;
3. expand the role of developing country private sectors in agricultural and rural development and the complementary role of the U.S. private sector in assisting this expansion;
4. provide food aid in an integrated manner with other assistance instruments so as to contribute to food security and nutritional needs.

The CARDI FSR/D Project will foster technology development and transfer through institutional strengthening and human resource development. It is expected that the Project will also contribute towards improved country agricultural policies. In fact, in some LDC's such as St. Kitts/Nevis, for example. CARDI is already playing a critical role in agricultural sector

planning. As CARDI matures and develops its information base, policy makers will look increasingly to CARDI for advice on constraints to food and agricultural production, marketing and consumption.

CARDI recognizes the importance of the private sector in the development of the Region. CARDI as it matures as an institution will broaden its outreach to address more thoroughly the needs of the agri-business sector. CARDI will work closely with the private sector through annual planning mechanisms, in addition to, keeping the agri-business community informed of the results of research being conducted.

2. Relation To Mission Strategy

RDO/C strategy in the agricultural sector in the Eastern Caribbean is to increase the per capita output of food and other marketable commodities and to expand employment opportunities for rural farm families thereby increasing farm family income. The focus of this strategy as outlined in the FY-83 CDSS is to: a) increase the productive efficiency of traditional export commodities; and b) promote commercial agricultural diversification to achieve greater food production for regional requirements.

The regional approach for this Project is proposed because it is the most cost effective method to conduct applied research on agricultural problems that are common among states in the Eastern Caribbean. By jointly supporting a regional agricultural research institution, individual islands have access to specialized research skills, (e.g. nematologist, plant pathologist, animal nutritionist, etc.) that would frequently be under-utilized in any one country, and would be simply unaffordable by most countries on a full-time basis. The regional approach to accomplish agricultural research is also the most cost effective method to transfer knowledge from international research centers to local application, and it facilitates technology transfer among regional states.

The RDO/C agricultural strategy also includes a strong emphasis on fostering appropriate linkages among regional institutions, as well as linkages between regional institutions and established centers of excellence outside the Region. RDO/C's utilization of a Title XII university to support the ongoing Caribbean Agricultural Extension Project, and the current contract with MUCIA for Technical Support to Mission (TSM) activity are examples of this strategy emphasis. RDO/C proposes to increase the use of these linkages in this Project. Institutions in the United

States and Puerto Rico appear to have unusually appropriate knowledge and skills to assist in the implementation of the Project.

The RDO/C support for technology generation is one of six strategy elements specified in the FY 83 CDSS. It is recognized that work in the other strategy elements of marketing, credit, input supply, infrastructure development, policy modification, etc., must be addressed, and AID, as well as, other donors are actively making parallel strides to overcome constraints in each of these areas. RDO/C is confident that research led technology improvements in production are essential to achieving regional agriculture objectives, and that activities in other program elements will enhance the benefits of research efforts.

In summary, the Project proposed is totally consistent with RDO/C's overall agricultural assistance strategy. Identifying and adapting improved production technology for farmers in the Region is of fundamental importance to stimulating agricultural sector growth, and therefore contributes directly to AID's assistance objectives and complements all other AID funded Project activities in the agricultural sector.

The RDO/C agricultural strategy includes both regional and bilateral Projects. Regional institutions are used to implement Projects when problems to be addressed are common to the English-speaking Caribbean states, when cost-effectiveness of Project resources can be demonstrated, and when sufficient institutional capacity exists.

AID assistance to other regional institutions include:

1) Caribbean Development Bank

AID has contributed over \$14.1 million in loan and grant funds to CDB programs in agricultural credit, feeder roads, input supplies and agribusiness development.

Through the Integrated Agricultural Development loan and the companion Food Crop Production grant, AID has contributed over \$7.4 million. These include: 1) agricultural production credit programs through Development Finance Corporations (DFC's) in Antigua, Belize, Dominica and Grenada; 2) feeder road construction in Antigua, Belize, St. Lucia and St. Vincent; 3) input supply programs for Dominica and St. Vincent; 4) pilot Projects and training programs in various LDC's.

Through the Regional Agribusiness Development Project over \$6.6 million in loan and grant funds have been provided for 1) agricultural on-lending programs through DFC's in Barbados, Grenada, St. Vincent, Antigua and St. Lucia; 2) agribusiness development activities including; a) funding private sector development of exotic plants for export in St. Lucia; b) fisheries development in the British Virgin Islands; c) sheep production in Carriacou; d) the development of sea island cotton industry in Montserrat; e) and sugar development in St. Vincent; f) Input supplies for citrus production in Dominica; 3) grant funds have financed pilot programs in various LDC's.

2) University of the West Indies

AID has contributed over \$6.9 million in support of UWI Faculty of Agronomy programs in extension in the LDC's, under the Caribbean Agricultural Extension Project (CAEP). The current phase of the program which is being implemented by the Midwest University Consortium for International Activities (MUCIA) will strengthen the capacity of LDC's to deliver extension services and increase the capacity of UWI to effectively backstop national extension efforts. Under the Integrated Regional Development Loan AID funds were utilized to construct the UWI/CARDI administrative building at St. Augustine in Trinidad.

3) Caribbean Agricultural Trading Company (CATCO)

Under this Project AID has funded \$4,225,000 in loan and grant funds to establish CATCO. The primary purpose of the program is to: 1) remove key marketing constraints to agricultural development; 2) promote and develop new marketable products produced by farmers in the LDC's and 3) sustain financially viable operations.

Bilateral assistance for agricultural development is designed to complement regionally supported Projects, while enabling AID assistance to be focussed on immediate high priority needs of individual countries. In addition, bilateral assistance is purposefully designed to increase the individual country's capacity to more effectively utilize available resources and services available from regional institutions. Existing bilateral programs in agriculture include:

1) The Dominica Banana Company: This \$1,750,000 grant to the Government of Dominica will support the restructuring of the banana industry to create a financially viable industry in Dominica with maximum private sector involvement. In addition, the Project will fund spray oil, fungicides and other commodities necessary for a Leaf Spot Control Program.

2) St. Lucia Agricultural Structural Adjustment: The \$8,000,000 grant Project is designed to assist the Government of St. Lucia to 1) increase banana yields; 2) produce and market a new and expanded array of commodities through the private sector; 3) assist in improving policies and procedures for addressing major land tenure problems in St. Lucia.

In addition to the above initiatives, RDO/C plans further bi-lateral programs in agriculture with St. Vincent, Antigua and St. Kitts/Nevis.

E. Relationship to Other AID Projects

The proposed Project has a direct and important relationship with the \$5.4 million Caribbean Agricultural Extension Project (CAEP) with Midwest Universities Consortium for International Activities (MUCIA) and the University of the West Indies (UWI). Indeed, both Projects complement each other, and the success of one, will to a large extent, be dependent on the success of the other. CARDI is an important member of the Technical Joint Action Committee which is established under CAEP to provide the vital research/extension linkages which will be necessary to increase agricultural production in the long-run. In addition, CAEP will play a vital role in developing along with CARDI, systematic approaches to transferring technological improvements throughout the Region.

The Project also has an important relationship with other regional and bilateral AID initiatives in the Eastern Caribbean in marketing, infrastructure, and credit.

Finally, the basic Project approach of technology generation and transference along with strengthening the institutional capability of CARDI will foster constructive linkages to expertise available in leading U.S. and international organizations.

F. Relationship with Other Donor Activity

The CARDI FSR/D Project has an important relationship with other CARDI activities funded by the European Economic Community's Economic Development Fund (EDF) and from Barclays Bank International.

The U.S.\$4.2 million EDF Project began in October. The Project's principal activities include: 1) Forage seed production and establishment of improved pastures. This is a continuation of a nine year Project previously funded by EDF. The Project will assist in establishing 280 hectares of improved pastures per year over the 3 years. Forage seed production activities will be continued in Antigua and Trinidad/Tobago with technical assistance funded for two seed production agronomists. 2) Improved soil and water conservation and management. The identification of areas with potential for improved water and soil management and the identification of appropriate conservation, including management techniques, will be carried out. 3) Increased production of aroids (Tannia, Dasheen, Eldoe and Arrowroot). Aroids are an important part of the cropping systems in the Eastern Caribbean constituting approximately 15% of the carbohydrate intake. Technical assistance will include a plant pathologist and an agronomist.

All three sub-Projects compliment the CARDI FSR methodology. For example, farmers growing the CARDI developed lisbon virus free yam in an improved cropping system interplanted with compatible crops under better soil managed conditions will benefit from the combined thrust of the FSR and EDF Projects. Improved forage seed distribution has begun in several of the Eastern Caribbean islands which augments the crop/livestock systems as a farming systems component. The cut and carry technique where the leguminous shrub Leucaena, has been planted in protein banks and the forage cut for livestock feed has been sufficiently researched by CARDI for farmer application. Such a system blends in with FSR and provides a high protein supplemental food for livestock with no appreciable capital outlay.

The Barclays Project is a follow-on to a three year effort in integrated pest management. The Project began in 1981 and will continue through 1984. Total Project funding amounts to US\$500 thousand. Contributors to the Project include: Barclays Bank International, CARDI, Barbados Sugar Producers' Association and various institutions in St. Vincent and St. Kitts. The Project is directed to improve the Region's capability to reduce crop losses caused by pests. The results of this work will have important implications for the farming system work. Pest management is an integral part of the farming system. Pest control measures can greatly effect the economics of production.

G. The Project Design Process

The CARDI FSR/D Project has been the result of a collaborative effort between CARDI and AID. The Project is essentially a CARDI Project. This Project Paper is essentially a CARDI document. CARDI has been intimately involved with the design process since its inception, with CARDI staff from all levels of the organization involved in the design process. Principal staff include:

<u>Name</u>	<u>Position</u>	<u>Location</u>
John Hamnerton	Weed Scientist	St. Lucia
Richard Carew	Economist	Trinidad
Vasanthra Narendran	Anthropologist	St. Lucia
Laxman Singh	Systems Agronomist	Antigua
Lennox Daisley	Country Team Leader	Antigua
Ronnie Pilgrim	Country Team Leader	St. Lucia
Royer Francis	Data Monitor	St. Lucia
Calixte George	Project Leader	St. Lucia

Principal assistance in the design of the Project has come from the USDA's Development Project Management Center (DPMC) and from the centrally funded Farming System Support Project (FSSP) administered by the University of Florida. The following is a chronological list of major actions during the design phase of the Project.

1. CARDI, AID and USDA/DPMC collaboratively developed the Project Identification Document which was approved in Washington during January 1983.
2. The FSSP team leader met with CARDI staff and developed a tentative design plan which was presented to RDO/C (March 21 - 24).
3. The FSSP team leader briefed other FSSP staff and a USDA/DPMC representative at the University of Florida (March 25).
4. Members of the FSSP team visited CARDI field research in Antigua (Leeward Island) and St. Lucia (Windward Island) in order to become more familiar with the types of farming systems with which CARDI scientists are working (April 4-7).

5. A workshop was organized in St. Lucia with nine CARDI scientists and three FSSP scientists. CARDI participants included field technicians, country team leaders, unit leaders (Windward and Leeward), discipline-oriented specialists (i.e. economics, anthropology, etc.). The objective of the workshop was to develop the technical aspects of the Project, including the general methodology, areas of research emphasis, and research plans to develop technical improvements on the islands participating in the Project. The workshop brought together staff from the Ministry of Agriculture in St. Lucia, WINBAN, Geest Industries and the Caribbean Agricultural Extension Project.
6. Representatives of the FSSP group and CARDI briefed RDO/C on the progress made in the St. Lucia workshop (April 18).
7. Representatives of the FSSP group and CARDI Project staff visited CARDI headquarters and developed guidelines for the organization and management of the Project (April 25-28).
8. Representatives of the FSSP group and CARDI briefed RDO/C on organization and management issues and delivered a draft proposal for a CARDI/USAID Eastern Caribbean FSR/D Project (April 28).
9. The proposal delivered by CARDI and the FSSP group was reviewed by RDO/C and issues were identified that needed to be addressed in the Project Paper.
10. Representatives of FSSP, RDO/C, CARDI, AID/W and USDA/DPMC drafted Project Paper (May 9-20).

III. DETAILED PROJECT DESCRIPTION

A. Major Constraints To Be Addressed

1. Introduction

CARICOM member states annually import approximately US\$800 million in food and feed grains and this value has been increasing rapidly. Given the limited financial resources of most of the island states this constitutes a substantial and continuing drain on crucial foreign exchange. A significant portion of imported food could be replaced from within the Region if productivity is improved so that regional supplies are price competitive with extra-regional sources. If the Region is to arrest the existing trend of rising food importation and provide for its needs, small and medium farmers will need to increase their production. To do this improvements are needed in farm production technology.

2. Agronomical and Organizational Constraints

Yields of most farm crops in the Eastern Caribbean are low compared to known crop potentials and compared to yields in other tropical areas. The lack of disease, insect and weed control, unimproved planting materials, seasonal water shortages, and poor agronomic procedures result in low yields and low productivity. Animal production and productivity is low due to use of marginal lands, poor nutrition, inadequate husbandry practices, widespread parasitism and use of unimproved animals.

Although farmers are influenced by constraints outside their immediate control such as poor transportation, lack of effective extension services and lack of adequate market services, certain technologies, in and by themselves, can be brought to bear on the farm unit to improve productivity. The drudgery and lack of incentives associated with farming as a livelihood has made agriculture less attractive to younger people. However, agriculture and agri-based industries do hold potential for generating significant additional employment. The development of more labor efficient tools could increase farm productivity, as well as, serve to attract younger farmers by eliminating much of the drudgery associated with agriculture.

3. CARDI Institutional Constraints

CARDI has been successful in establishing itself as the predominate agricultural research center in the English-speaking Caribbean and has established in-country research and development capacity in the small island states of the Eastern Caribbean. However, a series of institutional constraints remain to be resolved if CARDI is to succeed in becoming a cost effective instrument of agricultural technology development. A number of these constraints were identified during the in-depth evaluation of the CARDI Small Farm Multiple Cropping Systems Research Project (SFMCP). These constraints along with recommendations were further examined in the detailed CARDI Management Audit. While the SFMCP was successful in moving CARDI from its centralized research approach, (based almost exclusively on station conducted trials), to a decentralized research approach conducted mainly on small farmers' fields, the new approach severely taxed CARDI's institutional capability.

These institutional constraints revolve around CARDI's management, financial and administrative support systems for on-farm research efforts. For example, current financial controls are very weak and financial information required for management decision-making has not been available on a timely basis. Short and medium-term planning in terms of allocation of staff, physical and financial resources were also weak. The issue of management and communication among CARDI staff in the widely disbursed territories also has been a problem. Inefficiencies in this area have hampered decision-making and resulted in unnecessarily high cost operations.

Outside the management area, CARDI has specific additional technical staff requirements which need to be addressed to complement its existing capability.

B. CARDI: Farming Systems Research And Development Project (FSR/D)

The CARDI FSR/D Project is designed to address the most significant agronomic, organizational and institutional constraints to increasing agricultural productivity and production in the island states of the Eastern Caribbean. The Project is part of an overall CARDI FSR/D Program which will eventually be implemented in all CARDI member countries. Project activities will take place in the following LDC's over a five year period: St. Kitts/Nevis, Antigua, Montserrat, Dominica, St. Lucia and St. Vincent and the Grenadines. In addition, Barbados will participate directly in the development and production of animal livestock feed programs under the Project.

The Project has a limited geographic focus for two principal reasons: 1) Under SFMCP, CARDI has gained considerable knowledge and institutional support in conducting its on-farm research programs in the LDC's. It seems only logical to continue CARDI's Farming Systems Research Program in many of these same LDC's. 2) RDO/C does not believe that CARDI has the institutional capacity to significantly enlarge its FSR/D program at this time. Considerable time and resources will have to be committed to strengthen CARDI as an institution. The desire to proceed too swiftly with programs in too vast a geographic area could prove disastrous given CARDI's current institutional make-up. It is expected, however, that as the institutional strengthening component proceeds; CARDI will, with the assistance of other donors, expand its FSR/D program to other states. In addition, it is expected that the research results and methodology identified will have significant implications for FSR program in other CARDI member states.

The need for a focused approach to implementation reiterates the intent of the recommendations of the Special Meeting of the Standing Committee of Ministers Responsible for Agriculture held in Barbados during the week of May 9-13, 1983. At the meeting, the Ministers confirmed their support for the CARDI mandate, and noting the weaknesses of CARDI, directed that the recommendation of the Management Audit be implemented. Both CARDI and RDO/C view this Project as instrumental in achieving many of the directives of the Standing Committee.

C. Project Objectives

1. Goal and Purpose

The goal of the CARDI FSR/D Project is to improve the economic and social well-being of small and medium commercial farm households in CARICOM countries through an increase in the production of agricultural commodities and the generation of agricultural employment.

The Project's purpose is to develop an effective and sustainable Farming Systems Research and Development Program (FSR/D) in CARDI that is responsive to the agricultural needs of participating Eastern Caribbean countries. The purpose has both a productivity focus and an institutional focus. To achieve the productivity objectives, CARDI will concentrate its efforts on selected systems of major importance or potential on each of the participating islands, thereby avoiding dissipation of effort across

too wide a spectrum of activity. 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 oriented research program.

2. End of Project Status

The Project's purposes will be achieved when the following conditions are present:

- a) Up to 15 percent of the participating country farming households in the appropriate recommendation domains will have adopted FSR/D generated technological improvements.
- b) The Ministry of Agriculture Extension Departments are supporting FSR/D effort by continuing to provide staff and by conducting mass technology transfer campaigns for proven technological improvements.
- c) Farm level information generated is being used by and is having a substantial influence on the policy making and Project planning/implementation of participating country public officials, donor organizations and private enterprises.
- d) CARDI's regional and international image in adaptive research will improve as evidenced by country requests for FSR/D research and international invitations to describe the FSR/D methodology and experience.
- e) CARDI, by decision of its Board of Directors will be core funding the FSR/D program staff at headquarters, sub-regional and country levels.

3. Outputs

Project: Three inter-related outputs will result from the technology generation, technology transfer, and institutional strengthening.

- a) CARDI will refine its FSR/D methodology and develop a minimum of 42 economically viable farm tested and validated technological improvements in crops, livestock and crop/livestock combinations.

b) CARDI will establish a systematic approach to technology transfer, whereby, in cooperation with extension services, technological improvements can be rapidly transferred to farmers.

c) CARDI's organization and management systems will be strengthened to a point where it can effectively implement the FSR/D Project and support the continuation of a productive Farming System Research and Development Program, as well as, its other technical programs.

D. Detailed Project Description

1. CARDI Farming Systems Research Methodology

Improved technologies that can be transferred readily to small and medium farmers has proven time consuming and ineffective by traditional agricultural research and transfer methods. Known improved agricultural technologies that can take into consideration the improvements a small farmer is willing to accept and to incorporate into his environment can improve food production and productivity.

Food production can be improved by two methods (a) increasing production per unit of cultivated land and, or by (b) increasing the amount of land devoted to agricultural production. Since arable agricultural land is limited in the Eastern Caribbean, increased production can only occur by improving productivity per unit of land over the long-term.

Farming Systems Research (FSR) is a methodology which views the farm or production unit in a comprehensive manner and takes into consideration the rural household constraints to production. The FSR involves the farmer, research personnel and extension services in an inter-related, mutually reinforcing approach to identifying small farm production constraints and serves to communicate collectively small farmer needs and goals.

Traditional research methods still figure importantly in the FSR methodology since a backlog of research information is needed to be fed into the on-farm FSR system. By involving extension services in the FSR system, learning and communication of improved results by extension agents, can significantly decrease the time span for information transfers to a wider group of farmers.

FSR activities can, likewise, be tied into other commodity research programs by reinforcing linkages with other agricultural disciplines. CARDI, for example, has developed new cropping patterns in St. Kitts which can be incorporated into sugar cane production by growing various crops interplanted with cane prior to their being shaded-over. Such a change in agriculture cropping systems is a major change in agricultural policy and promises to utilize sugar cane land more efficiently than solely for a mono-culture system.

In FSR, consideration is given to exogenous constraints, such as, the availability of credit, transportation, supplemental water availability, information systems and markets; prior to on-farm tests, in order to, improve the understanding of the small farmer.

Endogenous constraints that confront farmers such as a lack of better cultivars, knowledge of plant spacing, fertilizer timing and placement and interplanting of more adaptive companion plant combinations can be addressed by FSR to improve production. FSR is, therefore, a unique and significant process in methodology involving farmers, multi-disciplinary teams of researchers and extension personnel. Improvements in the bio-technical farming systems in which large groups of farmers can accept and apply in the shortest period of time possible is FSR's goal.

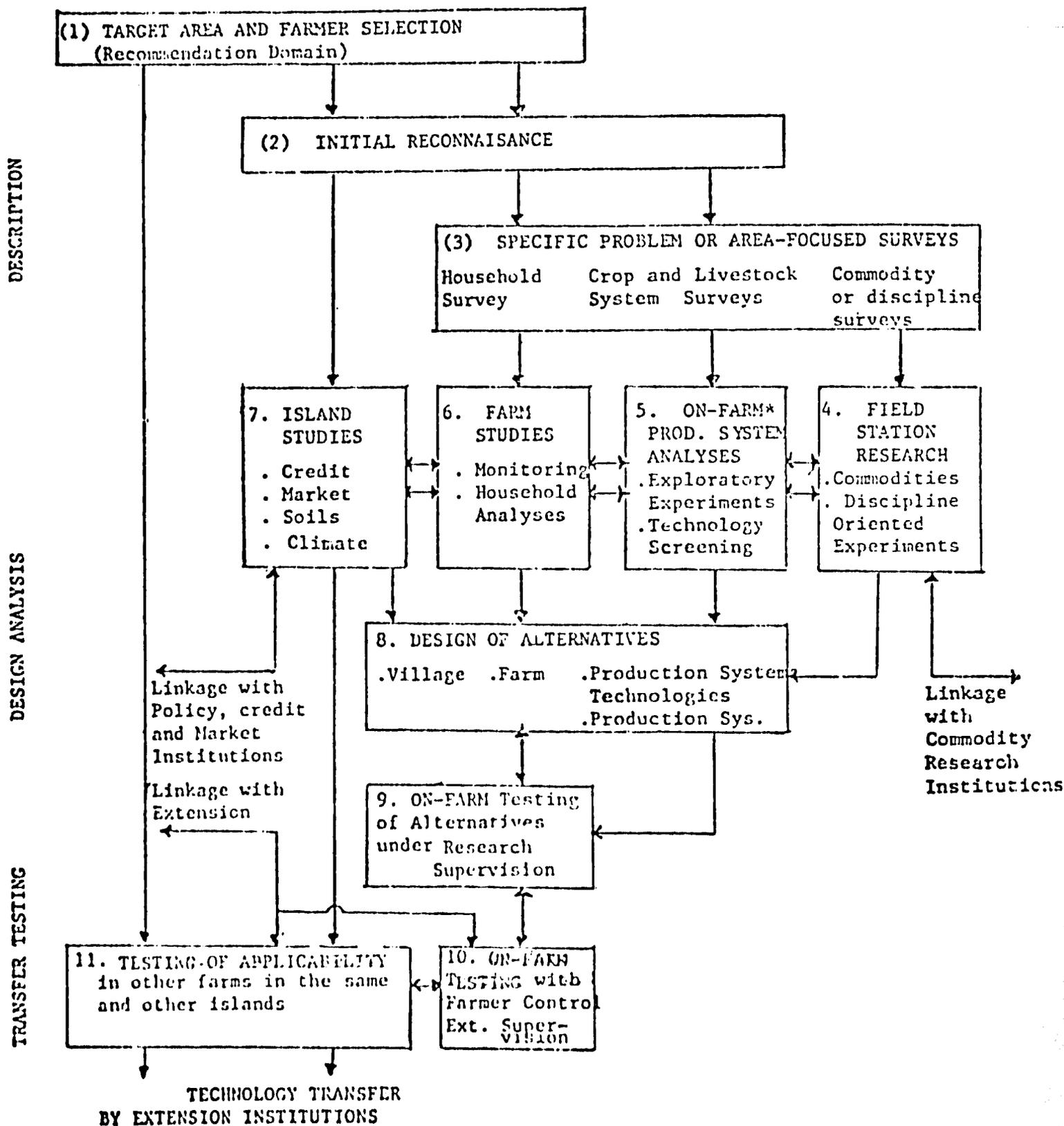
The FSR approach moves through four general stages of research involving eleven basic steps: (1) the descriptive stage includes: area and target farmer selection, initial reconnaissance, specific problem focused surveys, field station research, on-farm production system analysis, farm studies and island studies; (2) the design stage includes the design of alternatives; (3) the testing stage includes: on-farm testing of alternatives and on-farm validation; the transfer stage includes: applicability testing. The basic CARDI FSR methodology is more thoroughly discussed in Technical Annex E (pp 27-36). The stages and steps described are summarized in Table 1.

2. Technology Generation and Transfer

a. Technology Generation

Selection criteria and agricultural systems that CARDI will work on during the life of Project are exhaustively detailed in Technical Annex E. (pp 41-59) The following outlines the research priorities which have been identified and the results anticipated by the Project on an individual island basis:

Eastern Caribbean Island System Farm System Production System Production System Components



a) Antigua: CARDI will focus efforts in Antigua on vegetable based and cereal and grain legume production systems. In both cases the economic rationale is to reduce importation. In the case of vegetables, the work will include dry land farming techniques, simple trickle irrigation, testing of high yielding cultivars of tomato, squash, sweet pepper and eggplant and integrated pest and disease management. In cereals and legumes, work will include intercropping and relay cropping of cereal/legume combinations (especially corn and peanut) and the use of short duration, photo insensitive varieties in order to achieve year round production. The work is expected to result in at least seven technological improvements.

b) St. Kitts/Nevis: In St. Kitts, CARDI will concentrate on sugarcane production system intercropping. The economic rationale is to increase the productivity of sugarcane land and reduce imports of grain legumes. The work will include the production of grain legumes on fallow land and on intercropping of sugarcane and grain legumes (particularly peanuts).

On Nevis, CARDI will continue work on cotton/grain legume intercropping. The economic rationale is to increase the utilization of cotton land, and reduce imports of grain legumes. The work will involve the use of increased amounts of fertilizer and pesticides, as well as, intercropping cotton with legumes.

On both St. Kitts and Nevis, CARDI will work on mixed root crop/vegetable cropping systems. The objective is to reduce imports. The work will include testing alternative management techniques, integrated pest control and screening of improved cultivars. The work on these islands is expected to result in at least five technological improvements.

c) Montserrat: CARDI plans to work on vegetable based production systems. The objective will be to reduce imports by producing year round. The work will include an evaluation of the management system for year round production, cost-effective pest and weed control and the introduction of new cultivars of onion, garlic and irish potato.

CARDI will also focus on cotton with the same rationale and work plan as for Nevis. It is anticipated that cotton/legume research will be highly transferrable across the two islands because the agro-climatological and other conditions are very similar. In addition CARDI will carry out some evaluations of WINBAN recommendations on bananas because the Montserrat Ministry of Agriculture has extremely limited research capability.

Between the vegetable and cotton/grain legume work it is anticipated that at least five technological improvement will result by year five of the Project.

d) St. Lucia: CARDI research priorities for St. Lucia include yam/aroid/legume systems, vegetable/swine and/or poultry systems, and mixed tree crop systems. The economic rationale for the first two is import substitution and improved nutrition. In the case of mixed tree crops, the objective is export.

On the yam/aroid/legume system, CARDI plans to introduce virus free yam cultivars, improved strains of tannia, testing various species of legumes and different levels of fertilization. On the vegetable/poultry-swine system work will include the introduction of high yielding varieties of cabbage, tomatoes and carrot; improved livestock management practices; and the use of crop residues as feed supplements for swine. On the mixed tree crops, CARDI will focus on pest and disease control; management practices and determination of fertilizer needs.

Because of the work which has already been carried out in St. Lucia, it is expected that at least six technological improvement will result by year four. By the end of the Project, extension will be conducting a mass campaign to transfer the improvement in all applicable recommendation domains. Two additional technological improvements are anticipated in year five.

e) St. Vincent: In St. Vincent, CARDI will direct its efforts to peanut/sheep, carrots-vegetables/swine-goats, and banana/aroids/pigs systems. In the peanut/sheep system, CARDI will validate the use of gypsum, test feeding systems and improve the use of chemicals for pest control. In the carrots-vegetable/swine-goats system, CARDI will test crop rotation for control of nematodes, develop and test field equipment for land preparation and harvesting, introduce improved cultivars and improved pest and disease control. On the banana/aroid/swine system work will include identification and introduction of improved varieties of tannia, control of burning disease (tannia) and use of supplementary feeding from crop residues.

Like St. Lucia, previous work in St. Vincent should enable CARDI to develop at least five technological improvement by year four which the extension service will be disseminating on a mass scale. Two additional technological improvement should be developed by the end of the Project.

f) Dominica: The research priorities identified for Dominica include banana-aroids/swine and vegetable/poultry. In both systems, the objective is to reduce imports. In the banana-aroids/swine system, the testing program will be very similar to that described for St. Vincent. In the case of the vegetable/poultry system, CARDI will work on improved planting materials, control of diseases (particularly cabbage and tomato) and improved poultry strains and management practices. This work is expected to result in at least six technological improvements by the end of the Project.

g) Barbados: The coordination of the development and production of animal livestock feeds on several of the islands will be carried out from Barbados. The production of high carbohydrate energy extenders such as cassava and other root crops which can be substituted for imported feeds will be tested in poultry, swine, sheep and cattle.

Improved cassava cultivars will be interplanted with grain legumes such as cowpeas and pigeon peas which could give the farmer a cash crop as well as a higher nutritional diet. Prototypes of solar driers already tested in Belize will be tested by CARDI in Barbados, St. Vincent, Antigua and St. Lucia for drying root crops and such animal waste products as slaughter and fish wastes. Four technological improvements are expected by the end of the Project.

h) Other Research Activities: CARDI will also undertake some activities which are either not LDC specific or which will be undertaken in all six of the participating countries. This is generally work being conducted by the sub-regional support staff. The social scientists on the FSR/D team will be gathering and analyzing data on each island related to marketing, credit and input availability, as well as, benefit-cost analyses on each production system being testing. In addition, the social scientists plan to conduct farm family decision-making studies aimed at providing insights necessary in evaluation of appropriateness and transferrability of the technological improvements.

Other CARDI scientists will be working on various aspects of livestock research. These include a primary focus on alternative energy and protein supplies aimed at reducing production costs. Research on improved breeding may also be undertaken.

In any technology generation effort, availability of adequate supplies of appropriate inputs is essential to achieve acceptable adoption rates. CARDI has a capacity to produce some seed and plant material. This material is produced in CARDI laboratories and/or research stations. When the volume of material requirements is great enough, CARDI will encourage and assist CATCO and other private sector entities to contract for seed multiplication with individual farmers.

Some of the FSR/D work will be based on imported seed stock since certain vegetables cannot be multiplied under local conditions. In the case of these seeds and other imported inputs, CARDI will work closely with importers and distributors to assure the availability of ample supplies.

b. Technology Transfer

The FSR/D Project has particularly strong ties to the Caribbean Agricultural Extension Project (CAEP) with the University of the West Indies. Indeed, both Projects complement each other, and the success of one, will to an extent, be dependent on the success of the other. CARDI is an important member of the Technical Joint Action Committee which is established under CAEP to provide the vital research/extension linkages which will be necessary to increase agricultural production in the long run. In addition, CAEP will play a vital role in developing, along with CARDI, systematic approaches to transferring technological improvements throughout the Region.

The CARDI initiative cannot be successful without 1) the cooperation of the extension services and 2) extension services which are adequately organized, trained and equipped to effectively work with farmers. It is to this level that CAEP is working.

In order to be effective, extension must have a constant flow of farm generated technologies and flow of reliable information. The development of a strong research organization without an effective extension transfer capability will soon lack vitality and purpose. Research and extension are highly related functions which have the potential for augmenting mutual support for their respective organizations.

Farming systems research is a "hands-on" approach for technology generation. The research investigator, extension agent and farmer learn in this process by mutually doing and carrying out the on-farm experiments. The extension agents' involvement at an early stage of the generation process, insures familiarity, and confidence for extending the information results developed.

The extension agent, whose effectiveness will be determined by his appreciation and ability to judge farmer acceptance of alternate technology, is an important link in the chain of behavioral change for improvement of the farmers well being.

In the transfer phase, extension officers will be responsible for these on-farm trials and with CARDI they will participate in the evaluation. CARDI support for these officers will be the initial linkage. Support will consist of supplying recommended planting materials, where these are not available from commercial sources; detailed information on the techniques to be tested; and backstopping throughout the exercise should problems arise.

The transfer of technologies generated by CARDI will involve CARDI assistance to extension until these technologies can be tested on many farms under extension supervision. A sharp distinction cannot be drawn between the stage where CARDI takes a hands-off approach and extension takes over completely. A gray line exists in this technology transfer since CARDI field research personnel will have to interact in an extension mode with the farmer and extension assistance at the early stage of on-farm testing.

The demonstration techniques, along with a mix of other techniques such as group instruction and follow-up farmer visits, have proven effective methods for technology transfer in the LDC's. A farmer will accept a recommended practice by seeing the results and benefits of a practice in the field under his own environmental condition. A new practice can be compared with traditional methods of production and by having the farmer involved, these results can be shared with fellow farmers and neighbors.

A group of training programs are planned to coordinate the Caribbean Agricultural Extension (CAEP) and CARDI. CARDI will train extension agents and interact very closely with CAEP to facilitate the learning process. CARDI will also establish very close linkages with the Ministries of Agriculture, Research and Extension Divisions, where they exist. Joint cooperation and linkage in planning, implementation, training and evaluation of these on-farm exercises will be the central feature of the research/extension linkages between CARDI, CAEP and extension officials.

c. Research Activities

Research activity under the CARDI FSR/D Project will be continued based on the various steps of development which

occurred during the SFMCP. The island level, farm level and production sub-systems analysis for most islands have been carried out. Recommendation domains and grouping of homogeneous farmers with similar constraints and crops have been identified and the focus and thrust of this Project will be on the design, testing and validation of potential technological improvements.

A Technological Improvement File (TIF) will be initiated to keep pace and to organize the different steps of on-farm research. Within recommendation domains, e.g. those groups of homogenous farmers growing the same crops under the same agro-ecological systems; trials may be underway at different steps in the research process, perhaps on different crops or the same crop(s) depending on the improvement being carried out.

The TIF, at first, will include a description and analysis of a given farmer's agricultural system. As the research process proceeds, additional information is added, giving the results at each step which will justify the process to continue for that particular on-farm improvement.

Since there is a tremendous backlog of "shelf" technology which is known and appreciated by agricultural scientists, the FSR methodology may be initiated at whatever step the FSR team considers applicable. The on-farm trials utilizing a tested tomato variety, for example, can respond more productively if the known correct amounts of fertilizer, better placement in the soil of that fertilizer and the correct timing of the fertilizer application is carried out beginning with on-farm testing in the production system. The experience of the FSR team in making these time saving, practical decisions will tend to produce technological improvements which speeds up the entire process.

The decision to continue a particular research approach will depend necessarily on results gained at each step, and will depend on the FSR team's decision to continue.

The decisions which have to be made at each step in the FSR process will depend on data and field observations as to whether a process should be continued or discontinued.

CARDI will conduct annual planning workshops during which the work conducted is evaluated and specific research plans for the coming year are developed. Based on these plans and the actual work, the protocols will be developed for each of the

activities in the CARDI FSR/D framework. At the same time, the information gathered on the present farming system will be used to begin to create the TIF's. The formats will be designed and put into use in the first year of the Project.

Once the protocols from the first years work have been well documented, CARDI will hold a workshop for FSR/D staff to discuss and refine them, as well as, to disseminate the methods to all members of the staff. The TIF formats will also be discussed and revised at this workshop. This will be followed by the second annual planning sessions where detailed work plans for 1985 will be developed. During the second year, work will continue on the development of the activity protocols. It is expected that all of the protocols will have been developed and documented by the end of the second year.

The TIF for each production system will first be developed by hand and refined. Later, microcomputers will be introduced to ease the process of up-dating, communicating and storing the information. A more detailed description of the Technological Improvement Files is contained in Technical Annex E (pp 38-40).

i) Responsibilities

A long-term Farming System Specialist (FSS), to be provided under the Project, will assist CARDI in much of the work described. The FSS will be located in St. Lucia and will work closely with the CARDI project manager. The FSS and CARDI project manager will assist in conducting the planning workshops described. The 1984 work plans will be developed with the participation of relevant country officials and will be consistent with the research priorities which have been established for each of the participating islands. The FSS will be assigned to the Project full time, for approximately three and one half years.

Extension will be involved in the FSR/D process beginning in step one because of their knowledge of conditions. Their input into the generation of technological improvements becomes more important in the design of alternatives stage. CARDI will involve the agents at this stage largely as a sounding board regarding the alternatives being considered for a

particular farming system. The extension agents will participate in the on-farm testing primarily as observers. These tests are under the control of the researcher but interaction with the farmer and the extension agent are critical to the development of a viable technological improvement. It is at this stage when the extension agent becomes familiar with the technological improvement.

At the on-farm validation stage, the extension agent takes over supervision, the farmer is in complete control of the activity and the researcher is the observer. During this stage the extension personnel become intimately familiar with the technology. It is also at this stage where the critical decision is made regarding the appropriateness of the technological innovation. After this stage it is turned over to the extension service for wider on-farm applicability testing. If it is successful at this stage, the extension service will then develop a mass campaign to encourage widespread adoption.

Another critical responsibility of the extension officers will be the spread on a trial basis of the technological improvements from one recommendation domain to another. This may be on the same island or among islands. The extension officers will provide feedback to the CARDI research staff regarding their successes which will then enter into the design of alternatives.

ii) Expected Accomplishments

The output of the technology generation and transfer component of the Project is the generation of at least 42 technological improvements and the establishment of a systematic approach to technology transfer. One of the most important indicators of output will be the refinement and widespread use of the FSR/D methodology. CARDI will also train both in formal workshops and on-the-job at least 50 percent of the Ministry of Agriculture research personnel in each of the participating islands. CARDI will also conduct seminars and workshops for its own staff in which at least 75 percent are expected to have participated by the end of the Project. In addition to technical improvements, CARDI will also have a number of discrete production sub-systems which have reached particular stages in the FSR/D methodological framework. The key stages in the framework are technology screening, on-farm testing, on-farm validation, and on-farm applicability testing. Table 2 presents a breakdown of the number of sub-systems which are expected to have reached each of these key stages by the end of each year of the Project.

Still another indicator of Project output will be the documentation of a systematic approach for transferring technological improvements to large numbers of farmers. This will be further evidenced by at least five applicability tests per island during the final year of the Project. CARDI will train either in formal workshops or on-the-job at least 25 percent of all extension personnel in each of the participating islands in FSR methodology and concepts.

iii) Beneficiaries

This component of the Project will have two sets of beneficiaries CARDI and extension staff and the farmers of the Eastern Caribbean. CARDI and extension staff will carry-out the activities described; as they are doing this they will be learning how to do FSR/D. As the staff gains experience their performance will improve and CARDI success at generating and extension success at disseminating technological improvement will increase. In a very real sense, all of the staff involved in the FSR/D program will benefit professionally.

The ultimate beneficiaries of this Project will be commercially orientated small and medium sized farmers. This group constitutes the largest private sector group in the Eastern Caribbean. By the end of the Project over 3,000 farmers will have already participated in the technology generation process. CARDI has been limited in its outreach aimed specifically at the private sector due to a limited research base, and the absence, in many countries, of private sector institutions able to provide agricultural services and inputs to the farming sector.

The Project will attempt to expand the participation of the private sector in the development process in the following ways: 1) Members of private sector organizations, will be involved in research planning and evaluation activities which will form a critical element of the Project. Annually, CARDI will develop country research plans. CARDI will form Country Planning and Evaluation Committees, which will be made up of relevant public and private sector organizations. The result of these national sessions will be included in yearly CARDI country specific workplans. 2) Many of the activities involved in the Project have the potential for increased private sector involvement. For example, CARDI plans to involve farmers in seed multiplication when the scale of operation becomes economically viable for commercial enterprises. Likewise, the development of alternative livestock feed stocks has definite implications for commercial ventures.

TABLE 2

NUMBER OF TECHNOLOGY IMPROVEMENTS IN KEY STAGES OF THE FSR/D PROCESS

AT THE END OF EACH YEAR OF THE PROJECT

<u>YEAR</u>	<u>EXPLORATORY EXPERIMENTS (STEP 4)</u>	<u>ON-FARM TESTING (STEP 9)</u>	<u>ON-FARM VALIDATION (STEP 10)</u>	<u>APPLICABILITY TESTING (STEP 11)</u>	<u>MASS TECHNOLOGY TRANSFER EXTENSION</u>
(Numbers are cumulative as of year end)					
Phase I-1983 (Actual)	8	10	-	-	-
Phase II-1984	24	8	6	-	-
-1985	48	14	12	-	-
-1986	72	35	18	10	-
-1987	96	42	30	26	-
-1988	<u>120</u>	<u>70</u>	<u>56</u>	<u>50</u>	<u>42</u>
Number of) Farmers) affected) directly by) the Project) at the end of) year 5)	<u>240</u>	<u>480</u>	<u>720</u>	<u>1800</u>	

iv) Required Inputs

1. Staffing: Island research programs will be implemented by CARDI Country Teams. Each team will be under the direction of a Country Team Leader, who will be responsible for all CARDI FSR programs in the particular island. Each Country Team will consist of between three and four members. It is anticipated that many teams will have at least one Ministry of Agriculture staff assigned full time to the Team. Country Teams in Dominica, Montserrat, St. Lucia and Antigua will be supplemented by four Peace Corps Volunteers. The Project will fund the personnel and administrative costs of each country team, in addition to, necessary operational and research costs. AID will fund the total cost of country team operations (with the exception of MOA staff member salaries), during the first year of the Project. CARDI will assume a greater percentage of these costs during the life of the Project and will (with the exception of MOA staff member salaries) fund all personnel and administrative costs for country teams by the end of the Project.

CARDI currently has five technical specialists assigned to its FSR unit in St. Lucia and Antigua. These specialists give back-up support to country teams and serve on a "pool of FSR experts" to CARDI member countries. Current areas of expertise represented include systems agronomist, a crop protection specialist, a weed control specialist, an agricultural economist and economic anthropologist. Under the Project, CARDI will double its FSR technical support capability. It is anticipated that additional personnel in the following areas will be added to the CARDI FSR technical staff: a systems agronomist, a horticulturist, an animal science specialist, an agricultural economist and an agricultural engineer. All technical specialists will be stationed at the sub-regional offices located in St. Lucia and Antigua. AID will fund the total cost of technical specialists during the first year of the Project. Each subsequent year, CARDI will fund an increasing amount of specialists' costs. By the end of the Project CARDI will fund the total personnel cost of all technical specialists associated with the CARDI FSR program. CARDI is not expected to increase its technical specialist staff significantly until the second year of the Project, after management systems have been established and workplans finalized.

2. Equipment and Supplies: In addition to administrative costs, (rental of office space and utilities, office equipment and supplies and on-island travel costs) the Project will fund necessary operational and research costs associated with the FSR/D Project. A detailed equipment list is contained in Financial Annex G. (pp 97-101). A Summary of equipment and operational costs include:

a) Field and laboratory equipment for country research programs and for Barbados' CARDI unit participation in the livestock feeding program;

b) Plant materials, seeds and other research costs for island specific research program including Barbados;

c) Eight Project vehicles will be provided. It is anticipated that six of these vehicles will be pick-up trucks assigned to Country Teams in each of the six participating LDC's. A pick-up truck will also be assigned to the CARDI unit in Barbados to be used in conjunction with its livestock feeding program with the Ministry of Agriculture. In addition, a vehicle will be provided for the CARDI regional office in St. Lucia.

d) The development of a micro-computer system will be funded under the Project. The location of the system will be determined during the course of implementation, but it is currently envisioned the system will link CARDI offices in Trinidad, St. Lucia and Antigua.

3. Field Station Upgrading: CARDI's two field stations in St. Lucia and in Antigua will be upgraded. The field stations will also provide for the office space of the country teams in the two respective countries. AID will fund the cost of renovations to buildings and upgrading the facilities to make them compatible with FSR research needs. CARDI will fund the operational costs of the two stations.

4. Training and Technical Assistance: Considerable training and technical assistance will be required under the Project, a more detailed description of the resources and activities to be undertaken is included in the Training and Technical Assistance section.

3. CARDI: Institutional Strengthening

One of the major accomplishments of the Small Farm Multiple Cropping Systems Research Project was the initiation of a more decentralized and adaptive research focus within CARDI. This decentralization is consistent with CARDI's overall mandate and was strongly endorsed by the Standing Committee of Ministers at their meeting in May, 1983.

CARDI still lacks the financial base and the organization and management required to sustain a productive research system. As detailed in the CARDI Management Audit, CARDI's problems are a result, in many ways, of the growth of the Institute. Because of its growth, the development of crucial administrative systems needed to support its technical operations have been neglected. Principle CARDI weaknesses are as follows:

1) Financial support has not kept pace with the growth of core operations;

2) Lack of appropriate organization and management systems. Including: lack of personnel management and financial and accounting systems; administrative and office procedures; and Project preparation and evaluation capabilities;

3) Lack of a determined and consistent approach in carrying out its objectives.

The Standing Committee of Ministers has endorsed the recommendations of the Management Audit and has directed CARDI to begin implementation of several of the Audits recommendations.

The FSR/D Project will assist CARDI, through training and technical assistance to strengthen many of the management support systems identified in the Audit. Since many of the management areas will cut across the CARDI organization; assistance will not be narrowly focused on the FSR program as such. Therefore, a multi-phased approach to institutional development will be incorporated. 1) The Project will strengthen CARDI's ability to perform farming systems research in the Eastern Caribbean. This will entail the development of appropriate organization and management systems within the CARDI FSR Program. 2) The Project will develop and strengthen crucial organization and management systems which are needed to support CARDI's technical programs across the board. 3) The Project will strengthen CARDI's international image and instill a higher degree of professionalism among CARDI staff.

The following outputs are expected:

1) Appropriate procedures will be developed within CARDI to effectively administer an expanding FSR Program, including, financial control, program planning, and evaluation.

2) Appropriate CARDI organization and management systems will be developed. These include:

a) The development for implementation of appropriate administrative procedures by the end of 1983.

b) The development for implementation of personnel management systems by the end of 1983.

c) The development for implementation of finance and accounting systems by the end of August 1983.

d) Work programs will also be established in the following areas by the end of 1984.

- The development and implementation of a Project management and documentation system;

- The establishment and implementation of Project preparation and evaluation capabilities.

3) A Research Advisory Board will be established by mid-1984.

a. Project Activities

i) Project Management: Effective Project management will require the establishment of effective financial planning, financial reporting and evaluation procedures. An area which will receive immediate attention will be Project financial control. As a result of a Project audit of the Small Farm Multiple Cropping Systems Project, recommendations were made concerning financial controls for the CARDI FSR/D Project. These recommendations are contained in Administrative Annex H (pp. 139-144). Technical assistance will be provided to CARDI to establish appropriate financial systems and train staff in the implementation of these systems.

Specific area of improvements include:

1. General and Administrative Procedures.

a) Country budgets will be prepared on an annual basis and CARDI project manager will exercise budgetary controls.

b) An accounting procedure manual

will be compiled setting out guidelines for expenditure approval, together with standardized systems to be implemented in all countries. A training program for accounting personnel will be organized.

c) Reimbursements will be made based on monthly expenditure statements.

d) CARDI counterpart contribution will be monitored on a regular basis.

2. Central Control Procedures

a) A separate budget heading will be established for travel outside the member countries of CARDI. The Project manager will approve all travel, formal trip reports will be submitted with expenditure claims.

b) CARDI will maintain a cumulative record of disbursements and expenditure claims from individual countries. The surplus or deficit for each country as shown by this summary will be reconciled on a monthly basis to the balance on the bank statement.

c) Periodic visits will be made to ensure that the accounting system and controls are operating satisfactorily.

d) Any amendments to expenditure claims will be communicated in writing to the relevant personnel and adjusted on the following month's statement.

3. Individual Country Procedures

a) Separate bank accounts for Project funds will be maintained in each country participating in the Project. Formal bank reconciliations will be prepared periodically and submitted for review.

b) Monthly statements of expenditure submitted by each country will be standardized. Statements will be cleared by relevant personnel before submission to the CARDI Project Manager.

Other areas will be addressed through a series of workshops and through technical assistance to be provided under the Project. The first workshop will be a Project Management Workshop to be held early in 1984. This workshop will assist

Project staff to develop appropriate monitoring, reporting and financial procedures necessary to effectively implement the technical aspects of the Project. A second workshop will be held in conjunction with the first annual planning session scheduled for April. The workshop will be attended by CARDI, AID and consultants and will establish procedures to be used throughout the life of the Project for the development of effective workplan. Annual workplans for both the technical and institutional strengthening components of the Project will be developed by CARDI and submitted for AID approval. A third workshop will be held in June, 1984 and will be concerned with establishing guidelines and baseline data for the evaluation of the Project.

ii) CARDI Institutional Strengthening: This aspect of the Project will involve a two phased approach. First, CARDI will contract with a firm to design and implement essential management systems. These systems have been identified in the management audit and include: administrative systems, personnel and management systems and finance and accounting systems. All systems will be designed by the end of 1983. The same firm will assist CARDI in implementing these systems over a period of time. The actual setting in place of these systems will vary according to the availability of staff and the difficulties involved in establishing the systems. It is anticipated that all systems will be in place and operational no later than the end of 1984. It is anticipated that this phase of the CARDI institutional strengthening activity will commence as soon as CARDI meets initial conditions precedent.

Second, research management specialist (RMS) will assist CARDI to monitor the implementation of the FSR/D activities, as well as, the CARDI accounting and management systems being developed.

It is envisioned that the RMS will serve as principle advisor to this activity on the Project over the life of the Project. The RMS will assure that all CARDI and FSR Project management systems are being put in place according to agreed upon workplans. The RMS will be responsible for locating appropriate technical assistance when needed and assuming the appropriate CARDI staff are available to work with short-term consultants to implement the systems. It is not anticipated that the RMS will reside in the Caribbean. What will be required, however, is an individual to assist CARDI for intensive short-term periods over the life of the Project. The RMS will be required to spend extensive periods in Trinidad and other CARDI member countries, initially to become thoroughly familiar with CARDI problems and then to assure that workplans are being effectively carried and CARDI staff trained to implement the systems.

iii) Research Advisory Board: To strengthen CARDI's international image, and to inculcate a higher degree of

professionalism among their peers and the scientific community, a Research Advisory Board (RAB) will be formed made up of members from the international research community. Such international research institutions as Centro Internacional de Agriculture Tropical (CIAT), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), International Institute of Tropical Agriculture (IITA) and the Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT) including donors such as the Rockefeller Foundation, UNDP, The World Bank, USAID, CIDA and Ford Foundation will be invited to be a members of the CARDI RAB.

The responsibility of formulating the RAB and implementing the Board's functions will be the task for the Chairman of the Board of Governors with the assistance of the CARDI Executive Director and the RMS. It is expected that the RAB will be formed by mid 1984. It is anticipated that yearly meetings will be held in one of the participating countries in the CARDI FSR program.

The RAB will be directly responsible to the CARDI Board of Governors with their recommendations and guidelines directed to the CARDI Executive Director. The RAB responsibilities will be to maintain CARDI's thrust of professional improvement particularly in Farming Systems Research and related agricultural research disciplines. The RAB should welcome scientific papers at their yearly meetings which could be presented as one of the important contributions to FSR technology. Since CARDI will be taking a leading role in international FSR methodology development, papers which would be presented, sponsored by CARDI, could lend significant international prestige and professionalism and point the direction from among the world's FSR scientific community.

iv) Responsibilities: The CARDI Executive Director will have direct responsibility for all aspects of the institutional strengthening program. It will be his responsibility to assure that the technical assistance program developed respond to the management audit recommendations and that these systems help to strengthen the overall CARDI FSR program. The Executive Director may delegate responsibility to his two chief associates, the Director of Research and Development and the Director of Finance and Administration. It is uncertain at this time how authority will be delegated since many of the activities may cut across existing lines of authority. That is why it is essential that direct responsibility for this aspect of the Project lies with the Executive Director.

The CARDI Project manager will be directly responsible for establishing all Project specific management systems.

v) Major Beneficiaries: The major beneficiaries of this set of improvements will be the core staff of CARDI at the central, sub-regional and country levels. Given CARDI's close relationship with personnel in the Ministry of Agriculture in the various countries, it is also expected that the Ministries will benefit through better and more timely CARDI administrative operations.

vi) Required Inputs: Early in the Project CARDI will identify appropriate counterparts who can work with, and learn with the external consultants. It will also be necessary for CARDI to upgrade the administrative capabilities of the Country Team in order to effectively administer Project management systems. In this respect, CARDI will hire appropriate administrative staff to work along with technical staff in individual countries. AID grant funds will pay the salaries of administrative assistants during the first year of the Project. CARDI will assume full financial responsibility for these assistants for the remainder of the Project. Training and technical assistance requirements are described in more detail in the Training and Technical assistance sections of this Paper.

4. Project Training and Technical Assistance

1. Training

Three types of training programs are envisioned under the Project. The first are workshops which will cover Project management, program development and FSR/D planning and implementation areas. The workshops will involve CARDI staff, MOA research and extension personnel from both the LDC's and other CARDI member countries. There will also be technical short course training to upgrade CARDI staff in specific skill areas. It is anticipated such training will be in the U.S. or at research institutions in developing countries outside the Commonwealth Caribbean.

a) Workshops

The first workshop will be devoted to the development of Project management systems. The purpose of this workshop will be to establish the management and monitoring systems which will be used in the Project and familiarize those responsible for carrying them out. In June 1984, an evaluation design workshop is planned. The purpose will be to lay out a methodology for evaluation which will enable CARDI to begin collecting relevant data.

Another set of workshops will be the annual review and planning sessions. During these sessions CARDI FSR/D staff will review their past work, make refinements in the methodology and the TIF formats, and plan the activities of the following year. These workshops will be held each April and in addition to the CARDI staff, will involve extension, MOA staff and the private sector. A proposed outline of the workshop is as follows:

Objectives: The main objective of the review/planning workshops will be to elaborate specific plans of work for the FSR/D Project reconciled with available resources. The review/planning workshops will have secondary parallel objectives such as:

1. Interpret and clarify policies
2. Interchange among scientific disciplines
3. Coordinate work with extension and other collaborating public and private agencies
4. Action-training in technical and Project management matters
5. Monitor, update, and evaluate activities.

Participants

National Level

1. Farm level team personnel of CARDI
2. All other technical personnel assigned to the country
3. Program and support discipline representatives as pertinent
4. Extension agents that collaborate with the country farm level team

5. Extension management
6. Personnel from other collaborating institutions
7. Representatives of CARDI top management.

Regional Level

1. CARDI Executive Director
2. Director of Research and Development
3. Director of Finance and Administration
4. FSR/D Project Manager
5. Other related FSR/D persons

Chairman of Review and Planning Workshops

1. National level - Country Team Leader
2. Sub-regional level - Sub-regional Head of Unit
3. Regional level - Project Manager, working with the CARDI Director for Research and Development.

During the Project, there will be two workshops designed specifically for extension personnel. These workshops will be conducted primarily by CARDI FSR/D staff with assistance from the Farming Systems Specialists. These workshops will cover the FSR/D methodology in detail and will include "hands-on work for the extension agents in conducting on-farm trials. These workshops will help CARDI forge closer working relationships with extension.

CARDI and extension will jointly conduct three workshops/seminars for research and extension personnel from other CARDI member countries and non-member countries. The purpose of these sessions will be to expose these individuals to the FSR/D methodology, program successes and specific technological improvements which may have region-wide applicability. These will enable CARDI to have a broader and more cost effective FSR/D program influence.

b) Short Courses and International Conferences

It is anticipated that there will be need for some of the technical staff to attend formal short courses.

These courses are offered by many of the international research centers, U.S. Universities and the USDA. The purpose of this training will be to sharpen specific technical skills of key FSR/D staff.

2. Technical Assistance

Both long and short-term technical assistance will be provided under the Project to assist CARDI with implementing various aspects of the FSR/D Project. Three sources of technical assistance are expected to be utilized.

i) Institutional Contract

It is anticipated that the primary source of technical assistance will be with an institution under the Title XII program. It is expected that the contract will last for the duration of the Project and will provide for 1) The services of a farming systems specialist for up to 42 months. 2) The services of a research management specialist for approximately 27 months and 3) short-term assistance amounting to approximately 36 months to support CARDI in various technical and administrative areas.

It is anticipated that the farming systems specialist will reside in St. Lucia. The advisors principle duties will be:

a) Assist the Country Teams and the sub-regional support staff in the design and implementation of FSR/D activities.

b) Assist the CARDI Project Manager in the centralized Project activities of planning, budgeting and evaluating.

c) Participate and contribute to the Project workshops and seminars.

d) Assist in identification of short-term technical assistance requirements.

e) Coordinate with home office in arranging for suitable short-term technical assistance.

The research management specialist, who will be team leader, will not reside in the Caribbean, but will be required to spend extensive short-term periods in Trinidad and other states participating in the Project. The specialists duties will be:

a) Monitor and assist CARDI in the implementation of all FSR/D activities;

b) Monitor and assist CARDI in the implementation of all organization and management systems;

c) In conjunction with FSS, CARDI Project manager and executive director, arrange for short-term technical assistance;

d) Assist in the formulation of annual workplans;

e) Provide short-term assistance as appropriate.

Short-Term Technical Assistance

It is anticipated that short-term assistance will be required in the following areas:

- The design and analysis of on-farm trials;
- Integrated pest management;
- Economic evaluation of technological improvement from the farmer's point of view;
- Soil and water conservation and management in a farming systems context;
- Design and conducting of Project workshops;
- Management information systems;
- Micro-computer systems.

ii) CARDI Organization and Management Systems

It is envisioned that CARDI will contract with a firm to provide technical assistance and training to develop and implement the organization and management systems.

The contract will assist CARDI in the development and implementation of the following systems:

1) Project Preparation, approval and evaluation system including a Project management and documentation system.

2) Proper accounting system, including standard policies guidelines and procedures.

3) Clerical and paper work system.

4) Communication and management information system.

5) Personnel management system, including job descriptions and appropriate salary structure.

iii) Specialty Technical Assistance

CARDI will need additional technical services in areas such as Project audit, and for other needs that may be identified during the life of the Project, as well as, for travel, per diem and honorariums associated with RAB.

5. The Project Organization

The technical aspects of the Project will be headed by a CARDI designated Project Manager. The Manager will have a full delegation of authority and sufficient resources to manage the technology generation and transfer components of the Project.

The Manager will be appointed on a full-time basis for the duration of the Project and will have overall responsibility for managing, supervising, monitoring and reporting on relevant Project related activities. Working with the long and short-term specialists, the manager will ensure that an interdisciplinary team

approach is used at all Project levels in the implementation and evaluation of Project activities. The Manager will be responsible for maintaining close research/extension linkages at all Project levels, for responding to participating country requests, and for interfacing with donors and private sector institutions. The Manager's staff will include one administrative assistant responsible for financial management and inter-island communications. This person will be assisted in developing Project implementation and management systems by CARDI headquarters staff and external program/Project management consultants.

The Executive Director of CARDI will be responsible for the CARDI institutional strengthening program. The Executive Director may delegate this authority to appropriate CARDI personnel depending on the outcome of workplans and area of assistance to be determined. Because of the importance of the strengthening effort, responsibility, at least initially, will rest with the Executive Director.

Two sub-regional CARDI Project support units will be established, one for the Windward islands in St. Lucia and one for the Leeward islands in Antigua. Each unit will be headed by a technical coordinator. Sub-regional FSR/D technical specialist staff will be assigned to each unit based on particular agro-environmental needs of the countries included in the sub-regional unit. These technical specialists will spend a considerable period of time servicing the several islands in their sub-regional area.

At the country level, CARDI will have Country Teams (CTs) headed by a CT Leader and supported by a field technician, administrative assistant and several research support staff. The CT's will manage in-country operations calling on sub-regional specialist teams and research station staff to conduct field work and provide technical back-up support. The CT's will include participating country Ministry of Agriculture staff assigned to the FSR/D Project. In-country Project activities will be jointly designed and monitored by the National Planning Committees, already established through CAEP made up of members from both the Ministry of Agriculture the private sector and the representatives of the Caribbean Agricultural Extension Project. The CT's will employ a participatory approach to involve farmers and other key private and public local organizations in the FSR/D process.

The Parent Organization (CARDI)

The parent organization includes all the personnel in the CARDI organization that are either outside or only indirectly encompassed by the Project organization.

The organization structure of CARDI is currently undergoing a review and realignment. The basic CARDI structure has two lines of authority under the Executive Director: (a) Research and Development and (b) Administration and Finance. The Project Manager will report to the CARDI Director of Research and Development.

IV. COST ESTIMATE AND FINANCIAL PLAN

The total cost of the CARDI Farming Systems Research and Development Project is \$12,100,000. AID will contribute \$7,000,000 in grant funds. CARDI will contribute \$4,220,000 and participating countries an additional \$880,000. Inflation is calculated at 10% compounded per year and is incorporated into the budget figures.

AID

The AID contribution will consist of funding certain local currency costs (\$4,085,000) and all foreign exchange costs (\$2,915,000) associated with the Project. Detailed cost estimates are contained in Annex G. Summary cost estimates are as follows:

AID Contributions

1. Personnel Costs (\$1,890,000)

AID grant funds will be used to fund the following personnel costs on a decreasing basis over the life of the Project: 1) ten technical specialists to be stationed in St. Lucia or Antigua, 2) country team members who are not funded by individual countries, and 3) management support costs for the St. Lucia and Antigua regional offices. In addition, AID will fund for the first year of the project, administrative assistants assigned to each country team.

2. Equipment and Supplies (\$1,110,000)

AID will fund the following equipment and supplies: 1) office equipment for regional offices in St. Lucia and Antigua, and country team offices, 2) up to \$108,000 for micro-computer systems for up to three islands. Cost estimates include funds for three units, three back-up units and software, 3) laboratory equipment, field equipment and experimental materials and supplies for the life of the Project, 4) eight vehicles including six pick-up trucks for each country team, a pick-up truck for the CARDI unit in Barbados to be used in conjunction with Liventock feeding program, and an additional vehicle for the CARDI regional office in St. Lucia, 5) field station renovation, and equipment for two of CARDI's stations at La Resource in St. Lucia and Betty's Hope in Antigua.

3. Operating Expenses (\$950,000)

AID will fund administrative expenses, (office rental, utilities and office supplies) for the two regional offices and for each country team office on a declining basis for the life of the Project. AID will fund all on-farm research and on-island travel costs (gasoline, oil, and maintenance for project vehicles) for the life of the Project.

4. Regional Travel (\$400,000)

The AID contribution will fund regional travel for Project staff associated with technical and administrative activities.

5. Technical Assistance (\$1,960,000)

\$1,430,000 is budgeted for the following technical assistance: 1) 27 person months of a Research Management Specialist; 2) 42 person months for a long-term Farming Systems Research Specialist; 3) 36 person months of short term assistance.

\$100,000 is budgeted for short term assistance for the development and implementation of a CARDI institutional strengthening program.

\$430,000 is budgeted for specialty technical assistance needs such as, yearly project audits, workshops, the development of micro-computer systems, travel per diem and honorariums for Research Advisory Board, and other short-term needs that may arise during the life of the project.

6. Training (\$390,000)

Funds are provided for essential staff development of a short-term nature. Short-term training will focus on workshops, conferences short courses and other training necessary to increase the capabilities of CARDI, participating country staff and the private sector.

7. Evaluation (\$300,000)

Funds are provided for two external evaluations during the life of the Project.

CARDI

1. Personnel Costs (\$3,240,000)

CARDI will fund the salary and benefits of all CARDI staff needed to backstop Project activities. CARDI will also fund an increasing portion of the salary and benefits of technical specialists, country team members and management support staff. CARDI will also fund adequate administrative assistants to support teams in financial control and administrative systems beginning in year two.

2. Operating Expenses (\$880,000)

CARDI will fund, on an increasing basis, rental, utilities and office supplies associated with the St. Lucia and Antigua regional offices, in addition to, similar costs for all country teams. CARDI will also fund the operational costs of the field stations.

3. Regional Travel (\$100,000)

Beginning in year three of the Project CARDI will begin funding regional travel associated with Project activities.

Host Governments (\$880,000)

1. Personnel Costs (\$770,000)

Host Governments contribute to the salary and benefits of one member of each country team.

2. Operating Expenses (\$110,000)

The Governments of Antigua, St. Kitts/Nevis and Montserrat also contribute to the office space used by country teams in their states.

TABLE 1

SUMMARY COST ESTIMATE AND FINANCIAL PLAN

(US\$000)

	<u>FX</u>	<u>LC</u>	<u>TOTAL</u>
<u>AID</u>			
I. <u>Personnel Costs</u>	-	<u>1,890</u>	<u>1,890</u>
Technical Specialists	-	725	725
Country Teams	-	950	950
Management Support	-	215	215
II. <u>Equipment and Supplies</u>	<u>705</u>	<u>405</u>	<u>1,110</u>
Office Equipment	74	-	74
Micro-Computer	108	-	108
Laboratory Equipment	48	-	48
Field Equipment	275	-	275
Plant Materials/Supplies	-	305	305
Vehicles	100	-	100
Field Station Development	100	100	200
III. <u>Operating Expenses</u>	-	<u>950</u>	<u>950</u>
Administrative Expenses	-	250	250
Research Expenses	-	500	500
On-Island Travel	-	200	200
IV. <u>Regional Travel</u>	-	<u>400</u>	<u>400</u>
V. <u>Technical Assistance</u>	<u>1,720</u>	<u>240</u>	<u>1,960</u>
Farming Systems Specialist	500		500
Research Management Specialist	400		400
Short-Term Assistance	530		530
O&M Design and Implementation		100	100
Specialty Assistance	<u>290</u>	<u>140</u>	<u>430</u>
Audit		(40)	(40)
Workshops	(60)		(60)
Micro-Computer Systems	(50)		(50)
Research Advisory Board	(80)		(80)
Other Specialty Assistance	(100)	(100)	(200)
VI. <u>Training</u>	<u>190</u>	<u>200</u>	<u>390</u>
Short-term	100		100
Workshops		200	200
Conferences	90		90
VII. <u>Evaluation</u>	<u>300</u>	<u>-</u>	<u>300</u>
TOTAL AID	2,915	4,085	7,000

TABLE 1 (CONT'D)

	<u>FX</u>	<u>LC</u>	<u>TOTAL</u>
<u>CARDI</u>			
I. <u>Personnel Costs</u>		3,240	3,240
Core Staff		644	644
Technical Specialists	-	938	938
Country Teams	-	1,150	1,150
Management Support	-	508	508
II. <u>Operating Expenses</u>	-	880	880
Administrative Expenses	-	330	330
Field Station Operation	-	550	550
III. <u>Regional Travel</u>		100	100
		<u>4,220</u>	<u>4,220</u>
		<u>TOTAL CARDI</u>	
<u>Host Governments</u>			
I. <u>Personnel Costs</u>	-	770	770
Country Team	-	770	770
II. <u>Operating Expenses</u>	-	110	110
Administrative Expenses	-	110	110
		<u>880</u>	<u>880</u>
		<u>TOTAL HOST GOVERNMENTS</u>	
AID	<u>2,915</u>	<u>4,085</u>	<u>7,000</u>
CARDI	-	4,220	4,220
HOST GOVERNMENTS	-	880	880
<u>TOTAL</u>	<u>2,915</u>	<u>9,185</u>	<u>12,100</u>

TABLE 2
COSTING OF PROJECT OUTPUTS/INPUTS

(US\$000)

<u>PROJECT INPUTS</u>	<u>TECHNOLOGY GENERATION & TRANSFER</u>	<u>INSTITUTION BUILDING</u>	<u>TOTAL</u>
<u>AID</u>			
Personnel Costs	1,845	45	1,890
Equipment and Supplies	1,000	110	1,110
Operating Expenses	950	-	950
Regional Travel	300	100	400
Technical Assistance	980	980	1,960
Training	190	200	390
Evaluation	-	300	300
	<hr/>	<hr/>	<hr/>
<u>TOTAL AID</u>	5,265	1,735	7,000
 <u>CARDI</u>			
Personnel Costs	2,816	424	3,240
Operating Expenses	665	215	880
Regional Travel	50	50	100
	<hr/>	<hr/>	<hr/>
<u>TOTAL CARDI</u>	3,531	689	4,220
 <u>Host Governments</u>			
Personnel Costs	770	-	770
Operating Expenses	110	-	110
	<hr/>	<hr/>	<hr/>
TOTAL HOST GOVERNMENTS	880	-	880
 <u>GRAND TOTAL</u>			
	<hr/>	<hr/>	<hr/>
	9,676	2,424	12,100

TABLE 3

PROJECTION OF EXPENDITURES BY FISCAL YEAR

(US\$000)

	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>	<u>FY 86</u>	<u>FY 87</u>	<u>FY 88</u>	<u>TOTAL</u>
Personnel Costs	45	675	590	440	140	-	1,890
Equipment and Supplies	-	524	339	108	97.	42	1,110
Operating Expenses	-	160	225	220	195	150	950
Regional Travel	5	90	90	80	80	55	400
Technical Assistance	45	275	420	500	495	225	1,960
Training	-	95	85	80	68	62	390
Evaluation	-	-	-	100	-	200	300
TOTAL	95	1,819	1,749	1,528	1,075	734	7,000

V. IMPLEMENTATION PLAN

The implementation of the FSR/D Project is viewed as a continuation of a collaborative team process initiated during the previous AID-supported Project and heightened during the PID and PP preparation phases of the Project. CARDI country teams are already organized in the participating countries and are carrying out selected components of the FSR/D methodology. Thus, the intent of this Project is not to begin something once the implementation phase begins, but rather to elaborate, refine, and adapt a more efficient and farmer-responsive methodology that can be sustained and replicated in the Eastern Caribbean. Since this Project supports and builds on ongoing CARDI activities, it is essential that the implementation start-up phase be initiated immediately and be rigorously executed. AID and CARDI staff plan to continue their close working relationship over the coming months in order to assure that this is done.

A. Detailed Project Schedule

The implementation plan follows the principle that the "level of planning detail should be consistent with the level of certainty of occurrence." Therefore, maximum detail is given for initial Project start-up activities. In the technical operation subset of the plan, a variable time scaling technique is employed. That is, activities are scheduled on a monthly basis during the first year of the Project, a quarterly basis during years 2 and 3, and on a yearly basis in the final two years of the Project. This approach encourages detailed annual Project monitoring, assessment and replanning sessions, and these sessions are an integral part of the Project.

1. Project Start-Up Activity Schedule

<u>Action</u> <u>1983</u>	<u>Timing</u>	<u>Responsibility</u>
1. Short-list Title XII institutions	July	RDO/C
2. Prepare RFTP for Technical Assistance	July	RDO/C
3. Initial Conditions Precedent Met	July	CARDI

<u>Action</u> <u>1983</u>	<u>Timing</u>	<u>Responsibility</u>
4. Contract for O&M Systems Design and Implementation	August	CARDI
5. Assign staff to work with O&M Technical Assistance	August	CARDI
6. RFTP's sent to short-listed Institutions	August	RDO/C
7. C.P. for Personnel Met	September	CARDI
8. Proposals for Title XII Contract submitted	October	CONTRACTOR
9. Contract signed	December	RDO/C
10. O&M Systems Design in Place	December	CARDI/CONTRACTOR
<u>1984</u>		
11. FSR Advisor arrives St. Lucia	January	TITLE XII INSTITUTION
12. Senior Research Management Advisor arrives Trinidad	January	TITLE XII INSTITUTION

2. Project Operation Schedule

<u>Action</u> <u>1984</u>	<u>Timing</u>	<u>Responsibility</u>
1. Development of FSR Methodology	September	CARDI
2. Transfer approach developed	October	CARDI/MOA/CAEP
3. Procurement for Equipment initiated	January	CARDI/ CONTRACTOR
4. Project Management Workshop held	February	CARDI/ CONTRACTOR
5. Project Planning Workshop held	March	CARDI/ CONTRACTOR
6. On-Farm Testing of TIF's	May/Continuing	CARDI/ CONTRACTOR
7. Administrative System in place	May	CARDI/ CONTRACTOR

<u>Action</u>	<u>Timing</u>	<u>Responsibility</u>
<u>1984</u>		
8. Project Evaluation Workshop held	June	CARDI/ CONTRACTOR
9. Workplans submitted and approved	3rd. Q.	RDO/C/CARDI/ CONTRACTOR
10. Micro-computer system installed	3rd. Q.	CARDI/ CONTRACTOR
11. Personnel System in place	4th Q.	CARDI/ CONTRACTOR
12. RAB is instituted	4th. Q.	CARDI/ CONTRACTOR
13. Extension Training	4th. Q.	CARDI/ CONTRACTOR
<u>1985</u>		
1. Applicability Testing of TIF's	1st. Q.	CARDI/ CONTRACTOR
2. Project Planning Workshops held	2nd. Q.	CARDI/ CONTRACTOR
3. Workplans submitted and approved	3rd. Q.	CARDI/ CONTRACTOR
4. Mid-Term Evaluation	3rd. Q.	RDO/C/CARDI/ CONTRACTOR
5. All O&M Systems, tested and functioning	4th Q.	RDO/C/CARDI/ CONTRACTOR
<u>1986</u>		
1. Applicability Testing	2nd. Q.	CARDI/ CONTRACTOR
2. Extension Training	2nd. Q.	CARDI/ CONTRACTOR
3. Workplans submitted and approved	3rd. Q.	CARDI/ CONTRACTOR

<u>Action</u>	<u>Timing</u>	<u>Responsibility</u>
<u>1987</u>		
1. Extension Training		CARDI/ CONTRACTOR
2. Workplans Submitted		CARDI/ CONTRACTOR
3. Technological Improvements validated		CARDI/ CONTRACTOR
<u>1988</u>		
1. Technological Improvements validated		CARDI
2. More transfer campaigns held		EXTENSION
3. Final Evaluation		CARDI/RDO/C CONTRACTOR

B. Project Management

The USAID Evaluation Report of the SFMCP concluded that any follow-on activity would need to be substantially improved in its management dimension. The new Project has been carefully designed to incorporate an appropriate Project management process and system.

A Project Manager will be appointed and be delegated adequate authority by the CARDI Executive Director to carry out Project activities. This will include accountability for financial actions under the Project. The Project Manager will be assisted by headquarters staff in recruiting and training Project personnel, establishing overall Project management and information systems, and carrying out specific institutional strengthening activities. The Project Manager will be assisted by an administrative assistant in carrying out day to day implementation matters.

The Project provides for technical assistance to assist the Manager in establishing an effective Project management system that can be used as a model for the overall CARDI Program Management System. The initial Management workshop, will set out the overall framework for the Project management system. An integral part of the system will be the annual review and planning workshops held sequentially at different levels of the Project.

AID Support

Considerable support particularly in the first nine months of the Project will be necessary from RDO/C to assure that Project implementation keeps to agreed-upon schedules. In order to provide this support, RDO/C will establish and maintain an internal Project Implementation Committee. This Committee will be headed by a Project officer from the Agriculture and Rural Development Office. Other permanent committee members will be from the RDO/C Projects office and the controller's office. Assistance from other Mission divisions, such as the regional legal advisor and program office and AID/Washington will be called upon, on an as needed basis.

C. Procurement Arrangements

CARDI does not have a formalized procurement system. Therefore all procurement under the Project will be handled in accordance with guidelines contained in AID Handbook 11 (Country Contracting) or other appropriate AID procurement guidelines.

The major portion of the technical assistance provided under the Project will be under a Title XII institutional contract. RDO/C believes that CARDI can benefit from a strong institutional relationship with a U.S. institution under the Title XII program. CARDI will be involved, to the maximum extent possible, in the selection of the institution and approval of all consultants provided under the Project.

The institutional contract will provide for 1) long-term farming systems research specialist; 2) research management specialist, 3) in addition to, much of the short-term assistance required under the Project. In addition, the institutional contract will provide for the procurement of some of the commodities, training and evaluation activities planned under the Project.

CARDI will contract with a firm to design and implement the required O&M system. Several major international accounting and management consulting firms have local offices in Jamaica, Trinidad and Barbados and have the expertise available to perform the activities planned.

CARDI will utilize AID travel and per diem regulations during the Project.

VI. MONITORING, REPORTING AND EVALUATION PLAN

A. Monitoring plan

Monitoring involves tracking actual against planned Project progress--both physical and financial--and using the knowledge gained to fine tune Project operations. Therefore, monitoring begins with a specification of Project milestones or targets along with a listing of key actors responsible for various activities. The Implementation Plan outlined in Section V, accompanied by the Project's Logical Framework, already contains many of these elements and thus provides the foundation for the Monitoring Plan.

1. CARDI's Project Monitoring Activities

In this Project, CARDI will carry out activities at three different organizational levels and several dispersed geographical locations--the participating countries, the two sub-regional units, and the headquarters office. The Implementation Plan identifies general activities, completion data and targets for each of these units which will need to be monitored. Included here are key inputs, outputs, and external conditions summarized in the Logical Framework. A more detailed monitoring plan for each unit will be developed in the Project Management Workshop. This plan will be reviewed and revised once a year at the annual country, sub-regional and central level Review and Planning sessions. The Project Manager has responsibility of establishing the Project monitoring system and managing its operation. Short term assistance is being made available to assist in the establishment of this system.

2. AID's Monitoring Activities

AID's role in the Project includes assisting CARDI with procurement arrangements, approving annual workplans, participating in evaluations, assuring financial accountability, and helping in other ways agreed to by both parties. These activities, especially the initial ones related to contracting and procurement are extremely time sensitive. Thus, these initial activities need to be monitored closely to assure they are completed on time.

3. Contractor Monitoring Activities

Contractors will be required to carry out internal monitoring of their key activities. This responsibility will be included as a standard feature of all contracts. The specific monitoring and reporting requirements will be detailed in the scope of services to be performed.

B. Reporting Plan

Reporting is the communication of the status of Project activities to others, along with necessary analyses and action recommendations, so that they may better carry out their responsibilities. Reporting is based on events which occur at different organizational levels and are selected as important by those who have management responsibility. For example, in this Project the Manager needs to know from the CARDI Country Teams when and in what configuration the first year test-plots are initiated. He also needs to know from AID when it is likely that proposals for the technical assistance will be received. Both of these activities require reporting. Internal unit reporting is also required at each organizational level to assure quality control and permit financial accounting. Reporting requirements will be described in the Management Workshop.

Specifically, the CARDI Project Manager will receive simple reports from Country Teams on a monthly basis, more detailed reports quarterly, and an in-depth report at each year's planning workshops. The Manager, in turn, will submit quarterly progress reports to the CARDI headquarters and A.I.D. In addition to financial reports to AID on a monthly basis. All CARDI personnel involved in formal training and extra-regional activities will be required to submit training or trip reports. CARDI contractors and short-term consultants will also submit periodic and/or trip reports.

C. Project Evaluation Plan

During the Project design stage only the basic elements of an evaluation plan, as described below, were formulated. A detailed evaluation plan is to be developed during an Evaluation Design Workshop scheduled for late in the first year of the Project.

1. Key Evaluation Issues and Decision Makers

Seven issues that are key in the Project evaluations have been identified. The issues require variable periods of time to observe, and will therefore need to be dealt with in different evaluations. The following issues will receive priority attention.

- a. What changes in farm level economic and nutritional status have occurred among direct and indirect Project beneficiaries, and to what extent can these changes be attributed to the FSR/D Project?
- b. What is the process by which technology improvements generated by the Project are transferred from Project participants to other farmers and how can this process be improved?
- c. Is the FSR/D methodology refined under the Project effective in generating technology improvements that demonstrate substantial farm level production increases, and how might the methodology be improved?
- d. How viable is the FSR/D Program for CARDI and the participating countries as a means of further decentralizing CARDI operations and making it responsive to the agricultural needs of the Region?
- e. Given the different political, economic and institutional characteristics of Eastern Caribbean countries, does the FSR/D approach represent a cost-effective way of organizing and carrying out agricultural research?
- f. Is the Project management system, i.e. internal planning, budgeting, responsibility assignment, controlling, and feedback/evaluation, cost-effective and how can it be improved or replicated in other CARDI or East Caribbean Projects?

The key decision makers who require information on these issues include: the CARDI Executive Director and policy Boards, the Project Manager, the FSR/D technical staff, Country Team leaders, the participating country Ministry of Agriculture policy makers, USAID Mission Personnel, and the International Agricultural Research Community.

2. Detailed Evaluation Research Design

In the FSR/D Project, a design exercise is scheduled in the first year of the Project in order to specify necessary baseline information and detail the surveys and analyses of such data preparatory to or as part of the actual evaluations. The evaluation design exercise will also set up the exact timing, issues, research design, and scope of activities for each evaluation.

Current plans call for two internal CARDI evaluations and two joint CARDI-external evaluations over the life of the Project. The first internal CARDI evaluation will take place in May 1984 following the first full cycle of Project activities. It will focus on the efficiency of start-up operations and serve as a forum for introducing and learning Project evaluation tools and techniques. The detailed Project evaluation design will be an output of this session. Consultants will assist CARDI evaluation staff in facilitating the evaluation process.

The two external evaluations are scheduled for late in year two and early in year five of the Project. These evaluations will focus on leading indicators of Project impact, and will recommend mid-course corrections needed to improve Project effectiveness and assure sustainability. Several internationally renowned FSR/D professionals will take part in these evaluations.

VII. PROJECT SPECIFIC ANALYSES

A. Technical Analysis

1. Farming Systems in the Eastern Caribbean

Farming systems are the result of interactions among several interdependent components. At the centre of the interactions are the farmers themselves, whose households and means of livelihood are intimately linked. For achieving a specific farming system, families allocate certain quantities and qualities of inputs, to which they have access, to three processes -- crop production, livestock production and off-farm employment -- in a manner which, given their knowledge, will maximize the attainment of the goals.

The farming systems that have actually evolved in the Eastern Caribbean are intricate webs of resource allocation, cropping patterns and technologies that emphasize heterogeneity and combine traditional beliefs and practices, with rather unfavorable agro-ecological conditions. The focal point of these farming systems is the decision making processes of the farm household. An understanding of these decision making processes seeks to explain farmers' behavior in terms of logically consistent responses to economic and social opportunities, given existing constraints. The decision making processes of the small farmers in the Eastern Caribbean involve a range of factors. Each farmer makes choices within the context of the household, i.e. is influenced by the household's needs and goals, as well as, by the availability of resources. These resources include not only land, water, labor, etc., but also social resources such as extension information about agricultural methods and credit. At the same time, farmers face the difficult task of planning an enterprise in the face of uncertain weather and market conditions.

Small farmers who plant both tree crops and food crops allocate resources to tree crop cultivation on the basis of careful long-range planning decisions, while their resource allocation to food production appears haphazard and disorganized. The difference, it appears, is a matter of timing. Tree crops take several years to mature and bear for a long time thereafter. Once planted, tree crops will absorb part of the farmer's land and labor and yield him some income for many years. The decision to commit resources to a plot of tree crops is therefore considered very carefully and timed to avoid conflicts with other foreseeable demands on the farmer's

resources. The fact that income from citrus trees fluctuates unpredictably from year to year only reinforces the long-term nature of the decision. The farmer knows he is investing in a "life time" income rather than in a steady flow and makes his calculation accordingly.

Food crops, on the other hand satisfy, consumption needs and the opportunity cost varies continuously. The farmer would plant food crops "until he had enough" at which point he would stop and do something else. It is quite clear that the farmer cannot express his need in terms of the specific number of plants or specific acreage because "enough" is a relative measure depending on his family's needs, on market demand, and on what he had to forego in order to plant that much. Decisions regarding short-term crops are made in the course of action whereas decisions regarding cash crops are usually made beforehand. Consequently, farmers often change their plans between the time they clear land for food crops and the time they save the seed. Far from being haphazard, decisions about food production are adjusted continuously to changing circumstances.

Knowledge of the existing pattern of leadership, power, size and structure of families, division of labor according to sex and age, marketing patterns at local and regional levels, the calendar of social and cultural events, food habits, etc., can be used to indicate the priorities that new crops and crop technologies will have. Many farmers in Montserrat, for instance, will not fertilize root crops cultivated for home consumption because it is generally felt that the fertilizer affects the cooking quality and, consequently, the taste of the tuber.

Labor as a factor of production is further affected by the sex and age of the farmer. The majority of the small farmers in the Eastern Caribbean are over 55 years of age. Although age does not appear to be a hinderance to the amount of labor the farmer puts into his system, it does, however, affect the rate of acceptance of new technologies. Many farmers feel that they have established, through sufficient experience, fairly developed farming systems and that their major constraints are only two-fold, i.e. the lack of sufficient market outlets and consequently suitable prices and the lack of much needed inputs viz. chemical inputs and credit.

The general level of literacy is quite high in the Eastern Caribbean making for ease of communications between research extension personnel and small medium scale farmers. Communications is extremely important in understanding, precisely, the current farming systems. It is also very important for the transfer of technological improvements.

2. The Technique Selected

Because of the complex nature of the region's small and medium scale farming systems and because traditional research efforts had not made much progress, CARDI selected the systems approach. This decision is one that evolved over time. It began in 1976 with a decision by CARDI's Board of Governors to decentralize its operations from the Trinidad headquarters. In 1978, the Small Farm Multiple Cropping Systems Research Project enabled CARDI to expand its decentralization effort. The systems approach was introduced at that time because of the nature of the farming systems in the LDC's.

The experience of that Project confirms the nature of the farming systems. CARDI has somewhat improved its FSR/D methodology and will continue to do so under this Project. FSR/D as a research methodology is still not fully mature in any part of the world. There have not been any benefit-cost or cost effectiveness analyses conducted. It is, however, generally assumed the FSR/D is somewhat more expensive than traditional research. This is highly dependent, however, on the assumed relevancy of the product of that traditional research. FSR/D is considered preferable to traditional because of the intimate involvement of the research team, the farmer and extension personnel. The product of FSR/D is therefore not only very relevant for the farmer but is also relatively easy to extend. This in turn makes the extension service much more efficient.

When considered from the point of view of the ultimate objective, i.e. increase small and medium farm production and productivity, the FSR/D approach is more cost-effective than other alternatives. In the approach being used in this Project it is impossible to separate technology generation from technology transfer. The two are inter-twined as the extension personnel become integrated members of the FSR/D team. By the end of this Project it is expected that extension personnel will be making significant contributions at each stage in the FSR/D process.

The detailed FSR/D methodology which will be refined and employed in the Project is contained in Technical Annex L. The FSR/D approach is the most appropriate and feasible to address the constraints of the Eastern Caribbean.

B. Economic Analysis

The economic benefits from research can take a number of forms. The most obvious is increased agricultural output, be it sold domestically or marketed abroad. Benefits also can take the form of an improvement in quality of a commodity such as the development of a seedless variety. The innovation might lead to conservation of inputs for instance less chemicals might be required to obtain a given output. Lastly, an improvement in marketing might be secured as a result of a product which transports better thereby reducing waste and spoilage in the distribution system.

It is expected that the FSR/D Project will create many of these same benefits contributing substantially to national and regional objectives. That is, the Project is expected to: (a) increase production and productivity on small farms, (b) increase income and improve human nutrition, especially among low-income rural household, (c) improve self-reliance and security with respect to food, (d) save foreign exchange by reducing food imports and to increase foreign exchange earnings through an expansion of exports particularly in the Region, (e) increase productive employment on farms, especially during seasons of considerable under-employment, and (f) reduce the drudgery of farm work in order to reduce the paradox of seasonal labor shortages on farms while high levels of unemployment exist in the general economy. The Project is expected to contribute to income equity in that most of the gains are expected to accrue to lower income groups--to small farmers in the form of higher incomes and to lower income non-farm household, (where as much as 70 percent of income is spent on food) in the form of larger quantities at lower prices. In addition, larger volumes of inputs and outputs at the farm level are expected to lead to higher levels of employment and income in the marketing and input supply sectors.

Especially significant from the standpoint of economic benefits will be the Project's impact on employment and foreign exchange. Significant unemployment and underemployment exists in the Region, and undoubtedly some of the individuals to be employed under this Project will be drawn from the ranks of the unemployed and underemployed. As for foreign exchange savings, such savings generated by the Project will be of utmost importance given that the currency of the LDCs--the East Caribbean dollar--appears to be overvalued distorting the terms of trade in favor of imports. (A comparison of the inflation performance of the LDCs with that in the U.S.--their most important trading partner and the country to which the East Caribbean dollar is pegged--suggests the currency is overvalued by at least 10 percent).

Experience elsewhere suggests that investments in agricultural research have significant payoffs. Rates of return as high as 80 percent have been achieved in research on high yielding varieties of wheat and rice. The estimated rate of return on agriculture education and research in Japan over the 1880-1938 period was 35 percent. Numerous other examples also can be cited. While the returns on this Project's activities are unlikely to reach as high as 80 percent, they nonetheless, are expected to be significant.

Although the Project is expected to yield a significant economic impact, the benefits are difficult to quantify since neither the magnitude nor time pattern of the flow can be estimated ex-ante. It is therefore not possible to conduct a benefit/cost type of analysis. The problem is complicated because research is only one component of a system of mutually interdependent and complementary activities. The primary role of research is to generate new technologies and knowledge. Agricultural extension and other educational services have the major responsibility for transfer and adoption at the farm level. Other essential activities include the supply of inputs to farmers and the marketing of food products, as well as, the services associated with these functions. The final output of this complex of activities is an increase in farm production and ultimately a reduction in the consumer's food bill. In the absence of any one of these components, there will be little if any production change. Agricultural production is, in fact, a joint product of the total system which consists of these activities. The benefit flows, then, are a result of the total system. The costs associated with all of the activities should be considered simultaneously and related to the total benefits.

One approach would be to estimate the effects of the Project on "consumer surplus and producer surplus" as defined in economics. As pointed out earlier, the benefits to consumers are especially important in the case of food for the domestic market. Productivity increases initially benefit producers through increased sales but eventually, in competitive markets, most of the gains accrue to consumers in the form of lower prices. However, this approach required estimates of the demand and supply functions, for which the necessary data are not available. A second approach, less elegant from an economic standpoint, is to estimate incremental benefits resulting only from the FSR/D activity. For reasons cited above, however, such an estimation would be highly imprecise. Hence, calculation of an internal rate of return or cost-benefit ratio become quite difficult. Another approach is to use cost-effectiveness analysis which is frequently done with research and institution building Projects. Demonstration of cost-effectiveness is a two step process. First, a calculation is

made of the incremental benefits the Project needs to generate in order to yield a 15 percent real rate of return, (a return considered acceptable in light of the opportunity cost of capital in the region). Second, an assessment is made as to the plausibility of the benefits required to generate such a rate of return.

Project costs include contributions from three sources: USAID, CARDI itself and the LDC governments. USAID will be furnishing \$7 million; CARDI and the LDC governments together \$5.1 million.

There is generally a substantial lag between the initial generation of new technology and the full spread of the benefits. Based on previous experience, the process moves slowly at first, then accelerates, and is completed after about 20 to 25 years. For ease in calculation, the following assumptions were made: (a) that the benefit stream begins in year six and terminates in year twenty and (b) that benefits are the same in each year. Given the Project's total costs of \$12.1 million, annual income revenues increases of \$2.8 million must be achieved to attain an internal rate of return of 15 percent.

Existing market opportunities suggest that these annual net revenue increases are indeed plausible. For the LDCs, market possibilities consist of two main elements: (a) domestic import substitution possibilities and, (b) export opportunities. The LDCs food import bill is used as a measure of import substitution possibilities. On the other hand, a proxy for export opportunities is the food import bill of the larger CARICOM states, including Barbados, Guyana, Jamaica, and Trinidad and Tobago. Transport cost considerations would preclude LDC exports to states other than these large CARICOM countries. In 1980, the LDC food import bill stood at \$130 million while the combined food import bill for the larger CARICOM States was almost \$600 million (Trinidad and Tobago \$300 million and Jamaica \$200 million). Moreover, food import bills for both the LDCs and the larger CARICOM states are growing rapidly. It is recognized that the LDCs and the larger CARICOM States will continue to require imports that the LDCs will not be able to supply in the foreseeable future such as grains for animal feeds. However, the \$2.8 million in annual incremental income that needs to be generated, in order for the Project to be cost efficient amounts to less than 1 percent of the combined annual food import bills of the LDCs and the larger CARICOM States. It is highly plausible that this Project would reduce combined food import bills by this amount. Moreover, this outcome does not take into consideration other expected benefits such as improvements in food quality, reductions in the use of food production inputs and improvements in marketing.

The direct target group of this Project is small farmer households, accounting for 95 percent of farms in the LDCs. These farmers are the major producers of the domestic food supply--60 to 70 percent of the vegetables and 85 to 95 percent of root crops. The target group numbers 60,000, of which half market their commodities either domestically or abroad while the remainder produce food for home consumption. In order to achieve an internal rate of return of 15 percent, incremental annual benefits per household of \$47 would have to be generated beginning in year six. This level of increased household income appears to be entirely feasible.

Approximately 3,000 small farmers will be actually involved in the CARDI field trials. The farmers undoubtedly will receive the most significant benefit. However, we would anticipate a large portion of the other small farmer also to benefit as the technology is disseminated.

Moreover, while the primary focus of this Project is the small farmer in the East Caribbean LDCs, the technology and knowledge generated by this Project will undoubtedly be applicable to (a) larger farms and (b) countries other than the LDCs such as the larger CARICOM states. To the extent that larger farms and these other countries also benefit, the \$47 in incremental annual benefits per small farm household that would be required to make the Project economically viable would represent an overestimate. Indeed, if the innovations produced by CARDI were disseminated in Jamaica and Trinidad and Tobago whose small farm population together totals more than 500,000, the figure would represent a sharp overestimate.

C. Social Soundness Analysis

1. Introduction

The Project will be concerned with developing technologies appropriate to the circumstances of target groups of farmers, i.e., all the factors of production which affect farmers' decisions with respect to a crop technology - their natural environment (soil, type, rainfall); their economic environment (food production, product markets, price of inputs) and their own goals, preferences and resource constraints.

Almost all small farmers in the Eastern Caribbean have a goal of increasing incomes, broadly defined to include production for home consumption. Generally too, farmers have a security goal of meeting subsistence requirements of their preferred food; they also want to avoid taking those risks that might endanger their subsistence or cash sources of income. Clearly farmers reject available technologies not because they are conservative or ignorant, but because they rationally weigh the changes in incomes and risks associated with these given technologies under their natural and economic circumstances and decide that for them technology does not pay.

The FSR/D methodology determines whether farmers in a region are sufficiently alike to allow for a common set of experiments and common recommendations. No two farmers have identical circumstances. At the same time, however, a research program cannot be established to provide recommendations for each farmer. It is therefore necessary to classify farmers with similar circumstances into recommendation domains - groups of farmers for whom we can make more or less the same recommendations with minor changes to be worked out at the household - farm level. Recommendation domains are usually defined on the basis of agro-climatic environments. The data from previous research indicates that agroclimatic conditions are frequently modified by the socio-economic circumstances of the farmer. Indeed, a recommendation domain may result from a complex interaction of agroclimatic and socio-economic factors. Therefore, a knowledge of farmer circumstances and how they affect crop technologies is a necessary element in identifying recommendation domains. In the final analysis then, one of the ultimate tasks of this Project will be to incorporate a knowledge of farmer circumstances into the design of technologies so that they are consistent with farmer circumstances and goals.

The research conducted under the SFMCP concentrated primarily on describing individual farming systems and household characteristics--characteristics affect the type of on-farm research that is designed for the improvement of the farming practices and technologies. The characteristics referred to are those in addition to the biological and physical relationships that constitute a traditional system developed by the farmer himself/herself; a traditional system that does not only include the farmer's understanding of his/her own agroecological niche but which also includes the farmer's beliefs and customary practices, and his goals and motivations.

In light of the above, special attention will be given to understanding, in a comprehensive manner, some of those factors

which affect the farmer's system. For example, if farmers in most areas of a country have always been growing their own corn with pigeon peas, a more dynamic approach to improving farming systems would be to set up trials on corn and pigeon pea combinations rather than to introduce corn with sweet potato yields, it would be quite wrong to assume that he will react positively to growing corn with sweet potatoes; he could well be experimenting with his present corn and pigeon pea system.

Similarly, in an area where heavy emphasis is placed on cash crops and sweet potatoes are grown primarily for home consumption, it is quite likely that less importance will be placed on improving present sweet potato cropping technologies. As one farmer succinctly summed up the situation, "We prefer to follow tradition and do like our fathers and grandfathers plant. They always been good that way". Yet this same farmer who specializes in tree crops does not hesitate to improve on the cropping system of his tree crops because, "Them trees bring money; the potatoe is to eat at home - we sell only what we cannot eat".

An understanding of small farmer constraints will enable the Project to determine whether a new technology is suited to small farmers and what it will take to gain its adoption. To make these determinations, the Project will first examine the farmer's existing production patterns and identify the physical, socio-cultural and political factors that influence his decision-making. After ascertaining the farmer's current activities and the pressures on him, the Project will determine the changes required to behavior and resource commitment by small farmers if Project activities are to be successful.

The gap between small farmer behavior and what is required by the Project may be significant, entailing changes in agricultural practices, in the commitment of family labor, funds and land, and in patterns of cooperation and accountability. Whether a farmer will make these changes will depend on his perception of risk, which should be the primary consideration when studying how to bridge the gap between present and anticipated behavior. Through an active dialogue with local participants, it is possible to identify the major impediments in making the changes called for by the new technology. Once identified, it will be the responsibility of the Project to insure that the interventions are designed in a way to provide the farmer with the motivation necessary to overcome the constraints to change.

2. Social Consequences and Benefit Incidence

The direct beneficiaries of this Project will typically be households on small farms. The farm family will be the unit of analysis. A specific farming system arises from the decisions taken by a small farmer or farming family with respect to allocating different quantities and qualities of land, labor, capital and management to crops, livestock and off-farm enterprises in a manner which, given the knowledge the household possess, will maximize the attainment of the family goals.

Due to the low income generation of small farm agriculture in the Caribbean, members of farm households have to seek off-farm employment in order to supplement farm incomes. Small farmers in the Caribbean typically engage in other economic activities mainly because their earnings are too low to provide desired levels of living. Only a minority are full-time farmers, and a large proportion earn less than half their income from farming. In St. Lucia 36 percent of a sample of 200 small farmers (Monsen 1970:81) worked off their farms; Mills (1976: 155-156), who surveyed 66 small holders in St. Kitts, found that almost all of them were employed as laborers on sugar cane estates during the five-month harvest period; Briely (1974: 65-66) found that 39 percent of the 292 small farmers he interviewed in Grenada obtained at least half of their income from off-farm activities; and the government of Antigua's (1977) survey of 100 small farmers found that 48 of the 92 farmers responding to questions on off-farm employment spent at least half of their labor time on such activities. All of this off-farm work is not due to the land constraint. At the farm level, land often is under- or unused because of the limits of what the household can cultivate with existing equipment. In addition, at the national level, there are idle and under-used lands that are not readily available to households due to land tenure and other policies.

Although the data on income distribution are scarce the available evidence suggests that farm household incomes in the Eastern Caribbean are highly dependent on off-farm employment and on remittances. The fact that 70 percent of the farmers in the government of Antigua's survey (1976) have gross cash incomes from farm operations of EC\$1,000 (US\$370) or less suggests that part-time farming in Antigua is more important than full-time farming as a source of income. Similarly, unpublished data from the 1972 agricultural census show that only half of Montserrat's farm operations derived most of their income from farming.

<u>Source of Income</u>	<u>No. of Farmers</u>	<u>Percent</u>
Own farm	628	50.9
Working on other farm	14	1.1
Non-farm activities	590	48.0
<u>TOTAL:</u>	1,232	100.0

As would be expected landless farmers and those with less than one acre were even more dependent on off-farm employment.

In 1970 the economy-wide unemployment rate in the Caribbean Region was 7.9 percent (UWI/CRP 1976: Vol. 4, Part 16). Since 1970 unemployment rates appear to have risen in most, if not all the countries. In Dominica, a survey of 670 households in 1976 found the unemployment rate to be 22.7 percent and an additional 11.9 percent were found to be underemployment.

Open unemployment rates in agriculture were very low in 1970, averaging less than 1 percent of the agricultural labor force. Since most of the rural youth migrate from the farms to urban areas, or seek employment overseas, these very low rates of open unemployment are not surprising. Underemployment in the agriculture sector is very difficult to measure.

The Project will improve farming and cropping technologies so that there is an increase in agricultural production per unit of land and per unit of labor. The Project will also develop cropping systems for part-time farmers. It is therefore anticipated that the Project will have an impact on the status of part-time farmers by providing improved technologies and farming methods. Consequently, even if land and capital remain limited, farming becomes an attractive enterprise in so far as 1) farm incomes are increased, and 2) farming activities are made less arduous. Furthermore, since this Project will be concerned with all types of food crops for internal markets, as well as, food and cash crops for regional and external markets, it is expected that the Project will have a positive impact on the economic status of the farm family. It is also expected that the improved level of income of the farm family will tend to stabilize family relationships.

Finally, given the information available from the previous research work and from the literature available, it is highly unlikely that the Project will have any negative consequences for other social, economic or political groups. In fact, non-farm consumers, especially the low-income households, would share in the gains via larger quantities of basic foods at lower prices.

3. Women as Direct Beneficiaries

Special attention will be given to women in agriculture since women represent a substantial percentage of those engaged in agricultural production on small scale farmers in the Eastern Caribbean. Women farmers in the Eastern Caribbean play a significant economic role in small-scale agriculture. They too are subject to general constraints faced by small farmers, but frequently in ways different than those that touch men. For example, the case of women farmers who have to let their bananas rot on their mountainous parcels of land because they were not able to find the necessary labor to head the bananas down to the road - a rather strenuous activity, considering the terrain of many of the small farmers in the Eastern Caribbean.

In addition, women, because of their multiple work roles, agriculture, child care, home maintenance within the farm household and because of stereotypic notions of these roles, confront special problems in becoming more efficient food producers. Although a substantial number of women are engaged in farm work, women farm operators on the average receive less income than men and many of the women classify themselves as 'housewives' rather than 'farmers'. Moreover, women receive less attention from the extension service than do male farmers. Thus, another important explanation for the food production/importation dilemma, which is frequently overlooked, is the 'female factor' in local food production.

According to the Brandt report: "Any definition of development is incomplete if it fails to comprehend the contribution of women to development and the consequences of development for the lives of women. Every development plan, policy or Project has an impact on women and cannot succeed without the work of women." Consequently, the Project will take particular care not to assume:

1. that the man is usually or always the principal farmer;
2. that the man alone controls decision making on the farm (women more frequently are responsible for the foods for internal exchange in local markets and the women tend to control the money from these transactions);
3. that because a woman says that she is a 'housewife', she is not the principal farmer and decision maker.

It will be extremely important when selecting farmers for on-farm trials that female headed houses will be represented because the types of modifications made in cropping systems will invariably have an impact on the use of women's labor. At the same time the type of crops that will be introduced will determine to some extent who will market the crop and control the income, i.e. women more commonly control the marketing of food crops for local consumption while men control the marketing of export crops. One of the objectives of the Project is to increase the production of local subsistence crops so that the dilemma of increased imports and the loss of foreign exchange is reduced. It is therefore expected that the Project will have a positive impact on the status of women.

D. Financial Analysis

The CARDI Farming Systems Research and Development Project represents more than a three fold increase in AID resources to CARDI compared to the Small Farm Multiple Cropping Project (SFMCP). Some of the increases in costs are represented and explained by the lengthened implementation period, (five years as opposed to three years); and increased costs due to inflation. The Project, nonetheless is a far more intensive effort of assistance to CARDI. Table 1 summarizes the level and type of resources provided under SFMCP and planned under FSR/D.

	<u>SFMCP</u>	<u>FSR/D</u>
<u>Personnel Costs</u>	<u>1,038,608</u>	<u>\$1,890,000</u>
<u>Technical Assistance</u>	<u>425,020</u>	<u>1,960,000</u>
<u>Training</u>	<u>106,387</u>	<u>390,000</u>
<u>Other Costs</u>	<u>479,861</u>	<u>2,660,000</u>
Travel	293,843	400,000
Experimental Materials/Supplies	40,843	205,000
Operating Expenses	145,175	950,000
Equipment	-	805,000
Evaluation	-	300,000
<u>Administrative Fee</u>	<u>204,988</u>	<u>-</u>
TOTAL	2,254,864	7,000,000

A major thrust of the CARDI: FSR/D Project is institution building, therefore increased resources have been provided for technical assistance and human resources development. Increased operational resources have also been provided, particularly for equipment, experimental materials and supplies, to enable CARDI teams to function effectively at the regional, sub-regional and country level.

1. CARDI Financial Contribution

CARDI is not now able to fund necessary increases in professional staff and operating expenses to achieve Project objectives. RDO/C will therefore fund most operating expenses during the first years of the Project. CARDI will assume a greater share of these costs during the life of the Project. AID will fund the salary and benefits of technical specialists, country teams and management support staff for the St. Lucia and Antigua regional offices, in addition to certain administrative expenses on a declining basis according to the following schedule.

<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>	<u>Year 5</u>
100%	75%	50%	25%	- 0 -

This schedule will result in the following increased demands on the CARDI budget.

	<u>(US\$000)</u>				
	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>	<u>Year 5</u>
<u>Personnel Costs</u>	- 0 -	173	445	608	898
<u>Administrative Expenses</u>	- 0 -	<u>27</u>	<u>59</u>	<u>97</u>	<u>143</u>
TOTAL		200	504	705	1,041

The 1983/84 CARDI core budget has been increased from TT\$6,500,000 to TT\$7,000,000 per year (app. US\$2.9 million). The Board of Governors have indicated this level of funding will be provided for the next three years. At current levels of existing expenditures CARDI will have to obtain additional resources to be able to fund the FSR/D Project starting in year three. Sources of funds to meet these increased costs include: a) CARDI reorganization and decentralization efforts will result in savings of over TT\$1.0 million dollars per year starting in year 2, b) The management audit recommends that an independent CARDI Trust be established to fund CARDI core expenses. If the establishment of this Trust is successful, income from such a Trust could be a significant factor in providing resources for the CARDI Project by year 3. Since the CARDI budget is reviewed annually, Governments could allocate additional funds to the CARDI core budget if a rationale can be justified.

2. Comparison of Administrative and Operational Costs

Total AID costs associated with the actual operation of the CARDI FSR/D program will amount to \$5.1 million over the five year life of Project. Costs are budgeted heavily in favor of actual research operational activities as opposed to strict administrative costs. Most personnel costs are for country team members and for back-up technical specialists assigned to the regional offices. Similarly, costs of equipment, operations and travel are focused heavily into actual research operations. This is summarized in the following Table.

COMPARISON OF ADMINISTRATIVE AND OPERATIONAL COSTS
FOR AID PORTION OF FSR/D PROJECT

(US\$000)

	<u>Administrative</u>	<u>Operations</u>	<u>Total</u>
I. <u>Personnel Costs</u>	<u>215</u>	<u>1,675</u>	<u>1,890</u>
Technical Specialists	-	725	725
Country Teams	-	950	950
Management Support	215	-	215
II. <u>Equipment & Supplies</u>	<u>182</u>	<u>880</u>	<u>1,510</u>
Office Equipment	182	-	182
Laboratory Equipment	-	48	48
Field Equipment	-	275	275
Experimental Materials	-	305	305
Vehicles	-	100	100
Field Station Development	-	200	200
III. <u>Operating Expenses</u>	<u>250</u>	<u>700</u>	<u>1,180</u>
Administrative Expenses	250	-	250
Research Expenses	-	500	500
On-Island Travel	-	200	200
IV. <u>Regional Travel</u>	<u>100</u>	<u>300</u>	<u>400</u>
	<u>TOTAL</u>	<u>3,555</u>	<u>4,302</u>
	<u>1</u>	<u>83</u>	<u>100</u>

3. Recurring Costs

Maximum recurring costs of the FSR/D Project to CARDI and participating countries will be approximately \$1.4 million. A breakdown of these costs by the end of the Project is as follows: The figures assume a ten percent, across the board inflation rate.

Maximum Annual Recurring Costs of FSR/D Project in 1989

<u>Country Team</u>	<u>802,000</u>
Personnel	503,000
Adm. Expenses	110,000
Research Expenses	102,000
Plant Materials	35,000
Local Travel	52,000
<u>Technical Specialists</u>	<u>320,000</u>
Personnel	230,000
Support Costs/Travel	90,000
<u>Project Management</u>	<u>151,000</u>
Personnel	91,000
Administrative Expenses	30,000
Travel	30,000

The majority of these costs are to support front-line country teams in participating countries. It should be expected, that since CARDI teams maintain the principle research effort in many LDC's that these countries would be willing to assume many of the personnel and administrative costs of maintaining the teams. CARDI would support the team with operational costs for implementing research programs from its core budget and from donor support.

The technical specialists envisioned will cost approximately \$320,000 per year to maintain. The level and type of technical specialists that will be maintained in the long-run will evolve as the Project proceeds. Many of the technical specialists could be utilized for service in the other participating CARDI countries as FSR programs are initiated. Administrative costs generally have been kept to a minimum in the Project. Administrative costs associated with effectively running the Windward and Leeward sub-regional offices will amount to approximately \$151,000.

E. Environmental Analysis

The PID, submitted to AID/W in December contained an Initial Environmental Examination (IEE). Based on the data presented in the IEE a negative determination was recommended by the Mission and approved by AID/W on January 19, 1983.

The DAEC review cable, however, requested that the PP include procedures for ensuring the safe use of pesticides in the Project and integrated pest management techniques to reduce overall pesticide dependency. While the research work financed by this Project will be carried out under carefully controlled conditions, the objective of that research is that it be extended to and adapted by small farmers. Therefore, the major thrust of all pesticide use in the Project will be to select safe and effective pesticides within the context of the farming systems of Eastern Caribbean farmers.

Due to the nature of the Caribbean farm worker population (which includes many minor children and persons with minimal exposure to outside influences, including household and workplace safety practices) the use of all pesticide formulations having high acute oral or dermal toxicities is contraindicated. Lannate (methomyl) is a pesticide which fits this category. This pesticide is highly toxic and most formulations are restricted in the U.S. on the basis of user hazard.

The use of gammoxone (paraquat) poses a different problem. Due to the irreversible and always fatal nature of paraquat poisoning (lungs turn into fibrous mass within several weeks of accidental ingestion upon ingestion of even a single spoonful) and a long history of many accidental poisonings, paraquat has been classified as a restricted use pesticide in the U.S. Under conditions of this restriction, only specially certified applicators can apply the pesticide and special training is required to receive such certification. In addition, applicators are required to wear protective clothing.

If one considers that in the Caribbean, pesticides are frequently applied by children and almost always by untrained personnel, encouragement of the use of paraquat for general agricultural purposes is not recommended. Also, the true need for the herbicide is highly questionable. In many cases the herbicide glyphosate can be used as a direct substitute. In other cases, equally effective alternatives are likely to exist.

One argument which has been used in the past for paraquat is its low cost relative to other herbicides. However, when cost comparisons have been made, they usually only compare the relative herbicide treatment costs per unit area and do not give any indication of the incremental cost for producing a unit volume of crops. Additionally any increased cost is not weighed against the added margins of safety to be gained.

In 1981, CARDI submitted to AID a list of pesticides proposed for purchase and use in Project 538-0015. Based on that request the AID/W pesticide management specialist separated pesticides into the following four categories:

1. Pesticides Too Hazardous For General Use In The Caribbean:

Grammoxone - all crops
Dowfume, W-85 - all crops
TOK - all crops. (this pesticide has been withdrawn from use in the U.S.)

2. Pesticides Which Could Be Used In Experimental Quantities To Obtain Comparative Data On Efficacy:

Grammoxone - bananas

3. Pesticides For Which Residue Data In Support Of A Tolerance Or Maximum Residue Level Will Be Needed:

Malaron	-	bananas
Benonyl	-	cabbage
Prometryne	-	carrots, peanut, pea, onion
2,4-D	-	banana
Propineb	-	eggplant
Dimethoate	-	mango, peanut
Dithane M-45	-	onion
Dexon	-	pineapple
Kelthane	-	turnip
MSMA	-	banana

4. Pesticides/Use Patterns Suitable For General use By Caribbean Agricultural Community

All others on the list provided by CARDI in letter from Mr. Calixte George to Jim Hughes dated November 11, 1981. The AID/W Pesticide Specialist has indicated to the design team that this categorization remains valid and should be used as the guideline for this Project. In addition, a covenant will require AID approval prior to the procurement of any pesticides with Project funds.

In keeping with the FSR/D approach being followed in this Project, CARDI should carefully evaluate, from an economic point of view each pesticide treatment. This is the bottom line in any form of pest control. This can be done with a few well designed farmer field experiments (leaving parts of the fields untreated while treating other parts with different levels and/or combinations of treatments).

CARDI has a Project in integrated pest management being financed by Barclays Bank International. This Project is briefly described in Page 13. The integrated pest management approach is highly compatible with the FSR/D methodology which will be followed in this Project.

F. Institutional Analysis

1. Administrative Assessment

This section is divided into three segments. First a review and analysis is conducted of the Project's major implementation organizations to assess whether a Project like this could be implemented with no management technical assistance. This analysis will include a summary review of organization structure, staffing and management. The analysis will also include a review of evaluation and audit findings on implementation-related matters.

a. Assessment of Current Institutional Capacity and Performance

Several institutions will be instrumental in implementing the FSR/D Project. These include CARDI, and the Ministries of Agriculture in the Caribbean and particularly in the seven participating Project countries. Salient institutional features of each are analyzed below from the perspective of whether an FSR/D type Project could be implemented successfully without a management and institutional strengthening technical assistance component built into its design.

CARDI:

The Caribbean Agricultural Research and Development Institute (CARDI) was established in late 1974, as a regional institution of the CARICOM members, to perform agricultural research and development functions in support of their development.

CARDI's member countries include the twelve English-speaking countries of the Commonwealth Caribbean Community (CARICOM): Antigua, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts/Nevis, St. Lucia, St. Vincent and Trinidad and Tobago.

The governing body of CARDI is the Standing Committee of Ministers responsible for agriculture of the member countries.

A Board of Directors comprises representatives of the member countries, the Caribbean Development Bank, the CARICOM Secretariat, the Universities of Guyana and the West Indies and the Executive Director (ex officio).

The Executive Director has overall operational responsibility for managing CARDI. Under the Executive Director, there are two lines of authority: (a) research and development, and (b) administration and finance. Implementation of the work program is the responsibility of the Director of Research and Development.

There are Head of Units (HOU) in the five large territories while the seven smallest countries are grouped into two units each with a Head. HOUs are responsible for local finance and administration and for relations with local institutions. HOUs are appointed as scientists and are expected to have a full research and development program.

CARDI has 80 professional staff, of whom approximately half are relatively junior (i.e. first degree for diploma plus experience). There are 35 senior scientists and 5 fulltime professional staff in administration. Professional staff have increased from 25 when the Institute was established in 1975.

The distribution of staff in late 1982 was as follows:

	<u>Senior</u>	<u>Junior</u>
Administration	3	2
Ag. Engineering	2	1
Agronomy	13	30
Information	1	1
Livestock	5	2
Plant Protection	6	4
Social Sciences/ Statistics	4	4
Soils	2	1

CARDI had responded to the charge from the board of Governors (1976) to decentralize as illustrated by changes in the location of professional staff:

	<u>1975</u>	<u>1983</u>
Antigua	-	4
Barbados	4	6
Belize	-	2
Dominica	-	1
Guyana	-	3
Jamaica	2	7
Montserrat	-	1
St. Kitts/Nevis	-	2
St. Lucia	-	5
St. Vincent	-	2
Trinidad & Tobago	18	20

CARDI presently works on 8 field stations, 2 of which are directly related to the Project. CARDI is considering additional decentralization steps through further reduction of research personnel and technical activities at central headquarters in Trinidad.

CARDI is funded by the 12 member countries on the basis of an agreed formula. In addition, research contracts and grants are obtained. At present approximately one half of the US\$5 million budget is from external sources (i.e. not from the member countries).

CARDI experiences cash flow problems with its core budget. During the past two years approximately one half of the annual core budget has been outstanding. Different countries have failed to meet their contributions over time.

In December, 1982 CARDI commissioned a Management Audit to review and assess the operation of the Institute with respect to its efficiency and effectiveness in serving the Region. The audit covered the broad range of CARDI's organization and management issues. Due to its timeliness and comprehensiveness, the Executive Summary is attached as Appendix II to the Administrative Analysis Annex H (pp 145-149).

For the purposes of this administrative assessment, the following points made by the Management Auditors -- both in the report and during personal conversations -- are pertinent:

CARDI, as the leading agricultural institute in the English-speaking Caribbean, has substantial growing pains in the organization and management area. These are in three main areas:

- financial support from member countries has not kept pace with the expansion of core technical and administrative operations;
- CARDI currently lacks an organization and management structure appropriate to its kind of institution; and
- there is a lack of a determined and consistent approach (i.e. decentralization) in carrying out its mission.

These growing pains need not be fatal if institutional strengthening actions are initiated and effectively executed.

Ministries of Agriculture:

Caribbean Ministries of Agriculture

With Caribbean country populations ranging from 11 thousand in Montserrat to over 2 million in Jamaica, the sizes and configuration of the Ministries of Agriculture vary markedly. The MOA and private sector research and extension staffing patterns for the key countries in the FSR/D Project are given in Administrative Analyses Annex H. Thus in several countries, CARDI actually serves as the MOA research staff arm of the country.

Overall, the Ministries of Agriculture research functions and staffing is very minimal in the key participating countries. CARDI will not be able to easily find a large number of local staff to assist with Project implementation activities.

Conclusion:

CARDI, working closely with member countries and AID, needs to take major responsibility for implementing the FSR/D Project. In conclusion, due to the complexity and integrated nature of this Project, the current structure, staffing and management arrangements of the proposed implementation organizations, without any technical assistance, is clearly inadequate to successfully implement a Project of this nature and scope.

c. Feasibility of the FSR/D Project Organization and Management Plan

Considerable attention has been given to designing a Project that is both realistic, given CARDI's limited staffing and experience, and economically productive for the Region as a whole. This has necessitated that more time be given to the "organization and management of implementation" issue. This issue has taken two forms: (1) strengthening CARDI's long-term ability to sustain a productive and FSR/D program on a region-wide basis; and (2)

designing a feasible Project organization structure and management plan. The approach on the latter point has been to build in sufficient implementation management, and technical assistance to assure that CARDI performs adequately in this area, both in the short-run with the assistance of external consultants and in the long-run with the assistance of CARDI's internal staff who have been effectively trained during the first two years of the Project.

In assessing whether this plan is feasible, three issues deserve attention. First, is the Project organization appropriately placed -- with adequate delegations of authority -- in the organization? Second, is the internal Project organization suitable to carry out the planned activities. Finally, is managerial competence and skill to successfully guide the Project toward the accomplishment of its purpose? These issues are addressed below.

1) Project Organization Placement

The two major Project components, take place in different geographical locations and in different inter-CARDI units. The technology generation/transfer activities are primarily carried out at the sub-regional, country and farm household level. A large part of the institutional strengthening effort, with the notable exception of the Project management sub-component, will be carried out at headquarters level. The latter activity will need to have the direct support of and involvement by CARDI senior level staff, while the former will primarily be linked to the research arm of CARDI.

The current organization has the following components: A Project Manager will be named. The Project Manager will receive a full delegation of management authority for Project activities comprising the technical aspects of the Project as well as Project organization. This includes planning, supervision, and financial decisions and control.

2) Internal Project Structure and Staffing

Overall, the internal Project organization and structure appears feasible. The Project Manager is being given ample authority and resources to manage internal activities and monitor the necessary external linkages that will be required in this Project. The effort requires a fulltime Project Manager at

least during the first two years of the Project due to the numerous activities and dispersed geographical locations involved, that is accorded for in the staffing plan. The only potential difficulty is the origin of staff to work with consultants on the institutional strengthening activities. Arrangements need to be worked out with CARDI whereby headquarters staff can be temporarily and/or permanently assigned to this Project activity to assist with the institutional strengthening activity.

3) Managerial Competence and Skill

The final link in the implementation chain is the managerial competence and skill of key Project actors. Considerable attention has been given to designing an effort that is realistic given the managerial resources that already exist in CARDI supplemented by technical assistance and training. The strategy is to provide sufficient technical assistance in implementation as it is needed, and to structure the assistance in such a way that managerial capacity is built into the Project for continued use during the latter stages of the Project. This system is designed to serve the dual Project objectives of implementing the technology generation/transfer component of the Project and strengthening CARDI's overall FSR/D program within the framework of an improved institutional structure.

The management plan adequately addresses the start-up and technical operations implementation requirements. The procurement arrangements and consultant schedules do not appear to overtax CARDI's limited capacity. The technical improvements need to be the leading performance edge of the Project by which the final worth of all other activities is judged. Provisions have been made in the Project's management and monitoring plan to assure an appropriate balance is maintained, with the final criteria always being long-term farm level agriculture productivity improvements.

The FSR Project as currently designed has sufficient resources, an appropriate organization structure and a workable management plan to assure a high probability of implementation success.

In summary, the assessment concludes that the FSR/D Project is now feasible from an administrative perspective. A final note of caution, is in order, however. Projects represent evolving sets of activities and processes and are subject to continual changes in this internal and external environment. Thus, administrative feasibility issues are not once and for all considered and then put to rest. Rather, they must be continuously monitored and dealt with on a day-to-day basis.

VIII. CONDITIONS AND COVENANTS

In addition to the essential conditions contained in the Project Authorization, the following Conditions and Covenants have been developed and will be included in the Project Agreement:

Conditions Precedent for Initial Disbursement

(a) Evidence that a Project Manager has been designated with appropriate delegations of authority to effectively implement the project; and

(b) Final Project close-out reports for the Small Farm Multiple Cropping Systems Project (538-0015) will be submitted.

Conditions Precedent for Disbursement for Personnel Expenses

Except for financial management staff, prior to any disbursement under the Grant, or to issuance by AID of documentation pursuant to which disbursement will be made for personnel, the Grantee will, except as AID may otherwise agree in writing, submit for AID approval the names, qualifications and proposed worksite and job description for all professional personnel.

Conditions Precedent for Disbursement for Expenses Other Than Technical Assistance

Prior to disbursement under the Grant for activities other than technical assistance and Financial Management Staff, or to the issuance by A.I.D. of documentation pursuant to which disbursement will be made, the Grantee will, except as the Parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

(a) evidence that a suitable accounting system is in place to handle Project funds; and

(b) a workplan for the first year of the Project. The workplan should contain a detailed implementation plan and budget for all components of the Project.

Conditions Precedent for Disbursement Subsequent to Year One

Prior to disbursement for activities subsequent to the first year of the Project the Grantee will, except as AID may otherwise agree in writing, submit to AID a yearly workplan detailing the activities to be undertaken for the subsequent twelve month period.

Covenants

1. Pesticides: The Grantee covenants that prior to initiation of the procurement of any pesticide to be financed under the Project, the Grantee will inform AID in writing of the proposed procurement and use of the pesticide, including a detailed description of how the pesticide will be used and the safeguards to be followed, and shall obtain the written approval of AID prior to initiation of procurement procedures of the pesticides.

2. Agricultural Activities: The Grantee covenants that in carrying out Project activities under this Agreement, the Grantee should avoid Projects or activities which would cause or threaten serious injury to the production, marketing, or pricing of United States agricultural commodities or products. Exports of agricultural commodities or products should not be supported using such funds, if the issue of serious harm or threat thereof from such exports has been raised by AID, until the matter has been reviewed and discussed by AID and the Grantee. Both AID and the Grantee should keep each other informed of activities which appear to involve the potential for such harm.

3. Adequate Staffing: The Grantee covenants that it will provide adequate staff to work with all technical assistance provided under the Project.

4. Grantee Contribution: The Grantee covenants to make available, on a timely basis, its local currency contribution as specified in Annex I to this Agreement.

5. Per Diem: The Grantee covenants that per diem expenses to be reimbursed or paid under the Grant shall not exceed those which AID pays to its employees pursuant to its established regulations.

6. Research Advisory Board: The Grantee covenants to establish, in a timely fashion, a Research Advisory Board, with duties and membership acceptable to A.I.D.

ANNEXES

TABLE OF CONTENTS

	<u>PAGE</u>
A. <u>Logical Framework</u>	1 - 4
B. <u>PID Guidance Cable</u>	5 - 7
C. <u>Letter of Application</u>	8 - 11
D. <u>Statutory Checklist</u>	12 - 22
1. Project Checklist	12 - 19
2. Standard Item Checklist	20 - 22
E. <u>Technical Analysis</u>	23 - 63
I. CARDI's Farming Systems Research and Development Methodology	23 - 40
II. Research Priorities For the CARDI FSR/D Program	41 - 63
F. <u>Social Analysis</u>	64 - 95
I. Social Cultural Setting of Small Farm Agriculture in the Eastern Caribbean	64 - 87
II. Social Soundness of FSR/D Project	88 - 95
G. <u>Financial Analysis</u>	96 -118
H. <u>Administrative Analysis</u>	119 -149
I. Assessment of Current Institutional Capacity and Performance	119 -134
II. Feasibility of FSR/D Project Organization and Management Plan	135 - 138
Appendix I - Statement of Recommendations For Improvement of Procedures	139 - 144
Appendix II - CARDI Management Audit: Executive Summary	145 - 149

97

APPENDIX 1

LOGICAL FRAMEWORK SUMMARY
CARDI FARMING SYSTEMS RESEARCH AND DEVELOPMENT PROJECT

<u>Narrative Summary</u>	<u>OVI'S</u>	<u>MOV'S</u>	<u>External Conditions/Assumptions</u>
<u>Goal</u>			<u>Purpose to Goal</u>
To improve the economic and social well-being of small and medium commercial farm households in CARICOM countries through an increase in the production of agricultural commodities and the generation of agricultural employment.	1. Gross Domestic Product from crops and livestock increases in CARICOM countries. 2. Dependency on food imports decreases particularly from extra-regional sources. 3. Net farm incomes and productive employment increase for small and medium farmers. 4. Farm family nutrition improves. 5. Increase in exports of agricultural commodities between CARICOM countries.	1. Agriculture Statistics. (regional and country). 2. Agriculture statistics (regional and country). 3. Country farm surveys. 4. Country farm surveys. 5. Agri. statistics (regional & country)	1. Drastic shifts in international economic policies and markets do not occur. 2. Macro agro-climatic changes do not seriously impede with island and between island transfer of FSR/D generated technological improvements. 3. The availability of agricultural inputs (credit, farm implements, seeds, information expands in response to increasing farmer demand. 4. Additional Caribbean countries and research institutions decide to incorporate the CARDI FSR/D methodology. 5. The governments of the Eastern Caribbean continue farming systems development programs. 6. The policy environment encourages private sector investment in profitable, research identified agricultural ventures.
<u>Purpose</u>	<u>End of Project Status (EOPs)</u>		<u>Output to Purpose</u>
To develop an effective and sustainable Farming Systems Research and Development Program in CARDI that responds to the agricultural needs of participating countries.	1. By mid 1988, up to of 15% of island farming households in a given recommendation domain will have adopted FSR/D technological improvements which prove feasible in applicability testing. 2. Ministry of Agriculture Extension Departments are supporting FSR/D efforts by continuing to provide extension staff and by conducting mass technology transfer campaigns for technological improvements which prove feasible in applicability testing. 3. Farm level information	1. Country farm household surveys. 2. Country Ministry of Agriculture Records. 3. Regional and Country level	1. Agricultural inputs such as credit and seed required for initial adaption of Technological improvements are available. 2. Natural disasters do not seriously disrupt the validation and mass transfer of technological improvements. 3. The USAID supported UWI Extension and CATCO marketing are implemented as planned. 4. CARDI, after year 2 of the project, attracts additional donor funding in support of its FSR/D Program. 5. CARDI continues to improve operations and services.

111

Narrative Summary

MOA'S

MOA'S

External Conditions/Assumptions

Purpose

End of Project Status (EOPS)

Output to Purpose

generated by the FSR/D process will be used by and be having a substantial influence on the policy making and project planning/implementation of participating country public officials, donor organizations and private enterprises.

4. CARDI's regional and international image in adaptive research will improve as evidenced by country requests for FSR/D related research and international invitations to describe the FSR/D methodology and experience.
5. CARDI, by decision of its Board of Directors will be core funding FSR/D program staff at headquarters, sub-regional and country levels.

institutional analysis.

4. Regional institutional viability analysis.

5. CARDI financial records.

Outputs

1. Economically viable farm level technological improvements (TI's) in crops, livestock and crop/livestock combinations are generated, farm-tested and farm-validated.

1a. A FSR/D methodology for selecting potentially viable technological improvements and validating them at the farm level (as adapted to various country conditions) is refined, documented, and disseminated.

1b. At least 50% of MOA research personnel in each island, 75% of CARDI's staff have learned the FSR/D methodology by participating in seminars, workshops and formal training action training programs. Training is also provided for MOA and CARDI staff from other Caribbean islands.

1c. Minimum targets for various stages of the FSR/D process are as follows:
* Technology Screening (step 5) - 6 per island

1a. CARDI FSR documents and field surveys.

1b. CARDI and MOA records.

1c. Technology Improvement Files (TIP's) and FSR/D project records.

Input to Output

CARDI able to recruit and retain high-quality personnel for FSR/D positions.
2. Ministry of Agriculture in participating countries assign an adequate number of qualified research and extension staff to work on CARDI country FSR/D teams.
3. CARDI and MOA personnel from other Caribbean countries have adequate funding to attend CARDI-sponsored workshops and training sessions.
4. CARDI's Board of Director's continues to support a policy of decentralization and the strengthening of CARDI's overall institutional system.

5. CARDI provides the required counterpart staff to work with and learn with the institutional strengthening consultants.

Narrative Summary

OVI'S

MOV'S

External Conditions/Assumptions

Outputs

Input to Output

during each of last four years of project - 120 total.

* On-Farm Testing (step 9) - 3 per island during each of last three years of project - 42 total.

* On-Farm Validation (step 10) - 4 per island during each of last two years of project - 56 total.

* At least 2 of the On-Farm Validation trials will include livestock.

1d. The ratio of farmer participants between on-farm validation trials and on-farm testing of alternatives will be at least 3 to 1; and the ratio of adopters to participants in on-farm validation trials will be at least 5 to 1.

2a. A systematic approach for transferring (adapting and validating) technological improvements to farmers in fairly homogeneous recommendation domains is developed jointly with MOA, CAEP and related personnel.

2b. At least 25% of MOA extension personnel and selected private sector representatives in each island by CARDI.

2c. By year 5 of the project, applicability testing by the extension services will be completed for 56 technological improvements.

3a. By mid-1985, a decentralized FSR/D Program (with project management and information system capabilities) oriented to all countries in the East Caribbean be established and operating.

3b. By 1984, CARDI's structure and

1d. Technology Improvement Files (TIF's) and FSR/D project records.

2a. CARDI FSR/D documents.

2b. CARDI and MOA documents.

2c. MOA Extension Service Records.

3a. CARDI and MOA records.

3b. CARDI and MOA records.

1. Economically viable farm level Technological Improvements (TIF's) are systematically transferred to extension agents, private enterprises, and farmers participating in applicability testing.

3. CARDI's decentralized FSR/D Program is developed and strengthened, along with the headquarters structure and administrative systems required to support and sustain it.

6. Qualified Technical staff are available for CARDI FSR/D Project positions.

Narrative Summary

OVI'S

NOV'S

External Conditions/Assumptions

Outputs

Input to Output

administrative systems
(personnel, financial, etc.)
in support of
decentralized FSR/D Program
operations in the East
Caribbean will be
substantially strengthened.

Activities

Inputs (Project Costs)

(\$000)

Preconditions

	<u>AID</u>	<u>CARDI</u>	<u>MOA</u>	<u>TOTAL</u>
Personnel Costs	1,890	3,240	770	5,855
Equipment and Supplies	1,110			1,110
Operating Expenses	950	880	110	1,940
Travel	400	100		500
Technical Assistance	1,960			1,960
Training	390			390
Evaluation	300			300
TOTAL	7,000	4,220	860	12,100

1. CARDI and Board agree to
FSR/D project design
including Conditions
Precedent and Covenants.

11

ACTION AID INFO AMB DCM CFION

JAN 24 1983

PPJLVZCZCWA0007
PP RUEKWW
DT RUEKWW #0128/01 0220545
ZNY
P 211341Z JAN 83
FM SECSTATE WASHDC
TO AMEMBASSY BRIDGETOWN PRIORITY 0982
BT
UNCLAS STATE 020128

22 JAN 83
TOR: 0552
CN: 01832
CHRG: AID

ALM AID

E.O. 12356: N/A

TAGS:

SUBJECT: DAEC REVIEW OF EASTERN CARIBBEAN FARMING
SYSTEMS RESEARCH AND DEVELOPMENT PID

REFERENCES: (A) STATE 288428; (B) STATE 122247

1. SUBJECT REVIEW HELD ON JANUARY 17, 1983. PID IS
HEREBY APPROVED AND MISSION IS AUTHORIZED TO PROCEED WITH
INTENSIVE REVIEW SUBJECT TO THE FOLLOWING GUIDANCE.

2. NATIONAL PERSONNEL AND INSTITUTIONS: CONCERN
EXPRESSED AT THE DAEC REVIEW ABOUT THE ROLE OF LOCAL
MINISTRY PERSONNEL ON COUNTRY TEAMS (CTS) WHICH ARE TO BE
ESTABLISHED ON EACH PARTICIPATING ISLAND UNDER THE
PROJECT. DURING INTENSIVE REVIEW, MISSION SHOULD ASSESS
HOW BEST TO STRUCTURE THE CTS TO ENSURE THAT LOCAL -
INVOLVEMENT IS MEANINGFUL; THAT LOCAL RESEARCH
CAPABILITIES AND EXPERIENCE ARE STRENGTHENED, IF AND TO
THE EXTENT POSSIBLE AND DESIRABLE; AND THAT NATIONAL
PERSONNEL AND INSTITUTIONS ARE APPROPRIATELY LINKED TO
CARDI TO INCREASE LIKELIHOOD OF CONTINUED, COORDINATED,
AND SUCCESSFUL RESEARCH ACTIVITIES. PP

SHOULD OUTLINE THE NATURE OF THE STRUCTURE DECIDED UPON
AND INDICATE THAT THESE STRUCTURES ARE CONSONANT WITH THE
ABOVE OBJECTIVES OR ARE OTHERWISE APPROPRIATE UNDER THE
CIRCUMSTANCES.

3. BUDGET AND FINANCE:

--A. ADMINISTRATIVE COSTS - CONCERN EXPRESSED THAT
CONTINUATION OF PROJECT SUPPORT ACTIVITIES AFTER
TERMINATION OF A.I.D. PROJECT WOULD BE DEPENDENT ON
COUNTRY SUPPORT. AS WAS DONE FOR PERSONNEL COSTS,
MISSION SHOULD ATTEMPT TO DEVELOP BUDGET SO THAT CARDI
WOULD BE UP AN INCREASING PERCENTAGE OF THE
ADMINISTRATIVE COST PORTION OF THE BUDGET, OVER THE LIFE
OF PROJECT, AND THE ENTIRE PORTION AFTER PROJECT
TERMINATES. IF FULL ADMINISTRATIVE COST ABSORPTIONS
CANNOT BE NEGOTIATED, PP SHOULD INDICATE HOW BALANCE OF
FUTURE ADMINISTRATIVE COSTS WILL BE FUNDED.

ACTION	INFO
ASK	
DIR	✓
A/DIR	✓
PROC	
ECON	
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RLA	
CCO	
AGRI	
EDUC	
HLTH	
JAO	
DUE: 1/25/83	
TAKEN:	
SIGN:	

98

CARDI FINANCIAL CONTRIBUTIONS - IN DEVELOPING FINAL PROJECT BUDGET FIGURES, MISSION SHOULD INCLUDE ONLY THOSE FINANCIAL CONTRIBUTIONS OF CARDI WHICH ARE ASSOCIATED WITH THE A.I.D.-SUPPORTED PROJECT. FOR EXAMPLE, ONLY THAT PORTION OF CORE STAFF SALARIES DIRECTLY ATTRIBUTED TO THE A.I.D. PROJECT SHOULD BE INCLUDED AS A CARDI CONTRIBUTION TO THE PROJECT.

4. AGRIBUSINESS R & D FUND: PID AND SUBSEQUENT DISCUSSION IN DAEC DID NOT ADEQUATELY EXPLAIN THE PURPOSE AND NEED FOR THE PROPOSAL THAT CARDI PROVIDE R&D SERVICES TO THE PRIVATE SECTOR ON A SUBSIDIZED BASIS. DURING INTENSIVE REVIEW, THE MISSION SHOULD FURTHER ANALYZE THE NEED FOR SUCH AN APPROACH, AND IF IT STILL SEEMS DESIRABLE, THE JUSTIFICATION AND SPECIFIC CRITERIA AND GUIDELINES FOR SUCH AN OPERATION SHOULD BE SET FORTH IN THE PP. EVEN IF THE SUBSIDIZED R&D APPROACH IS RETAINED, NO JUSTIFICATION OR NEED IS SEEN FOR USING AID RESOURCES AS A FUND TO PAY THE SUBSIDY. TO THE EXTENT THAT SERVICES ARE PERFORMED BY REGULAR CARDI STAFF, THESE REPRESENT COSTS WHICH HAVE ALREADY BEEN FUNDED, EITHER BY THIS PROJECT OR OTHER CONTRIBUTIONS TO CARDI. ANY NEW COSTS, INCURRED BY CARDI FOR A PARTICULAR R&D PROJECT, SHOULD BE A RELATIVELY LESS SIGNIFICANT ELEMENT OF TOTAL PROJECT COSTS, AND THEREFORE PRESUMABLY COVERED BY PRIVATE BUSINESS CONTRIBUTION. IN OTHER WORDS, EVEN IF CARDI MIGHT DECIDE TO PROVIDE SERVICES ON A SUBSIDIZED BASIS, THIS WOULD NOT APPEAR TO REQUIRE THE ESTABLISHMENT OF A FUND. ACCORDINGLY, UNLESS MISSION HAS OTHER RATIONALE, NOT PRESENTED IN PID OR AT DAEC, FUND SHOULD BE DROPPED FROM PROJECT.

5. PARTICIPATING COUNTRIES: IN DETERMINING APPROPRIATE PARTICIPATION UNDER THE THE PROPOSED PROJECT, THE MISSION SHOULD REVIEW POLICY GUIDANCE PROVIDED BY STATE/AID. REFERENCES CITED ABOVE ARE OF PARTICULAR RELEVANCE.

6. ENVIRONMENT: THE PP SHOULD INCLUDE PROCEDURES FOR ENSURING SAFE USE OF PESTICIDES IN PROJECT AND RESEARCH FOR INTEGRATED PEST MANAGEMENT TECHNIQUES TO REDUCE OVERALL PESTICIDE DEPENDENCY. RECOMMEND RDO/C USE PEST MANAGEMENT EXPERT WHO WILL BE DOING ENVIRONMENTAL ASSESSMENTS ON TWO OTHER RDO/C PROJECTS AND COORDINATE WITH S&T/AGP/FCP, CARROLL COLLIER.

7. SOCIAL ANALYSIS: IN UNDERTAKING THE SOCIAL SOUNDNESS ANALYSIS, THE MISSION SHOULD INCLUDE APPROPRIATE ATTENTION TO, INTER ALIA, THE ROLES OF WOMEN, THE CROPS THEY CULTIVATE, AND THE INTRA-HOUSEHOLD DIVISION OF RESOURCES AND INCOME.

UNCLASSIFIED

STATE 2/2

8. PROJECT APPROVAL: APPROVAL AND AUTHORIZATION OF FINAL PP CAN BE HANDLED IN EITHER OF TWO WAYS:

ANNEX B
Page 3 of 3

--A. IF MISSION WISHES TO INCLUDE FUND FOR PRIVATE SPONSORSHIP WHEN, AT ITS OPTION, MISSION SHOULD SUBMIT TO AID/W AID/W INTERIM REPORT, COVERING POINTS RAISED IN PARA 4 ABOVE (CNCF BUREAU CONCURS, MISSION WOULD THEN BE GRANTED AUTHORITY TO AUTHORIZE PROJECT IN THE FIELD), OR FINAL PP;

--B. IF FUND IS DROPPED, MISSION MAY PROCEED TO APPROVE WITHOUT FURTHER AID/W REVIEW.

PLEASE ADVISE OF MISSIONS PREFERENCE AND TIMING FOR FINALIZATION OF PP.

9. FYI: ALL LAC MISSION FID APPROVALS ARE SUBJECT TO RE-EVALUATION IF POST-PID PROJECT DEVELOPMENT EXTENDS BEYOND ONE YEAR. END FYI. SEULTZ
BT

UNCLASSIFIED

STATE 2/2

Best Available Document

100



CARIBBEAN AGRICULTURAL RESEARCH AND DEVELOPMENT INSTITUTE
UNIVERSITY CAMPUS · ST. AUGUSTINE · TRINIDAD, W. I.

Cables: "CARDINST"
Port-of-Spain
Telephone: 663-5511

OFFICE OF THE EXECUTIVE DIRECTOR

Our Reference:

June 8, 1983

Mr. William B. Wheeler
Mission Director
Agency for International
Development
Regional Development Office/
Caribbean
P.O. Box 302
BRIDGETOWN

Dear Mr. Wheeler:

The purpose of this letter is to make formal application to AID for assistance in a five year program to assist CARUI to develop an effective farming systems research program in the Eastern Caribbean.

The AID support amounting to \$7.0 million in grant funds will assist CARDI with personnel, administrative and operational costs of the program in six LDC's: Antigua, St. Kitts/Nevis, Montserrat, St. Lucia, St. Vincent and the Grenadines and Dominica. In addition to, costs for a livestock feeding program which Barbados will participate in.

The CARDI contribution will amount to approximately \$4,200,000 and will include personnel for CARDI core staff to backstop the farming systems program, as well as, an increasing share of the personnel and administrative costs associated with the program. By the end of the project CARDI will assume all personnel costs and administrative costs associated with the program in the LDC's.

Sincerely,

A handwritten signature in black ink that reads 'J. A. Bergasse'.

J. A. Bergasse
Executive Director

161



*Ministry of Agriculture, Food
and Consumer Affairs*

P.O. Box 505, Graeme Hall, Christ Church, Barbados

Our Ref:

Your Ref:

Tel: 84150/

1983-06-06

Dear Sir:

At the Special Meeting of the Standing Committee of Ministers responsible for Agriculture held in Barbados on May 10-12, 1983, the Ministers agreed that "A Regional Institute for Applied Agricultural Research and Development is necessary and that CARDI properly structured, staffed, managed and financed would be able to perform these functions."

2. With respect to funding and the Work Programme of the Institute, the Ministers agreed inter alia that "in order to ensure the operational effectiveness of the Institute the Board of Directors will be charged with the responsibility of keeping the level of core funding within a \$7 000 000 limit annually over the next three years and that the Work Programme should be re-designed to make the most efficient use of available funds, due account being taken of the availability of external funding."

3. The Ministers also examined the need to institute management systems and controls and instructed the Board of Directors "to institute proper management and control systems and procedures by the end of 1983".

/4. . . .

Mr. William Wheeler
United States Agency
for International Development
Gulf House
Broad Street
BRIDGETOWN

ACTION	FILED
DIR	✓
ADP	✓
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CD	✓
AC	
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JAO	
DUP	07/14/83
TAKEN	
SIGN	

102

Mr. William Wheeler
United States Agency
for International Development

1983-06-06

4. A meeting between the Chairman of the Governing Body, the Chairman of the Board of Directors and the Executive Director was held to discuss how the Ministerial mandates would be effected.

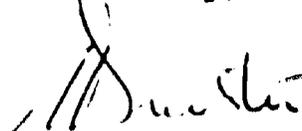
5. The meeting decided that the first priority in the reorganization of the Institute was that a firm of consultants would need to be selected to examine the current organizational systems and to recommend new systems which the consultants would then assist management in putting into place. The terms of reference for the consultants are attached.

6. I refer to the Ministers' decisions that the systems be put in place by the end of 1983. In order to fulfill this mandate it would be necessary to execute the consultancy contract over the four months period August to November, 1983.

7. The Institute is not currently in a financial position to provide funds for this consultancy contract. Consequently, I am hereby making an urgent request to you to finance the cost of this consultancy from any funds at your disposition. In order to meet the established deadlines and recognizing the resultant time constraints, I would appreciate a prompt response to this request.

With thanks for your co-operation.

Yours faithfully,


R. L. OUELLET
MINISTER

TERMS OF REFERENCE

PHASE I:

Develop a Project Preparation, Approval and Evaluation System including a Project Management and Documentation System

- (1) A recruitment and performance approval system
- (2) Clerical and paper work systems
- (3) A communication and management information system
- (4) Proper accounting systems including standard policies, guidelines and procedures
- (5) An internal audit function

PHASE II:

- (1) Develop a Project Preparation, approval and evaluation system including a Project management and documentation system
- (2) Undertake a formal job evaluation exercise to establish a proper classification system with an appropriate salary structure
- (3) Prepare job descriptions for all employees and a compensation package to meet the Institute's requirements
- (4) Prepare a job manual on the basis of these
- (5) Prepare a Procedures Manual

Assist the management of CADI in the implementation of the above.

104

PROJECT CHECKLIST

Listed below are statutory criteria applicable generally to projects under the FAA and project criteria applicable to individual funding sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Funds.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP-TO-DATE? HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

A. GENERAL CRITERIA FOR PROJECT

1. FY 1982 Appropriation Act Sec. 523; FAA Sec. 634A; Sec. 653(b).

- (a) Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project;
- (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that amount)?

A Congressional Notification has been forwarded to Congress

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance? **Yes**

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance? **N/A**

4. FAA Sec. 611(b); FY 1982 Appropriation Act Sec. 501. If for water or water-related land **N/A**

105

resource construction, has project met the standards and criteria as set forth in the Principles and Standards for Planning Water and Related Land Resources, dated October 25, 1973?

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project? N/A

6. FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. This is a regional project

7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) The primary thrust of the Project is to increase the productivity and production of the agricultural sector in the Eastern Caribbean

strengthen free labor unions.

8. FAA Sec. 601(b).
Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).
Project will broaden the scope of CARDI's efforts and assist in addressing problems of agricultural sector as a whole. Consistent increases in production and productivity could establish stronger ties with U.S. private sector for increased input supplies and for other complementary goods and services
9. FAA Sec. 612(b), 636(h); FY 1982 Appropriation Act Sec. 507. Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.
CARDI and host governments will contribute at least 25% of the total project costs. Local currencies will be used for the extent possible for West Indian consultancies and for the provision of other goods and services
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?
No
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?
Yes
12. FY 1982 Appropriation Act Sec. 521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the
No

107

resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?

13. FAA 118(c) and (d).
Does the project take into account the impact on the environment and natural resources? If the project or program will significantly affect the global commons or the U.S. environment, has an environmental impact statement been prepared? If the project or program will significantly affect the environment of a foreign country, has an environmental assessment been prepared? Does the project or program take into consideration the problem of the destruction of tropical forests?

IEE was prepared for the PID
A negative determination was recommended and approved

14. FAA 121(d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (dollars or local currency generated therefrom)?

N/A

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

- a. FAA Sec. 102(b), 111, 113, 281(a). Extent to which activity will (a) effectively involve the poor in development, or

Project will indirectly assist rural poor by increasing productivity in agriculture, previously among small and medium farmers

103

extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

b. FAA Sec. 103, 103A 104, 105, 106. Does the project fit the criteria for the type of funds (functional account) being used?

Yes

c. FAA Sec. 107. Is emphasis on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses,

Yes

The FSR approach to be utilized in the project will directly involve the small farmer in the development process. The basic thrust of the Project is to increase small farmer productions, research in labor saving tools and methods will be designed to have impact in making agriculture more desirable to rural populations, especially younger people

109

and small incomes of the poor)?

d. FAA Sec. 110(a). Will Yes
the recipient country
provide at least 25% of
the costs of the program,
project, or activity
with respect to which the
assistance is to be
furnished (or is the
latter cost-sharing
requirement being waived
for a "relatively least
developed" country)?

e. FAA Sec. 110(b). N/A
Will grant capital
assistance be disbursed
for project over more
than 3 years? If so, has
justification
satisfactory to Congress
been made, and efforts
for other financing, or
is the recipient country
"relatively least
developed"?

f. FAA Sec. 122(b). Does Yes
the activity give
reasonable promise of
contributing to the
development of economic
resources, or to the
increase of productive
capacities and
self-sustaining economic
growth?

g. FAA Sec. 281 (b).
Describe extent to which
program recognizes the
particular needs,
desires, and capacities
of the people of the
country; utilizes the
country's intellectual
resources to encourage
institutional
development; and supports
civil education and
training in skills
required for effective
Project supports the institutional
development and stated programs of
CARDI. CARDI's mandates include
decentralization of activities to
contribute to the agricultural
development of the Region.

participation in
governmental processes
essential to
self-government.

2. Development Assistance Project
Criteria (loans Only)

a. FAA Sec. 122(b). Information and N/A
conclusion on capacity of
the country to repay the
loan, at a reasonable
rate of interest.

b. FAA Sec. 620(d). If N/A
assistance is for any
productive enterprise
which will compete with
U.S. enterprises, is
there an agreement by the
recipient country to
prevent export to the
U.S. of more than 20% of
the enterprise's annual
production during the
life of the loan?

c. ISDCA of 1981, Sec. 724
(c) and (d). If for N/A
Nicaragua, does the loan
agreement require that
the funds be used to the
maximum extent possible
for the private sector?
Does the project provide
for monitoring under FAA
Sec. 624(g)?

3. Project Criteria Solely for
Economic Support Fund

a. FAA Sec. 531(a). Will N/A
this assistance promote
economic or political
stability? To the extent
possible, does it reflect
the policy directions of
FAA Section 102?

b. FAA Sec. 531(c). Will N/A
assistance under this
chapter be used for
military, or paramilitary
activities?

c. FAA Sec. 534. Will ESF N/A
funds be used to finance
the construction of the
operation or maintenance
of, or the supplying of
fuel for, a nuclear
facility? If so, has the
President certified that
such use of funds is
indispensable to
nonproliferation
objectives?

d. FAA Sec. 609. If N/A
commodities are to be
granted so that sale
proceeds will accrue to
the recipient country,
have Special Account
(counterpart)
arrangements been made?

5C(3) - STANDARD ITEM CHECKLIST

Listed below are statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the Agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of goods and services financed. Yes

2. FAA Sec. 604(a). Will all commodity procurement financed be from the U.S except as otherwise determined by the President or under delegation from him? Yes

3. FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will agreement require that marine insurance be placed in the U.S. on commodities financed? N/A

4. FAA Sec. 604(e). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity? N/A

5. FAA Sec. 608(a). Will U.S. Government excess personal property be utilized wherever practicable in lieu of the procurement of new items? Yes

6. FAA Sec. 603. (a) Compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 percentum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S.-flag commercial vessels to the extent that such vessels are available at fair and reasonable rates. Yes

7. FAA Sec 621. If technical assistance is financed, will such assistance be furnished to the fullest extent practicable as goods and professional and other services from private enterprise on a contract basis? If the facilities of other Federal agencies will be utilized, are they particularly suitable, Yes

not competitive with private enterprise, and made available without undue interference with domestic programs?

8. International Air Transport Fair Competitive Practices Act, 1974. Yes
If air transportation of persons or property is financed on grant basis, will provision be made that U.S.-flag carriers will be utilized to the extent such service is available?
9. FY 79 App. Act. Sec. 105. Does the contract for procurement contain a provision authorizing the termination of such contract for the convenience of the United States? Yes

B. Construction

1. FAA Sec. 601(d). If a capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interest? N/A
2. FAA Sec. 611(e). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable? N/A
3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed \$100 million? N/A

C. Other Restrictions

1. FAA Sec. 122(e). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter? N/A
2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights? N/A
3. FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foreign aid projects or activities of Communist-bloc countries, contrary to the best interests of the U.S.? Yes
4. FAA-Sec. 636(i). Is financing not permitted to be used; without waiver, for purchase, long-term lease, or exchange of motor vehicle manufactured outside the U.S., or guaranty of such transaction? Yes

114

5. Will arrangements preclude use of financing? **Yes**
- a. FAA Sec. 104(f). To pay for performance of abortions or to motivate or coerce persons to practice abortions, to pay for performance of involuntary sterilization, or to coerce or provide financial incentive to any person to undergo sterilization? **Yes**
- b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property? **Yes**
- c. FAA Sec. 660. To finance police training or other law enforcement assistance, except for narcotics programs? **Yes**
- d. FAA Sec. 662. For CIA activities? **Yes**
- e. FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained? **Yes**
- f. FY 1982 Appropriation Act, Sec. 503. To pay pensions, annuities, retirement pay, or adjust service compensation for military personnel? **Yes**
- g. FY 1982 Appropriation Act, Sec. 505. To pay U.N. assessments, arrearages or dues? **Yes**
- h. FY 1982 Appropriation Act, Sec. 506. To carry out provisions of FAA section 209(d) (Transfer of FAA funds to multilateral organizations for lending? **Yes**
- i. FY 1982 Appropriation Act, Sec. 510. To finance the export of nuclear equipment, fuel, or technology or to train foreign nationals in nuclear fields? **Yes**
- j. FY 1982 Appropriation Act, Sec. 511. Will assistance be provided for the purpose of aiding the efforts of the Government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights? **No**
- k. FY 1982 Appropriation Act, Sec. 515. To be used for publicity or propaganda purposes within U.S. not authorized by Congress? **No**

TECHNICAL ANALYSIS

PART I - DETAILED DESCRIPTION OF CARDI'S FARMING SYSTEMS RESEARCH & DEVELOPMENT METHODOLOGY

A. CARDI's Approach To Farming Systems Research

The Caribbean Agricultural Research and Development Institute (CARDI) was established in 1975 to serve the agricultural research and development needs of the 12 member countries of the Caribbean Community. The objectives of the Institute are (1) to provide for the research and development needs of the agriculture of the region as identified in national plans and policies; (2) to provide an appropriate research and development service to the agricultural sector of member states; (3) to provide and extend the application of new technologies in production, processing, storage and distribution of agricultural products of member states; (4) to pursue for specified periods long-term research in pertinent areas; (5) to provide for the coordination and integration of the research and development efforts of member states where this is possible and desirable; (6) to undertake teaching functions normally at the post-graduate level, limited to the development of the relevant research by any member state; and (7) to seek to achieve the optimum decentralisation of facilities.

CARDI was structured like most traditional agricultural research institutes and was conducting research along disciplinary and commodity lines. In 1978 with AID assistance, CARDI initiated the Small Farm Multiple Cropping Systems Research Project. The primary purpose of the project was to improve small holders' farming systems through the development of management and production recommendations which farmers could and would use, extension agents could explain, and credit institutions would finance. The project was fundamentally an adaptive research project where proven technology was to be introduced into the farm systems to enhance farm productivity.

The first activity undertaken was a reconnaissance survey in eight territories to identify the location of small farmers according to size of holdings, number of parcels and major farming enterprises. One of the first problems encountered was that in some territories there were no recent or existing farmers' register from

which an appropriate sample could be selected. The concept of a small farmer varied from island to island. Further, the ministry of agriculture in one territory laid down certain criteria for the selection of farmers in the absence of a register which did not allow for a random sample to be drawn. In another territory, because of certain circumstances beyond CARDI's control, certain districts in the island were left out of the population from which a sample was drawn.

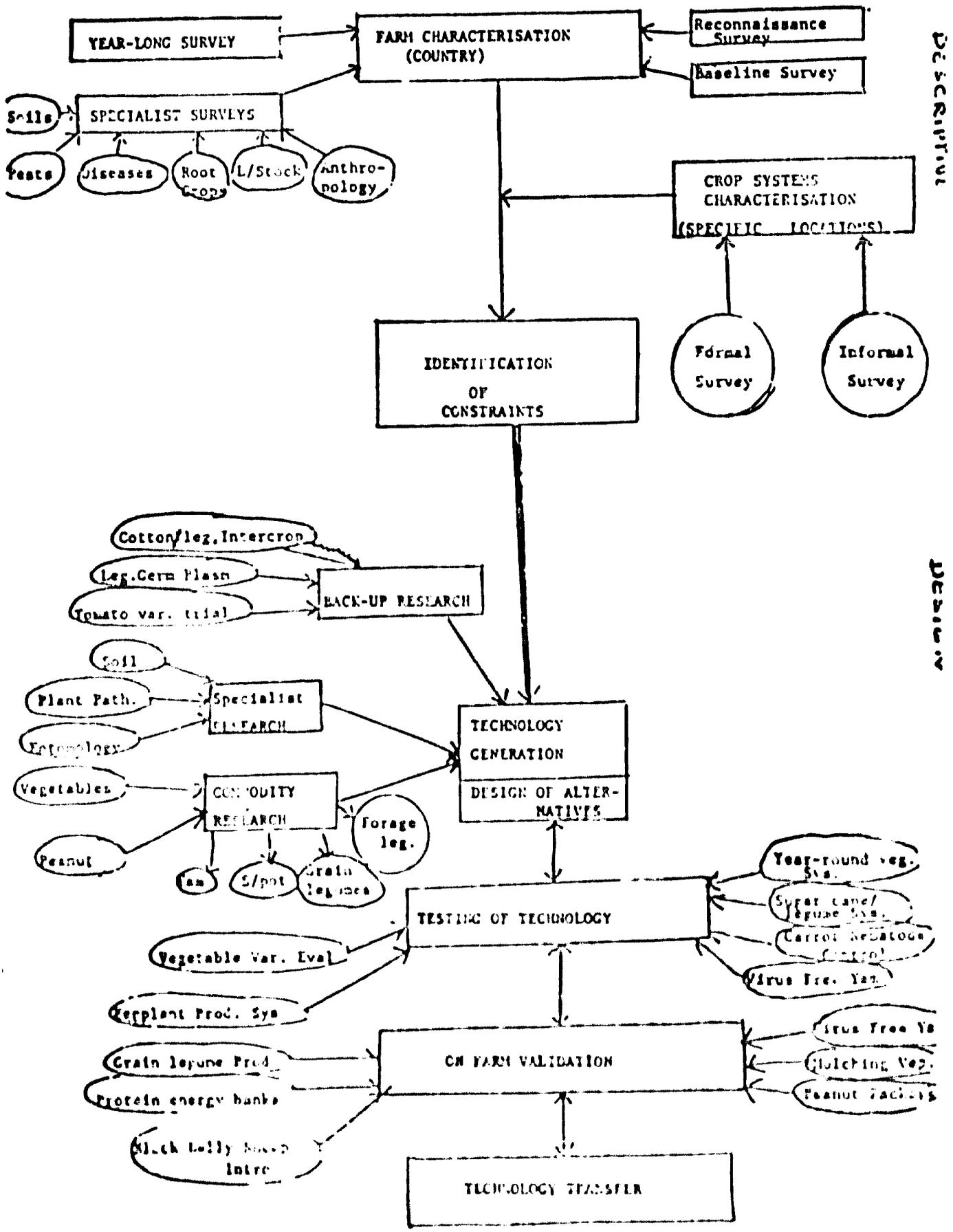
Further, although the project was to deal with multiple cropping systems, the reconnaissance surveys indicated that the livestock component in the small farm milieu could not be ignored. Thus, the project was directed to a holistic farming systems approach as illustrated in Figure 1. CARDI researchers conceived a farming system to be a complex interaction between the physical, socio-economic and political environments, the available production resources at the farm level, and the farm household. A farming system evolves to meet the self fulfillment of farmers aspirations within a specific community environment.

The unavailability of secondary agro-socio-economic data considered essential for a farming systems analysis necessitated the conduct of one-shot baseline surveys on an island basis. Initially, these surveys were conducted by the University of the West Indies and did not involve CARDI, who were to work on subsequent stages of the project. The project staff were not familiar with the circumstances of farmers at the outset and this delayed the learning process on the part of the researchers which is vital in farming systems work.

However, the results derived from the baseline surveys provided criteria for the selection of a sub-set of 25 farmers per territory who participated in a long term monitoring exercise. The criteria were: (a) farmers between 25 and 65 years of age; (b) farmers with 1 to 3 parcels of land; (c) reasonable access to farm holdings and; (d) cooperativeness of farmers.

The sub-sets of farms in each territory were visited at weekly intervals and monitoring continued for about one year. These surveys were 'whole farm' in that data were collected on all aspects of the farming systems as well as certain non-farm activities. Several problems arose during this exercise. There were misinterpretations on definitions leading to variations in the data collected by different interviewers. Due to the complex nature of the enterprises identified and the minute nature of some, it was very difficult to separate the inputs and the outputs of several components in an enterprise.

FIGURE 1 - 25 -
SCHEMATIC DIAGRAM OF MAJOR COMPONENTS OF SMALL FARM MULTIPLE
CROPPING SYSTEMS RESEARCH PROJECT #538-0015



The sheer volume of data collected led to delays at the country level in the preparation of the data for computerisation at headquarters. Time lags occurred in the return of data central processing unit to the country teams which did not allow for the proper identification of constraints before interventions were designed. Many of the difficulties encountered in the data collection exercise were rectified by the introduction of a new system which involved pre-coding of data, rapid checking and processing with the establishment of a data management sub-unit within the project.

The results of these activities described led to the identification of constraints and opportunities on crop and livestock systems on an island or regional basis. The nature of the research undertaken varied from country to country depending on the problems identified and the 'body of knowledge' existing to alleviate the problems. Thus in some cases, on-farm testing of shelf technology was conducted, e.g. virus-free yam in St. Lucia, and commodity research activities led to the testing of a package of practices in peanut production in St. Vincent. In other cases, because of the absence of existing knowledge, the generation of new technologies had to be carried out by back-up research activities at the country level, e.g. cotton/legume intercropping evaluations in Nevis. In addition, on-farm validation of known, proven and tested technologies were conducted, e.g. protein/energy banks for livestock in Montserrat and mulching of vegetables in Antigua.

The conduct of the research was confined to the farmers who originally participated in the detailed year long monitoring and it was thus difficult to obtain adequate replication of some experiments. The experiments were not confined to clearly defined agro-ecological zones. In order to develop more relevant technologies and to effect faster transfer of technologies to a wider group of farmers, each country was divided into tentative recommendation domains on the basis of natural conditions -- rainfall, number of dry months, topography and soils. These domains were further refined by taking socio-economic farmer circumstances into consideration. Both formal and informal surveys were conducted in specific locations on a particular cropping system.

The greater amount of project time, devoted to data collected, limited the time spent on actual conduct of on-farm tests. This in turn resulted in a low level of technology generation and adaptation and so precluded the last link in the Farming Systems Research chain, i.e. transfer of technology. The experience gained from this approach to farming systems are being used to refine and modify the approach to this project. More emphasis will be placed on analysis of data collected, design of

on-farm tests, conduct of on-farm tests, and the question of technology transfer will be tackled vigorously. This involves the consideration of establishing formal linkages with extension and support services and their involvement in the Farming Systems Research Approach to be adopted in this project.

B. The Systems Approach

Taking a systems approach to agricultural research and development means conceptualizing agricultural phenomenon as systems. The identification of components that interact to form systems that use inputs to produce outputs is not an arbitrary process. In this complex agricultural scene of the Eastern Caribbean, it is often quite difficult to identify, describe and analyse the agricultural systems that must be understood if alternative technologies are to be recommended.

CARDI's Farming Systems Methodology requires an understanding of the following agricultural systems:

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

2. The Farm System: A farm system is a key sub-system of an island agricultural system. It is composed of a household and a set of agricultural production systems that are controlled by the household. The inputs include the family labor and assets owned by the family plus those items purchased and those provided by nature. A farm system produces and sells agricultural commodities. In addition, part of the output is consumed by the household. Using the cash obtained from selling these outputs, or credit a farm system buys the inputs required for its agricultural production system and the household. Aspects that have not been included as farm system components in the above definition, but which are important factors that affect farm operation, are off-farm work by members of the family and non-agricultural activities (such as running a small store) that may occur within the physical limits of the farm.

3. The Agricultural Production System: This system is a sub-system 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, labour, mechanical energy, animal energy, management, etc. Outputs include desirable commodities such as grain, roots and tubers, fruits, meat, milk, 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 time. All crops and livestock on a farm interact in that they compete for labour, land and capital resources, but sets of crops and/or livestock are grouped together to form a system when they compete biologically (e.g. for sun or soil nutrients, or for the same feed resource) and when farmers manage them as a unit, (e.g. when small plots of different vegetables are planted in one field to which a farmer allocates labour without regard to vegetable species).

System analysis is a process of applying different analytical techniques in order to understand the relationship between a system's structure and its behaviour. Analytical techniques can include simple systems diagrams or graphical techniques, and financial budgeting, or more sophisticated mathematical modelling such as linear programming or simulation analyses. The objective is to explain how inputs are turned into outputs and how the relationships among components affect this process. For example, an analysis of a crop production system may explain how solar radiation, nutrients and water are turned into crop biomass and how the spacing between crops affects yield.

Much of the success of CARDI's Farming Systems programme is dependent on the development of system analysis techniques to analyse agricultural production systems, farm systems and island agricultural systems. This does not mean that all the data used to conduct these analyses must be generated by CARDI scientists. It does mean, however, that the methodology must contain activities to capture the information needed and to analyse this information so that alternatives to farmers' present production systems can be identified and evaluated.

C. Farming Systems Research Methodology

As mentioned above, CARDI has continually refined its

methodology as it has gained experience in farming systems research. The philosophical guidelines that were used to design the original methodology are still important. Some of the key characteristics are:

1. Farmer Participation: The farmer is conceptualised as a member of the FSR/D team. His or her intuitive knowledge of how farming systems and production systems function and the constraints that affect their function are key pieces of information.

2. The Objective is Alternative Production Systems: The technological options that are generated as a result of applying the methodology are alternative management, inputs, components and/or arrangement of components of existing production systems. The output of the research process is not just a production system component, such as a new crop variety or a new veterinary product, but rather alternative set of technological options that encompass the production system as a whole. In some cases the basic change proposed may be only a change in variety; but in most cases changes in other components will be necessary, such as management and other inputs.

3. Evaluation of alternative production systems is based on farm system performance criteria. While the new technology is generated at the production system level, its evaluation is based on how the farm performs. The question is not how does new technology function in isolation, such as on a field station, but rather how does it fit into an existing farm system (is labour available, etc?) and does the farm function better (using the farmer's criteria to define "better") with the alternative or without it?

4. Linkage with other agricultural institutions is essential. To function, the FSR/D methodology requires linkage to commodity and discipline oriented research to receive new technology and to give information as to the type of component research that should be done; linkage to agricultural policy institutions to receive information on credit, marketing, etc. and to give recommendations on possible policy changes; and linkages with extension institutions to receive information on farm level constraints and to give assistance in farmer evaluation of alternative technology and technology transfer.

The detailed FSR/D methodology contains 11 sets of activities. A key activity is that of "design of alternatives". The first 7 activities come together to allow the design of alternatives. The last 3 activities involve the testing and

transfer of the technological improvements that are produced during the design activities. Each of the 11 activity sets are discussed below. Figure 2 presents the methodology in Flow Chart form.

1. Area And Target Farmer Selections

The Country Team in each territory, together with Ministry of Agriculture decision makers, will select target areas and target groups of farmers. The team will then divide the target areas into sub-areas which may be based on communities to establish the outlines of the area to conduct the research. The team will divide the target area or target group of farmers into sub-sets according to common physical, biological and socio-economic characteristics. Such a classification leads to the establishment of a certain amount of homogeneity. This classification of farmers into 'Recommendation Domains' makes the cost-effectiveness of research more likely since results of on-farm tests conducted are likely to be applicable to farmers with similar circumstances. Recommendation domains are determined by the variations in farmer circumstances. They may be determined by variations in natural circumstances such as rainfall, soils, topography. Thus distinct agro-ecological zones in an island may be a recommendation domain. However, these agro-ecological zones may be further modified by socio-economic circumstances that will produce different recommendation domains. The country team by working within homogeneous units will be able to develop improved technologies for farmers operating under similar circumstances.

The number and locations of research areas in the various domains established will be dependent on the heterogeneity of the area, size of the areas to be covered, the number of farmers per area and the available physical, human and financial resources.

2. Initial Reconnaissance

When the target area has been identified and the type of farmers that the project hopes to impact has been selected, the next step is to do a rapid reconnaissance. Different institutions have used different techniques to do this reconnaissance. Some do relatively structured short surveys, others send out a multidisciplinary team with the objective of qualitatively describing the agricultural systems in the area, and others send out multi-disciplinary teams to ask questions related to their own discipline. Techniques to be used by CARDI will depend on availability of human resources, the complexity and homogeneity of the farming systems, and the amount of time available.

FIGURE 2

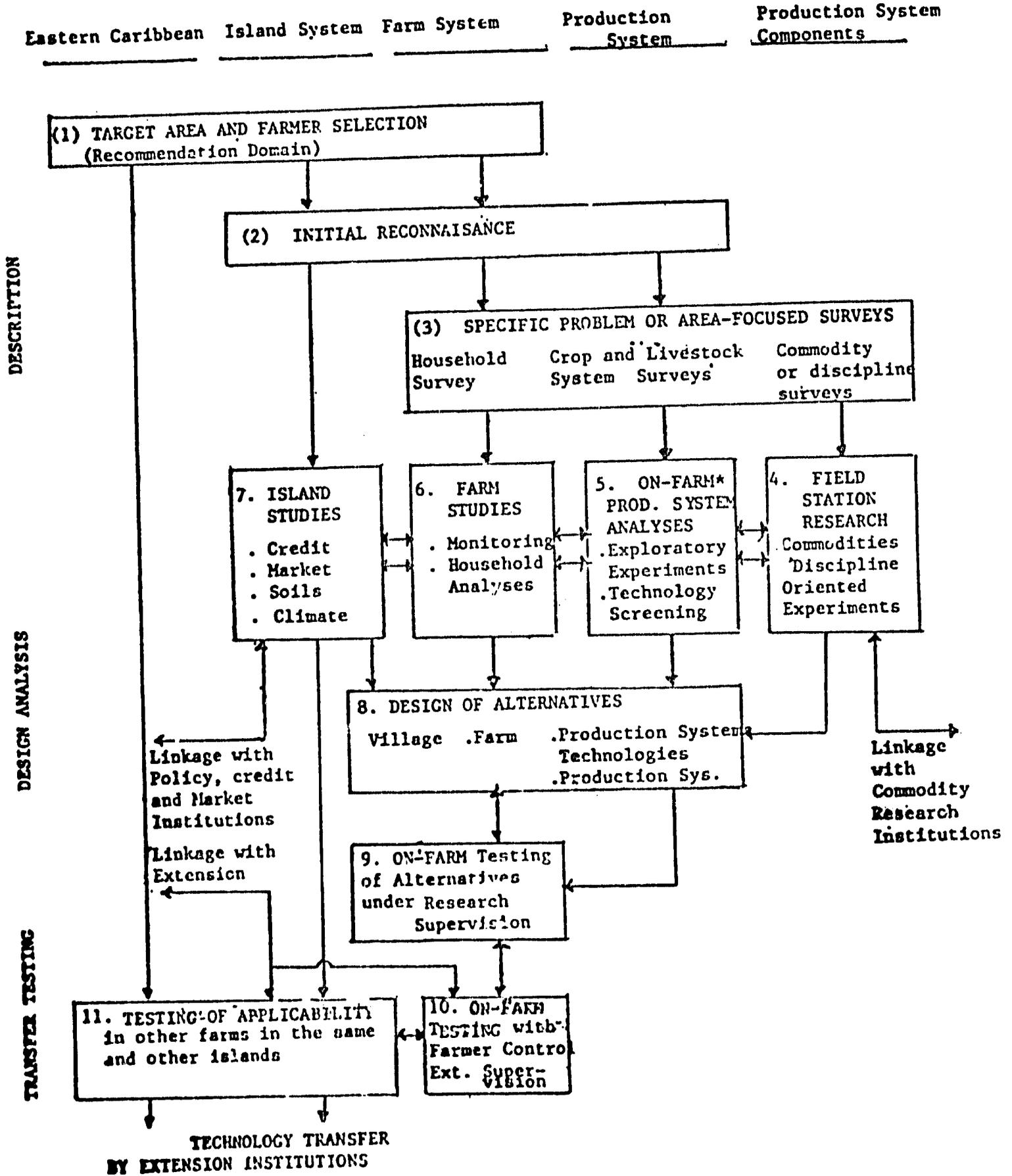


Figure 3:2. CARDI's GENERAL FARMING SYSTEM RESEARCH AND DEVELOPMENT METHODOLOGY

*Note overlap in nature on On-Farm Tests in relation to Analyses, Testing and Transfer processes

Regardless of the technique used, the objectives of this activity are to gain a general understanding of the resources available at the farm level and how the farming systems work, and to identify the important questions that need to be addressed in the survey stage.

3. Specific Problem - Focused Surveys

During the evaluation of farming systems methodology, most projects have made the mistake of not devoting enough resources to the initial reconnaissance and, instead, began with a large un-focused survey. Most projects found that it took too long to analyse the results and a lot of the information gathered was never used. In the early stages in the development of CARDI's methodology, some of these same problems occurred. Overtime, CARDI has begun to put more emphasis on short, problem-focused surveys.

An important difference between the survey stage and the reconnaissance stage is that the information collected during the reconnaissance cannot be used to generalise from a sample to the population with statistical confidence. In the survey stage, enough is known about the population that a sampling procedure can be developed that will allow inferences about characteristics of the population. These surveys are designed to test specific hypotheses. Examples include: (a) sex of farmer affects choice of production system, (b) labour availability during land preparation is the key production constraint, or (c) off-farm work affects farmers choice of farming systems.

4. Field Station Research

The conduct of research under field station conditions is a complementary part of on-farm research. The objectives of this research is to increase the 'body of knowledge' from which researchers can draw technologies for on-farm testing and to attempt to solve specific problems encountered at the farm level. It has been found that such 'back-up' research, when conducted at the country level, can often provide technologies that are rapidly available for farm testing. The research can be conducted along the traditional commodity and disciplinary lines, but in a farming systems programme researchers at that level should make every effort to work as interdisciplinary teams. The key issue, however, for the inclusion of this type of research activity in a farming systems programme is the opportunity it provides for interaction between

specialist and country teams so that the specialists can direct their research closer to the needs of small farms.

The conduct of research at this level allows for the tapping of knowledge from international and regional research centres. It also provides a focal point for the introduction and testing of new materials from these centres. Most important, however, is that such stations provide a centre for multiplication of planting materials which could serve as inputs for on-farm testing and validation.

5. On Farm Production Systems Analysis

The major focus of this project is on-farm testing. On-farm testing occurs at several stages in this farming systems process. On-farm tests to be conducted at this stage are aimed at the development or modification of technology that may be applicable for a particular group of homogeneous farmers. The objective of the exercise is to identify the best way to improve the existing production systems. The tests are designed in such a way that a better understanding of the effects of physical, biological, social and economic factors on the performance of production systems can be obtained. These tests can involve the screening of technologies such as varietal or breed evaluation, livestock feed combination trials, polycultural crop interactions, fertility evaluation, pest and disease management, livestock management etc.

This first type of research activity aims primarily at generating information on the performance of production systems under varying environments to be used as a basis for design of alternative production systems.

Such experimentation that is to be conducted will be done under the strict control of the researcher. The principles of experimentation as those conducted at a research station should be operative. In other words the farmer's field is being used as an 'experiment station' so that the experiment is being conducted in an environment that is more akin to farmers' conditions.

6. Farm Studies

An understanding of how the farming systems, used by target farmers, operate is obviously a key requirement for a farming systems project. The farming system is the immediate environment in which the alternative technology that is generated by the research will have to fit.

The reconnaissance and surveys will provide the basic information about the existing farm systems, but most of this information is static in nature. Farms are dynamic systems and almost all farming systems projects have introduced some type of farm monitoring into their methodology. First, the key inputs and outputs from the farm and from the various production systems are identified, then a questionnaire is developed and filled in periodically. Information is usually collected either weekly, bi-weekly, or monthly. Some information is relatively dynamic and must be collected as often as possible, and other information is quite static and can be collected infrequently.

An important type of farm study is the analyses of specific farm sub-systems. These studies can be directed at one production system or at the household. For example, a detailed labour use study of a predominant production system may be needed. A study of household decision-making is often needed in order to understand how a farming system operates.

7. Island Studies

To identify alternative production systems that can have an impact on an island's agricultural sector, island level credit, marketing, soils and climate information are needed. To obtain this information, CARDI will have to establish strong linkages with policy, marketing and credit institutions both in the public and in private sector.

The soil and climate analyses are needed in order to identify the inputs into production systems and to identify the physical limits where a technological alternative is applicable. The policy, credit and marketing situation must, obviously, be understood in the design of a technological alternative; but the linkage with these institutions is also important in that it allows CARDI to communicate how changes in the macro-economic environment could allow more rapid adoption of potential technological alternatives.

8. Design Of Alternatives

This is a key stage in farming systems research. The information gathered during the analysis stage in (steps 4-7) is synthesized and alternative technology to be tested is identified. Design can be divided into the following steps:

107

- (i) Identification of constraints at the production system level (for example, low soil fertility); the farm level (for example, lack of labour during land preparation periods), and the island system level (for example, excess production of vegetables during one period of the year).
- (ii) Prioritization of constraints with regard to the possibility of overcoming them and, therefore, offering an opportunity to identify alternatives.
- (iii) Prioritization of opportunities by the availability of technology that could potentially have an impact on farming systems.
- (iv) Prioritization of technology to be tested by its level of potential impact on the farming systems in the target area.

9. On-Farm Testing Of Alternatives

Alternative designs of production technologies and systems identified are put to the test at this stage. These tests must be carried out on representative farms of a particular recommendation domain. The number of farms involved will be dependent on the nature of the experiment, the number of treatments, etc. However, regardless of the nature of the experiment, the tests must include a check plot with the farmers systems against which the alternatives will be evaluated. Adequate replication of these tests are mandatory. Wherever possible at least two replicates of the designs under test should be established per farm.

In these tests it is necessary that the farmer be a participant so that his experience and knowledge can be incorporated in the refinement of technologies and an insight can be gained into his ways of assessing the tested technologies. The extension agent is involved as an observer in these tests. However, these tests must be under the strict control of the researcher.

10. On-Farm Validation

This phase allows the testing of the best alternatives under several farmers' conditions. In this case the test can be under the control of the farmer with supervision from the extension agents. The researcher becomes an observer at this stage. The aim of these tests is to assess the extent of acceptability by the farmer of the best alternative systems developed. An important aspect of these validations is the development of close interaction between the researchers, extension agents and farmers. This is the point at which the technology transfer process begins. Thus, although the farmer will control the tests, the researchers must provide guidance on the design and sequences to be followed in the tests. The extension agents must monitor these tests and provide the farmer with any technical or other information relevant to the test that he may desire.

These tests will be conducted on a larger number of farms than was the case of researcher controlled tests. In these cases a minimum requirement is two plots. Each test, however, must have the farmers' system as a control. Each farmer can be used as a replicate in this case.

11. Applicability Testing

On farm validations will give a fairly good guide as to the acceptability of new technologies and production systems. The transfer of these technologies to a wider group of farmers within a given region or recommendation domain or even to other domains within a country can be evaluated by the involvement of the extension agents in simple On-farm applicability testing under farmer conditions and control. In this way the 'elasticity' of the technology can be determined. There is the added dimension that the technology developed in one agro-ecological zone in an island may be more applicable to an agro-ecological zone in another island. Thus validations of technologies across islands can be achieved as a further aid to the technology transfer process. The very close interaction of researchers and extension agents in the same as well as in different islands will be necessary for effective and rapid technology transfer.

E. Production System - Specific Research Processes

The general FSR/D methodology described above is a general process that is applicable in a wide range of situations. To apply the methodology on a specific island in a specific recommendation domain, with the objective of improving a specific production system within a specific type of farming system requires a detailed research process.

When area and target farmer selection, initial reconnaissance, and specific problem-focussed surveys (steps 1-3) have been implemented, and island, farm and production system-level analyses have been initiated (steps 4-7), it will be possible to identify specific production systems as key research foci. Criteria to identify these key production systems will include both the availability of technology to overcome biological farm-level constraints (e.g. disease resistant varieties of a particular crop are available to overcome a plant pathology problem that is a constraint), and the availability of island-level macro-economic opportunities (e.g. - import substitution opportunities exist). These production systems may include only crops (e.g. cotton-legume rotation), both crops and livestock (e.g. intercropped bananas and aroids, and pigs fed primarily crop residues), or only livestock (e.g. - pasture-fed cattle). When a preliminary identification of key production systems has been made, then the next step is to develop a research process that is specific for that production system and the farm system, recommendation domain and island where it is found. The key elements in this research process are: (1) a continuously-updated Technological Improvement files (TIF's), and (2) work plans to design, test and validate potential technological improvements.

The steps outlined above are linked to each other in a process which yields identified, tested and documented technological improvements. The process begins with the implementation of area and target farmer selection, initial reconnaissance and specific problem focused surveys (step 1-3). When the island level, farm level and production sub systems analyses have been initiated (steps 4-3) it becomes possible to identify research foci. Criteria to identify these foci include both the availability of technology to overcome biological farm-level constraints (e.g. disease resistant varieties of a particular crop are available to overcome a plant pathology problem that is a constraint) and the availability of island-level macro-economic opportunities (e.g. - markets, inputs and credit are available). (These production systems may include only crops (e.g. cotton-legume rotation), both crops and livestock (e.g. intercropped bananas and aroids, and pigs fed primarily crop

122

residues), or only livestock (e.g. - pasture-fed cattle). When a preliminary identification of key production systems has been made, the next step is to develop a research plan that is specific for that production system, the farm system and recommendation domain. The key elements in this research plan are: (1) a continuously up-dated Technological Improvement Files (TIF), and (2) work plans to design, test and validate potential technological improvements.

i) Technological Improvement Files (TIF's)

The objective of FSR/D is to generate technology that is better than what farmers are presently using. These technological improvements evolve over the course of time. At any point in time, the progress made towards identifying improvements will be at a different stage for different production systems. In the case of one production systems, it may be possible to move quickly and begin on-farm testing under farmer control (step 10); in other cases more than five years will be required to reach that stage. This means that on an island basis, and for the project as a whole, research planning and data management will be very complex. Continuously updated production system-specific Technological Improvement Files (TIF's) will be used to organize both the information that is generated and the research activities that are undertaken.

The format of the TIF will evolve over time, but is expected to take the form of four sub-files:

- description of the present production system, the farm system and the physical environment in which it functions (i.e. chronology of farmer management activities, inputs and outputs from the system, etc.);
- description of available technology to improve the present system (e.g. new crop varieties, crop population and spacing, or new livestock breeds, feed management systems, etc.);
- technical justification for the technological improvements (e.g. experimental evidence, results of marketing or anthropological studies, etc.); and

- research activities that are presently being implemented or planned for the future.

The TIF for each production system will first be developed by hand and refined. Later, microcomputers will be introduced to ease the process of up-dating, communicating and storing the information. When confidence in the Technological Improvement is such that extension begins to play the lead role, the first three sub-files will be transferred for use in the development of extension activities and extension bulletins.

ii) Work Plans To Update TIF's

A Technological Improvement File will be started when a decision has been made that a specific production system in a specific farming system and recommendation domain on a given island is an area of future research emphasis. At first, the file will include only a description and analysis of the farmers present system. This is information that will have been gathered during steps 1-7. As part of the analysis to identify a priority system, potential technological improvements will have been discussed, and these can be stored in the sub-file on technological improvements, even though the sub-file on "justification" will be empty.

At the first planning session after a specific production system has been identified, work plans will be developed to implement either analysis activities (steps 4-7) if further analysis is needed, or begin to test potential technological improvements (step 9). In cases where a specific technology has obvious potential, it may be possible to move directly to on-farm validation trials (step 10).

The work plans that are developed by a country team with the assistance of project specialists can be filed in sub-file 4 of the TIF. At the next planning sessions the results from the research that was planned can be moved to the technical justification sub-file. Based on an analysis of the result, other potential

124

improvements can be identified and stored in sub-file 2. The work plans for the next year can then be developed and stored in sub-file 4. At the yearly planning session the decision will be made to continue research on a specific production system until viable ecological and socio-economic improvements have been identified; or to discontinue the research because of the low probability of generating improvements. Availability of resources may also enter into this decision.

iii) Technological Improvements As Project Outputs

If the research with a specific production system has been successful, and potential improvements have been evaluated in on-farm tests under researcher control (step 9) and validated in on-farm tests under farmer control with extension supervision (step 10), the TIF can be transferred from research (CARDI and Island-level Research institutions where they exist) to extension institutions. The file at this point will include the sub-files describing the farmers system and ecological and socio-economic environment where the technology was generated, the sub-file describing the technological improvements, and the sub-file describing the technical justification for recommending the improvements.

When the TIF is transferred from research to extension, the first step will be for extension management personnel and research personnel to jointly plan a testing of the applicability of improvements in geographic areas outside of the specific area where the technology was developed (step 11). This may be on one island or possibly more than one island. If this test is successful and farmers adopt the new technology, extension will plan a more extensive effort (such as mass media campaigns) to transfer the technology to more farmers.

PART II. RESEARCH PRIORITIES FOR THE CARDI FSR/D PROGRAM.

Research priorities were established through a process of analysis involving three major phases. First, the major constraints affecting crop production in all island systems were listed and opportunities for the removal of these constraints identified. Second, for each island the major cropping systems together with some socio-economic characteristics were ranked into three categories - high, medium, and low priority - according to their relative importance in maintaining the supply of food. Third, production systems of high priority were then selected and a thorough examination made of the specific constraints and technological opportunities for constraint removal.

For the systems given high priority the specific constraints and opportunities for their removal, taking into consideration technical, social, and economic factors as they relate to individual countries were analyzed. Arising out of this analysis priority areas for research were selected and approaches identified for constraint removal taking into consideration the human and financial resources available. In the prioritization process several were assessed. These included the likelihood of (1) immediate substantial farm productivity improvements (2) immediate economic returns to farmers (3) availability of continual favorable market access and prices (4) quick and adequate rate of return on investment (5) minimizing risks (6) contribution to food security (7) contribution to farm nutritional needs (8) ability to conserve natural resources (9) high extra-regional and regional export market potential (10) contribution to local food consumption and import substitution (11) amenability to local food processing (12) ability to contribute to the integration of crop and livestock production systems. It should be indicated that not all factors were applied to each individual system and no quantitative weighting calculated.

The following tables present in summary form the exercise described above. Table 1 lists the major constraints which have been identified by CARDI FSR/D staff to date. The table further lists specific research opportunities with potential for alleviating the constraint and identifies important linkages with international centers, other CARDI research programs, private sector organizations etc. Table 2 presents the major production systems which have been identified for each participating island along with the ranking assigned by CARDI staff. Finally, Table 3 presents the priority research areas and a brief description of planned activities. Attachment 1 provides a description of the agro-ecological zones and recommendation domains.

<p>5. Poor sowing, planting and nursery techniques resulting in the (a) waste of funds for purchase of large quantities of seeds than actually required and (b) use of higher or lower plant populations than optimum for a particular crop.</p>	<p>1. Evaluation of plant population interactions in polycultural systems.</p>	<p>UWI</p>
<p>6. The use of marginal land for agricultural activities leading to (a) drainage problems in low lying areas of heavy soils (b) poor fertility in certain areas and (c) sever erosion in steep areas under high rain-fall conditions.</p>	<p>1. Evaluation of different drainage systems for low lying areas. 2. The determination of the nutrient requirements of crops growing in specific soil types where deficiencies exist and in different polycultural situations. 3. Development of simple low cost soil conservation methods applicable to small farm conditions</p>	<p>U.W.I.</p>
<p>7. The predominance of rain-fed agriculture with little control of water resources. There can be an over supply of water during the rainy season leading to drainage and disease problems and undersupply during the dry season leading to drought conditions. In drier areas and especially in the Leewards - a lack of improved dry farming techniques, renders crop production risky resulting in total wastage of inputs and an unwillingness to risk inputs.</p>	<p>1. Analysis of rainfall patterns using agro-climatological water balance model of ICRISAT.</p>	<p>ICRISAT CMI</p>
<p>8. Unplanned and/or unorganised systems of production often resulting in a mosaic or amalgam of crops which makes proper management difficult.</p>	<p>1. Design and test planned and systematic small model farms which would meet farmers' goals and objectives and make management easier.</p>	<p>National Land Settlement Schemes.</p>
<p>9. Poor handling at harvest, poor post-harvest handling, packaging, and transporting leading to damage to and loss of marketable produce.</p>	<p>1. Development of proper harvesting handling and packaging system</p>	<p>National Marketing Board</p>
<p>10. The complete lack of proper on-farm storage facilities resulting in high storage losses.</p>	<p>1. Development of appropriate small farm storage facilities. 2. Testing of small agro-processing machinery.</p>	
<p>11. Lack of dependable markets and marketing channels and uncertain prices for most commodities.</p>	<p>1. Analysis of weekly/monthly production and import of corn, peanuts, beans, vegetables and fruits and initiate integrated production marketing systems</p>	<p>1. Ministry of Agriculture 2. Ministry of Trade 3. Marketing Boards 4. Co-operative Producer Organisations</p>

AntiguaMajor Production SystemsTable 2

	<u>Production Systems</u> <u>livestock</u>	<u>Socio-Economic</u> <u>Characteristics</u>	<u>Agro-ecological zones</u> <u>Recommendation Domain</u>	<u>Rating</u>	<u>Remarks</u>
<u>Crops</u>					
1.	Vegetable	Small farm; off farm employment; family; male; land rented		***	
2.	Root crops	Small farm; off farm employment; family, male; land rented.		**	
3.	Cereals and grain legumes	as above		*	
4.	Cattle	large and small farms; communal grazing. Small farmers often landless; off farm employ- ment.		**	
5.	Sheep	as above		**	
6.	Goats	Small farm; off farm employment		*	

Major Productive Systems

Table 2

St. Kitts

<u>Crops</u>	<u>Production Systems</u> <u>livestock</u>	<u>Socio-Economic</u> <u>Characteristics</u>	<u>Agro-ecological zones</u> <u>'Recommendation Domain</u>	<u>Rating</u>	<u>Remarks</u>
1. Sugar		Government owed; (NACO) Some lands leased to small farmers; male; employment with NACO		***	
2. Mixed Root crop/vegetables	Sheep, goats, pigs	Small farms, off farm employment with NACO. Rented lands.		***	
<u>NEVIS</u>					
1. Mixed Root crops/vegetables	Sheep, goats	Small farm, rented lands, no-off farm employment; remittances.		***	
2. Cotton		as above		***	
3.	Cattle	Large and small farms; communal grazing; landless farmers; no-off farm employment; remitt- ances.		*	
4.	Sheep	Small farms; rented lands, no-off farm employment; remittances.		**	
5.	Goats	as above		*	

196

Major Production Systems

Table 2

Montserrat

Vegetables	Sheep, goats	Small farms - rented lands; no-off farm employment; remittances	***
Bananas	Pigs	as above	***
Cotton		as above	**
Root crops		as above	*
	Cattle	Large and small farms. Communal grazing; landless farmers; no-off farm employment; remittances.	
	Sheep	Small farms; rented lands; no-off farm employment; remittances	**
	Goats	as above	*

1/29

TABLE 2 MAJOR PRODUCTION SYSTEMS

	PRODUCTION SYSTEM CROPS	LIVESTOCK	SOCIO-ECONOMICAL CHARACTERISTICS	AGRO-ECOLOGICAL ZONE "RECOMMENDATION DOMAIN"	PRIORITY RATING	REMARKS
1	Banana and coconut	fowl, pigs	Small farm; high-off farm employment; family owned; male	1, 2, 4, 5	**	Though most small farmers are male, in many cases women play an important role in decision-making in farm operation particularly marketing
2	Banana and coconut		Large farmer; small farmer; freehold; male	1, 2, 4, 5	*	
3	Banana, tree-crops and aroids	fowl, pigs	Small farm, high-off farm employment; family owned; male	1, 2, 4, 5	*	
4	Banana and aroids	fowl, pig	Small farm; high-off farm employment; family owned	1, 2, 4, 5	**	
5	Yam, aroids and legume	fowl	Small farm; no off farm employment; family; male	2	***	
6	Mixed roots pigeon peas	fowl, sheep	Small farm; no off farm employment; family; male	3	***	
7	Peanuts	fowl, sheep	Small farm; off farm employment; family; male	3	***	
8	Vegetable (flat)	fowl, pig	Small farm; off farm employment; family; male	2, 3	***	
9	Vegetable (raised)	fowl, pig	Small farm; off farm employment; family; female	2, 3	***	
10		goats	Small farm; off farm family; male	1	*	
11		cattle	Large and small farms; male	1	*	

TABLE 2 MAJOR PRODUCTION SYSTEMS

CROPS	PRODUCTION SYSTEM		SOCIO-ECONOMICAL CHARACTERISTICS	AGRO-ECOLOGICAL ZONE "RECOMMENDATION DOMAIN"	PRIORITY RATING	REMARKS
	LIVESTOCK					
12		sheep	Small farm; off farm employment	3	***	
13	Coconut and pasture	cattle	Large farm; low off farm employment; freehold; male	3	*	
14	Cocoa and tree crops		Large; low off farm employment; Freehold; male	2, 4.	***	

High priority ***
 Moderate Priority **
 Low Priority *

141

TABLE 2 MAJOR PRODUCTION SYSTEMS

ST. VINCENT

	PRODUCTION SYSTEM CROPS	LIVESTOCK	SOCIO-ECONOMICAL CHARACTERISTICS	AGRO-ECOLOGICAL ZONE "RECOMMENDATION DOMAIN"	PRIORITY RATING	REMARKS
1	Banana and coconut		Large; low off farm; freehold; male	3, 4	*	Though most small farmers are male, in many cases women play an important role in decision-making in farm operation particularly marketing
2	Banana and aroids	fowl, pig	Small farm; off farm; freehold; family; male	3, 4	***	
3	Sweet potato and pigeon pea	fowl, sheep	Small farm; off farm; freehold family, rental, male; female	2, 3	**	
4	Peanut	fowl, sheep	Small farm; off farm; freehold family, rental, male; female	1, 2, 3	***	
5	Vegetable (flat)	fowl, pig	Small farm; off farm; freehold family; rental; male, female	2, 3	**	
6	Carrot and mixed veg.	fowl, pig goats	Small farm, off farm, freehold family; rental, male, female	2, 3	***	
7	Arrowroot		Large; freehold; family, male	4	*	
8	Arrowroot, carrot and sweet potato	fowl, pig, goat	Small farm, off farm, freehold family, male	2, 3, 4	*	
9	Aroids	fowl, pig	Small farm; off farm; family; freehold; male, female		**	

1/12

DOMINICA

TABLE 2 MAJOR PRODUCTION SYSTEMS

	PRODUCTION SYSTEM CROPS	LIVESTOCK	SOCIO-ECONOMICAL CHARACTERISTICS	AGRO-ECOLOGICAL ZONE "RECOMMENDATION DOMAIN"	PRIORITY RATING	REMARKS
1	Banana and coconut	fowl	Small farm; low off farm; freehold family; male	3, 4, 5	*	Though most small farmers are male, in many cases women play an important role in decision-making in farm operation particularly marketing
2	Banana and coconut		Large, low off farm, freehold	3, 4, 5	*	
3	Banana and aroids	fowl, pig	Small farm; low off farm; freehold; family; male, female	3, 4, 5	***	
4	Banana and citrus	fowl	Small farm; low off farm; freehold; family; male, female	3, 4, 5	*	
5	Banana and citrus aroids	fowl	Small farm; low off farm; freehold; family; male	3, 4, 5	**	
6	Vegetables	fowl	Small farm; low off farm employment; freehold; family, male and female	3, 4	***	

1/22

**TABLE 5.3 RESEARCH PRIORITIES
ANTIGUA: PRIORITY RESEARCH AREAS**

PRODUCTION SYSTEMS	ECONOMIC OPPORTUNITIES	CONSTRAINTS TO PRODUCTION SYSTEMS	POTENTIAL ALTERNATIVES	ON-FARM TESTS	BACK-UP FIELD STATION RESEARCH	JUSTIFICATION	WORK PLAN	LINKAGES
Vegetable based	Increase production of vegetables for local market and hotels.	Water scarcity in dry season and seasonality of production. Pests and diseases weed control. Poor marketing channels	Use of dry land farming techniques; use of simple water saving techniques such as trickle irrigation, mulching, etc. Introduction of high yielding cultivars of tomato, squash, sweet pepper, egg plant.	Testing of dry land farming techniques, trickle irrigation systems, varieties. Integrated pest and disease management. Testing small-scale vegetable production systems.	Testing of cultivars; weed control systems.	Reduce importation of vegetables	On farm tests '84 - '87. Field station '83 - '87	MOA CAEP Women's desk
Cereals and grain legumes	Increase production for local market.	Corn-ear worm attack; low yielding cultivars long duration. Photo sensitive cultivars of pigeon peas; pod borers in pigeon peas.	Year round production of legumes through use of short duration, photo insensitive types. Development of intercropping and relay cropping systems.	Testing of intercropping and relay cropping systems for cereal/legume combinations, especially corn and peanut.	Evaluation of short duration photo insensitive legumes; study of plant population interactions for different cereal/legume combinations.	Reduce importation of grain legumes.	On farm tests '84 - '88 Field station '83 - '87.	MOA CAEP

1/1/88

TABLE 3 RESEARCH PRIORITIES
DOMINICA: PRIORITY RESEARCH AREAS

PRODUCTION SYSTEMS	ECONOMIC OPPORTUNITIES	CONSTRAINTS TO PRODUCTION SYSTEMS	POTENTIAL ALTERNATIVES	ON-FARM TESTS	BACK-UP FIELD STATION RESEARCH	JUSTIFICATION	WORK PLAN	LINKAGES
Banana + aroids/pigs	Increased production for export of aroids. Increase production of pork products for local consumption	Burning disease of tannia. Labour for weed control. High cost of feed and poor management. Unimproved breeds of pigs.	Introduction of improved varieties of aroids into cropping systems. Control of burning disease in tannia. Use of crop residue as feed supplement. Comparison of existing pig rearing system with alternative improved system.	Evaluating the introduction of eddoe as an intercrop vs tannia. Introduction of improved varieties of tannia and dasheen in the cropping system. Evaluating the use of supplementary pig feed. Introduction of legume into banana cropping system.	Evaluation of improved variety of tannia and dasheen. Development of feed supplement. Varietal screening of legumes <i>Vigna</i> sp and <i>Phaseolus</i> sp.	Reduce the importation of animal protein. Increase production of locally consumed high carbohydrate staple food stuffs. Increase export of aroids.	1982-83 Evaluation eddoe vs tannia as intercrop. On-farm 1983-88. On farm evaluation of feed supplements. 1983-85 Evaluate the performance of legumes as an intercrop with bananas.	EDF Aroids Project Ministry of Agriculture CAEP
Vegetable/ Poultry	Increase productivity of vegetable production. Increase local production of poultry and poultry products.	Un-availability of planting material. Poor management practices of poultry. Low grade of poultry strain presently reared.	Introduction of improved planting material; introduction of improved management practices and better strains of poultry.	Introduction of selected vegetable cultivars into the cropping system. Improved poultry management practices. Control of cabbage disease and tomato diseases.	Varietal screening of selected vegetables. Testing different vegetable production systems.	Reduce importation of poultry products. Increase vegetable production for export market and home use.	1983-1985 Field Station screening of selected vegetable cultivars. 1984-86 introduction of vegetable into crop system. 1983-1988. Introduce improved poultry strains and practices - on-farm	MAO CAEP

St. Kitts Only
Nevis Only

TABLE 3 RESEARCH PRIORITIES
ST. KITTS/NEVIS: PRIORITY RESEARCH AREAS

PRODUCTION SYSTEMS	ECONOMIC OPPORTUNITIES	CONSTRAINTS TO PRODUCTION SYSTEMS	POTENTIAL ALTERNATIVES	ON-FARM TESTS	BACK-UP FIELD STATION RESEARCH	JUSTIFICATION	WORK PLAN	LINKAGES
sugar*	Increased production of peanuts and other grain legumes.	NACO policy of mono-cropping.	Utilization of fallow land prior to first planting of sugar cane and intercropping of ratoon canes with peanuts.	Intercropping of sugar cane and peanuts on settlement lands.	Testing of sugar cane/legume intercrops.	Underutilization of sugar cane lands; increase production of peanuts for export; reduce importation of grain legumes.	On farm '83 - '87 Field station '84 - '87	NACO CAEP MOA
fixed root crop/vegetables	Increase production of local root staples and vegetables.	Pests and diseases; Unimproved root crop cultivars.	Improved management practices; control of pests and diseases; introduction of improved cultivars.	Testing of alternative management systems. Testing integrated pests and disease control systems.	Varietal screening.	Reduce importation of vegetables; Stabilize production of local root staples.	On farm '83 - '87 Field station '84 - '87	CAEP MOA
Cotton**	Increased production of cotton, peanuts and other grain legumes.	Pests of cotton. Poor fertility levels.	Increase use of fertilizers. Increase use of pesticides for cotton pests. Utilization of land space between cotton rows.	Testing of cotton/legume intercropping systems; Testing of pest control systems.	Evaluation of fertilizer requirements for cotton/legume system. Development of Integrated Pest Control System.	Underutilization of cotton lands, increase production of cotton for export, increase production of peanut for export, reduce importation of grain legumes.	On farm '83 - '87 Field station '83 - '87	MOA

146

TABLE 3 RESEARCH PRIORITIES
 MONTSERRAT: PRIORITY RESEARCH AREAS

PRODUCTION SYSTEMS	ECONOMIC OPPORTUNITIES	CONSTRAINTS TO PRODUCTION SYSTEMS	POTENTIAL ALTERNATIVES	ON-FARM TESTS	BACK-UP FIELD STATION RESEARCH	JUSTIFICATION	WORK PLAN	LINKAGES
Vegetable based	Increase production of vegetables for local market and hotels; Export of vegetables such as tomato, hot pepper, onion.	Weed control; pests and diseases.	Introduction of onions into vegetable production system; Introduction of adaptable Irish potato cultivars. Introduction of adaptable garlic cultivars.	Evaluation of small-scale year round vegetable production management systems; control of pest, diseases and weeds by cost effective means.	Varietal screening of onion, Irish potato and garlic cultivars.	Reduce importation of vegetables. Production of year round vegetables for export markets.	On farm tests '83 - '87 Field station '83 - '87	MOA CAEP
Cotton (as for Nevis)								
Banana	Increase production for local consumption and export. Ready market available in U.K.	Poor yielding cultivars; leaf spot disease; virus disease; nematodes, poor fertility.	Introduction of improved banana husbandry techniques.	Evaluation of WINBAN recommendations.		Increase foreign exchange earnings.	On farm tests '84 - '87	MOA

111

TABLE 3 RESEARCH PRIORITIES
ST. LUCIA: PRIORITY RESEARCH AREAS

PRODUCTION SYSTEMS	ECONOMIC OPPORTUNITIES	CONSTRAINTS TO PRODUCTION SYSTEMS	POTENTIAL ALTERNATIVES	ON-FARM TESTS	BACK-UP FIELD STATION RESEARCH	JUSTIFICATION	WORK PLAN	LINKAGES
Yams, aroids and legumes	Increase production of yam, aroids, and legumes for local markets and for export.	Yam: virus infested; tannia: burning disease; legumes: unavailability of planting material	Introduction of virus free yam. Introduction of improved strains of tannia. Introduction of legume planting material. Increase eddoe production to supplement tannia production.	Testing of intercropping. Testing of different species of legumes. Testing of different levels of banana fertilizer on yam production.	Relay system for legume intercrops. Varietal screening of <i>Vigna</i> species. Varietal screening of <i>Phaseolus</i> species. Evaluation of Root Crop/Legume plant population interactions in polycultural systems.	Import substitution of legumes. Increased land utilization and productivity. Improved nutrition status and income of farm family.	On-farm tests '83 - '87. Field station research '84 - '87.	EDF funded aroid project MOA. CAEP
Vegetables and poultry/swine	Increase production of vegetables for local market during the wet season. Increase production of swine, and poultry products for home consumption.	Pest and diseases of vegetables. Weed control: labor; timely availability of labor; poor marketing channels; marketing infrastructure. Poor management practices of poultry. Production cost of concentrate feed for swine.	Introduction of high yielding varieties of cabbage, tomatoes and carrots. Improved management practices for livestock. Increased use of crop residues as feed supplement for swine.	Development of wet season production systems. Control of cabbage diseases. Determination of fertilizer needs. Evaluation of different cultivars of cabbage, tomatoes and carrots on different soil types for wet season production.	Varietal screening of cabbage, carrots and tomatoes. Weed control systems in the selected vegetable production systems. Improved management practices for tomato cultivation in the wet season. Comparison of swine feeding on a combination of concentrates and off-farm products and those fed on farm products alone. Evaluation of cost/benefits of chemical control of pests and diseases.	Reduce importation of vegetables especially during the wet season. Increase availability of locally grown vegetables during the wet season.	On-farm: 1984-88. Field station '83 - '87.	MOA CAEP

TABLE 3 RESEARCH PRIORITIES
ST. LUCIA: PRIORITY RESEARCH AREAS (Cont'd)

PRODUCTION SYSTEMS	ECONOMIC OPPORTUNITIES	CONSTRAINTS TO PRODUCTION SYSTEMS	POTENTIAL ALTERNATIVES	ON-FARM TESTS	BACK-UP FIELD STATION RESEARCH	JUSTIFICATION	WORK PLAN	LINKAGES
Cocoa and mixed tree crops	A guaranteed market. Most cocoa trees have already been established.	Pest and disease control. Poor fertility.	Improved management techniques.	Integrated pest disease management in vegetable production. Improved management of poultry. Testing of improved management systems. Introduction of better pruning techniques. Integrated pest and disease management. Determination of fertilizer needs.		Guaranteed market.	On-farm: '83 - '87	MOA CAEP

1/21

TABLE 3.3 RESEARCH PRIORITIES
ST. VINCENT: PRIORITY RESEARCH AREAS

PRODUCTION SYSTEMS	ECONOMIC OPPORTUNITIES	CONSTRAINTS TO PRODUCTION SYSTEMS	POTENTIAL ALTERNATIVES	ON-FARM TESTS	BACK-UP FIELD STATION RESEARCH	JUSTIFICATION	WORK PLAN	LINKAGES
Peanut/ sheep	Increase production of peanuts. Fuller utilization of residues for feeding.	High incidence of "props" High labour requirement for reaping. Pest and disease control. Soil erosion. Suboptimal plant densities.	Use of gypsum. Testing of feeding systems. Better use of chemicals. Use of terrace bunds etc. Higher seed rates.	Validation of gypsum. Testing of feeding systems. Integrated pest control.	Development and test- of peanuts lifting, and thrasher machinery.	Low yield of peanuts and high labour requirements. Poor use of crop residues.	1983-87 Development of equipment and on-farm testing of equipment 1983-5-6. On-farm tests & validation of improved practices.	MOA EDF Peanut Project
Carrots/ Vegetables, pigs & goats	Increased exports of carrots and other vegetables. Improved use of crop residues for feeding.	Nematodes on carrots. Seasonal production of vegetables. High labour demand for carrots.	Crop rotation and nematicides. Small equipment for land preparation and harvesting to reduce labour requirement.	Testing of crop rotation etc. to overcome nematode problems. (Development and testing of field equipment. Introduction of improved cultivars of vegetables into the cropping system. Control of pests & diseases.	Development & testing of carrot harvest equipment. Evaluation of carrots, tomato, cabbage, cultivars. Improve management practices. Weed control. Timely application of pesticides. Introduction of protein energy bank to supplement crop residue during off season.	Potentially high income earners. Improved nutritional status and income of farm family.	1983-87 Development of equipment. 1983-85. Evaluation of vegetable cultivars - field station	MOA

TABLE .3 RESEARCH PRIORITIES

PRODUCTION SYSTEMS	ECONOMIC OPPORTUNITIES	CONSTRAINTS TO PRODUCTION SYSTEMS	POTENTIAL ALTERNATIVES	ON-FARM TESTS	BACK-UP FIELD STATION RESEARCH	JUSTIFICATION	WORK PLAN	LINKAGES
Banana/ roids/ pigs	Increased yields and export of aroids. Improved utilisation of residues and un-saleable produce.	Burning disease of tannia. Labour for weed control.	Introduction of improved variety of tannia into cropping system. Control of burning disease in tannia. Increase use of crop residue as supplementary feed for livestock.	Identification and introduction of improved varieties of tannia. Evaluating the use of supplementary feed from crop residues.	Evaluation of improved variety of tannia & dasheen. Development of feed supplement.	Increase production of locally consumed high carbohydrate staple foodstuff. Increase utilization of land resource. Use of waste as feed to supplement to cut imports of concentrates.	1983-85 testing of improved variety of tannia & dasheen 1985-88. On-farm Evaluations of improved variety of aroids 1983-88. On-farm Testing of feed supplement	EDF aroid projects MOA MOA

In addition to the research priorities presented in Table 3, the following activities have been identified as essential complementary research:

(1) Animal Breeding Strategies: These would involve in the main the selection and/or introduction of superior breeding stock into the participating countries to upgrade the genetic quality of the farmers' animals. This will involve the use of suitable rams, bucks and boars. These will be made available to participating farmers across all countries in such a way that improvement could be measured (earlier marketing growth rate etc.) and compared both between farms within countries and across countries. The objective is to test whether improved genetic stock will improve the farming system of which it is a part.

(2) Energy Supply Strategies: The aim of these strategies is to produce locally and within the farm system appropriate energy sources needed to sustain the farm animal population. A major activity within this strategy is the Cassava production, processing and feed compounding and testing activities. The main thrust in this cassava crop production will be centred in Barbados with feed testing and machinery development activities. The need for and use of a cheap energy source for drying is very important for the success of this activity. Therefore, solar powered driers will be constructed for the dehydration of the cassava.

(3) Protein Supply Strategies: This will in the main involve the harvesting of locally available by-products e.g. poultry and fish offals, meat and bone meal, coconut meal, legume leaf meals. An appropriate scale rendering and drying facility (such as the one developed by Michigan State Univeristy for fish processing in Belize) will be used to render offals. The products from this activity will complement the energy production effort leading to the preparation of compound feeds.

(4) Parasite Control Strategies: Both ecto and endo parasites and major animal health problems in the Eastern Caribbean. CARDI will use experience already developed in Barbados to extend these parasites control measures to farms in the LDC's. Essentially this involves the strategic choice and use of suitable parasite control drugs for spraying and worming animals. These activities will dovetail into the feeding and breeding strategies to ensure the maximum expression of inherent capability by the farms animals.

154

ATTACHMENT 1

IDENTIFICATION AND PRIORITIZATION OF AGRO-ECOLOGICAL ZONES

In order to identify similar agro-ecological zones within the respective territories four parameters -- mean annual rainfall, number of dry months, topography and soil type -- were used. In the absence of reliable data on the critical factor of rainfall distribution patterns for the respective zones, the number of dry months was used as the best approximation of this factor. Dry months are those where the mean monthly rainfall (20 year average) is less than 4 inches. This figure is based on the mean potential evaporation for the entire area.

Six major groups (Appendix Table 1) have been identified in the Eastern Caribbean:

(1) GROUP A - Dry Lands With Heavy Clays

A dry-land group with heavy, mainly montmorillonitic clay soils at moderate elevations (500 - 1,000 ft.) and with imperfect drainage.

(2) GROUP B - Low Lying Dry Lands

A dry-land group with shallow soils (mainly shoals) which swell when wet and crack when dry. This group occurs at low elevation.

(3) GROUP C - Alluvials

A low-lying alluvial group, which is subject to flooding during the wet season.

(4) GROUP D - Wet Hill Lands

A high rainfall group on steep slopes at high elevations characterized by latosols.

(5) GROUP E - Scrub Lands

A dry highland group with shallow soils (lithosols) on which scrub predominates.

(6) GROUP F - Semi-Arid Lands

A dry land group at moderate elevations with free draining soils.

1.2

Based on physical land areas and overall agronomic possibilities, the availability of water (rainfall) and soil type, the following four groups are recommended for major emphasis in order of priority: Group D, Group B, Group F, and Group A.

Group C has good potential, but these flat lands are usually occupied by estates rather than by small farmers. Group E is relatively useless scrub land.

TABLE 2 PERCENTAGES (APPROXIMATELY) OF TOTAL
LAND AREA IN THE MAJOR AGRO-ECOLOGICAL
ZONES IN THE WINDWARD AND LEEWARD ISLANDS

	<u>% Land Area</u>	<u>Recommendation Domain</u>
<u>DOMINICA</u>	5	I
	15	II
	25	III
	20	IV
	35	V
<hr/>		
<u>ST. LUCIA</u>	30	I
	33	II
	7	III
	9	IV
	15	V
	6	VI
<hr/>		
<u>ST. VINCENT</u>	11	I
	33	II
	27	III
	10	IVa
	15	IVb
	4	V
<hr/>		
<u>ANTIGUA</u>	34	I
	20	II
	12	III
	20	IV
	14	V
<hr/>		
<u>MONTSERRAT</u>	36	Ia
	20	Ib
	11	II
	20	III
	13	IV
<hr/>		

100

	<u>% Land Area</u>	<u>Recommendation Domain</u>
<u>ST. KITTS</u>		
	20	I
	12	II
	16	III
	12	IV
	40	V
	<hr/>	
<u>NEVIS</u>		
	27	I
	17	II
	22	III
	34	V
	<hr/>	

156

ANNEX F

SOCIAL ANALYSIS

Social Cultural Setting of Small Farm Agriculture in the Eastern Caribbean

In the Eastern Caribbean, the peculiarities of small farming systems have their origins in the history of colonialism and the dominance of the plantation system. During colonialism, most of the land became the property of planters who were often absentee landlords living in far-away metropolises. Some of the lands were also owned and cultivated by external companies. Only land which was abandoned or situated on the borders of plantations were available to the indigenous population. Moreover, in a general sense the plantocracy constituted the ruling class of these societies and it was only from the second quarter of this century that their unmitigated powers were modified. After political or constitutional independence in some of these countries, the unoccupied lands have become state property, while the plantations continue to exist under private ownership. Fortunately, the exploitative relationships between landed elites on plantations and small farm agriculture which is typical in some of the Central and South American countries is not a serious problem in the Eastern Caribbean.

The farming systems that have evolved in the Eastern Caribbean are a combination of extensive plantation agriculture (in which the better coastal lands have been planted to cash crops) and intensive small farm agriculture (in which polyculture and short term crops are common). The agricultural systems of the Eastern Caribbean are therefore intricate webs where crop production is not a simple function of plantation versus subsistence farming but a function of complex ecosystems of differing soil types, rainfall patterns and tenurial arrangements. And this complexity is further heightened by the general decline in plantation agriculture, a decline caused by the fluctuating international market coupled with the labour shortages in agriculture.

Demographically, small farm agriculture in the Eastern Caribbean is extremely complex. The farmer, however, tries to understand the ecosystem and each farming system is geared towards the preservation of this complex ecosystem of steep mountain slopes, loose soils and small streams. The small farmer has developed - through the experiences of having to operate with limited resources

and therefore limited alternatives - a system of resource allocation, cropping patterns, and cropping technologies that emphasize heterogeneity. It is this heterogeneity that enables the farmer to spread risks so that farming becomes economically viable. The heterogeneity that is referred to here includes differing tenurial arrangements and water regimes; but more importantly, it includes the system of multiple cropping and polyculture wherein the farmer may plant four to six different crops in a single enterprise. Thus, the intensity of the use of the land appears to be a function of the type of crops grown, and the use of these crops in the economy of the farming system, i.e., whether the crops are for home consumption or whether they are for sale. If the parcel of land is viewed primarily as providing "for the family cooking pot", then the intensity of cultivation is rather high. This is reflected by the very intensive polyculture of crops. For example, in the instance of a farmer from Montserrat, identify sixteen varieties of vegetables, legumes, tubers, and cereals, all grown within an area of three-tenths of an acre were identified. To this farmer, this parcel provides the family with the daily food requirements; crop diversification provides the family with a varied and nutritious diet. This parcel constitutes family subsistence. The farmer is subsequently willing to take the risk of cultivating an entire range of crops in a very random fashion. Compare this to farmer other parcel where crop production is commercialized: pure stand each of sweet potatoes, peanuts, pigeon peas and cassava as border plants. The farmer had an interesting rationale for distinguishing cropping practices vis-a-vis the parcels. The home parcel provides for 'the cooking-pot' and in order to establish a nutritious diet for the family. The farmer has to cultivate a whole range of food crops. The commercial parcel, on the other hand, has to be carefully planned so that, given the allocation of the scarce factor of production, only the maximum yield can be obtained.

To reiterate, the one feature of small farm systems in the Eastern Caribbean that warrants first mention is the complexity of these farming systems and the allocation of the farmer's resources such that the resultant agrarian systems are configurations of ecology, unfavourable climatic conditions, limited factors of production (land, labour, capital and managerial abilities) and an inadequate market infrastructure. Different land tenurial arrangements, for instance, have evolved from a system of limited alternatives. Small farmers in the Eastern Caribbean grow in a piecemeal fashion as they acquire whatever fragment is for sale or rent at a price they can afford. Furthermore, each parcel of land within a single holding is usually of a different tenurial arrangement. Of importance to cropping interventions, then is the need to understand that the availability of suitable land in an equally suitable agroclimatic area is a major constraint faced by

the small farmer for whom land is security and for whom the flexibility of different tenurial arrangement allows freehold parcel to tree-crops, family land to bananas, and rented land to short-term vegetables and food crops.

There are four general tenurial classifications which are applicable throughout the Eastern Caribbean. These are (a) family land; (b) freehold; (c) annual lease; and (d) share cropping.

The tenurial arrangements which appear most frequently in the Windward Islands are that of family land, followed by free-hold land. The high ownership of land by small farmers in the Windward Islands is very significant because there appears to be a definite relationship between types of crops grown and land ownership. Where rights to land are permanent, after the initial land clearing, the farmer is more than likely to plant it to permanent crops. These permanent crops are then intercropped with secondary crops and other shade tolerant crops which are important subsistence food items in the local diet. Among these secondary crops the farmer then plants a wide variety of vegetables.

In the case of the Leeward Islands, because most of the land is under state control (Antigua, St. Kitts) or in large private ownership (Montserrat), tenure tends to be of the annual lease type; there tends to be a proportionately smaller percentage of freeholds and family land. It is not surprising then that farming systems in these countries tend to emphasize short-term crops, usually aroids and vegetables; if there are any tree crops planted they are usually annual (bananas and certain fruit trees) rather than perennials.

Lease arrangements tend to be rather nebulous in so far as payment is sporadic and there is very little legal documentation of the lease. The owner, in the case of the private lease while seldom receiving any direct payment in the form of rent does, on the other hand, benefit from the tenurial arrangement in so far as sanitation and fertility of the land is maintained. In the cases of government leases and crown lands, the state of course loses a substantial revenue resulting from default of payment and squatting. Yet, imposing a land tax might reduce the security of the farmer and consequently affect the agricultural potential of the state.

Share cropping is one form of tenurial arrangement that reflects the way in which the small farmer's limited sources are maximized. In St. Lucia, for instance, most share-cropping is done on land which has already been planted to perennial crops, especially coconuts. The share-cropper thus intercroops the perennials with quick maturing root and vegetable crops. As a result, the landowner has his land planted to perennial crops; the share-cropper on the other hand has access to land which would otherwise remain underutilized.

A variation to share-cropping is the practice common in the larger estates where a landless estate worker is given use rights to a parcel of land (which is usually under primary vegetation) on a share-cropping basis. The farmer has use right to the same parcel of land for not more than two to three cropping seasons; at the end of this time he is usually given a new parcel to clear and work. This way the estate owner is assured that there is sufficient rotation of his lands. At the same time, more and more of his virgin land is brought under cultivation.

Aside from land tenure, economic data reveals differences in the levels of farming. The indicators in this classification are: (a) Number of acres the small farmer occupies; (b) Farm expenses; (c) Generation of income from sale of farm produce; (d) The importance of agricultural income to the total income of the farm household.

On the basis of this classification there are three general types of small farmers in the Eastern Caribbean: (a) Non-commercial - having no sale of produce; (b) Semi-commercial - having part of the family income from the agricultural enterprise; (c) Commercial - obtaining a larger proportion of the family income from the sale of farm products.

The first type refers to kitchen or backyard gardening where crop production is solely for home consumption. Nearly all of the other farmers have these backyard gardens too. It is a most common sight to see lettuce and condiments growing in bamboo troughs and old receptacles. All such produce is consumed primarily by the family. Thus for all intent and purpose, the small farmers in the Eastern Caribbean are either semi-commercial/part-time or full-time/commercialized farmers.

There are a number of features which distinguish semi-commercial farmers. For one thing, semi-commercial farmers have an additional source of income from off-farm employment. For another, because the farmer is involved in off-farm employment, the farmer grows those types of crops which need less maintenance and care. So the distinction between the two types of farmers is further reflected by

the types of crops grown. How long a farmer remains semi-commercial depends upon the profit he makes from his crops as compared to his other sources of income, and/or the availability of land on which the farmer can expand.

Farming systems in the Eastern Caribbean reflect a rather intensive system of intercropping. The decision to intercrop is a partial function of: (i) the dependence of the farm family on income(s) derived from off-farm employment, and (ii) the age and sex of the farmer. In the first instance, where the farmer holds a steady job outside the farm, the farmer is more liable to specialize in crops which do not require constant crop maintenance. For example, one farmer in Montserrat is a full-time mason who can attend to his farm only after work. He cultivates either sweet potatoes or peanuts in pure stands. In order to cut back on the labour input necessary for weeding, he increases his plant density, i.e., he plants two to three rows of the crop on the same ridge. Similarly, another farmer from St. Vincent, who has his own carpentry business, has planted two-thirds of his holding to bananas and he visits his farm only once a week, on the week-end.

Both farmers are not adverse to intercropping but, because farming is a supplementary occupation and source of income, the decision to cultivate pure stands hinges on the trade-off between optimal exploitation of space, available soil moisture, and incoming solar radiation and the necessary labour input required to maintain an intercropped farm. These two farmers have chosen the latter; their labour allocation leans heavily outside the farm where returns to labour for that amount of labour is higher than perceived returns from additional on-farm work.

Although the factors of production are limited, the resource allocation of family labour on the farm and outside the farm may be complimentary rather than competitive. If the opportunity for off-farm work occurs at times when the farm does not require labour and vice versa, the two alternatives are complimentary rather than competitive. A farmer in Dominica can afford to spend only two hours on his banana farm and work, on a permanent basis, with a road construction crew. By a similar token a farmer also of Dominica, who has 17 acres of land planted to bananas, food crops, citrus and coconut trees and who holds a rather important job in the community as a supervisor of the local marketing board, can afford to maintain his farm by employing a full-time overseer and two farm labourers. In the final analysis then, off-farm employment of labour should not be seen as detrimental to agriculture. If anything at all, it should be seen partly as the result of the poor market infrastructure that characterizes agricultural system in the Eastern Caribbean. Irrespective of the uneven land distribution system one

161

of the main constraints to increase production is not the underutilized land and labour but the lack of any proper infrastructure which will absorb the farmers' produce at prices that induce production.

Ethnicity, Sex and Age of Farm Operators

In all the islands of the Eastern Caribbean, the predominant ethnic groups within small farm agriculture are blacks of African descent. African slaves were brought to the West Indies to work the plantations. In some of the Windwards (of St. Vincent and St. Lucia) there are small pockets of farm families who are of East Indian descent. Initially the East Indians were brought to the West Indies as indenture labourers, also to work in the plantations.

Generally speaking, although the majority of the small farmers in the Eastern Caribbean are of African descent, there are small concentrations of farmers of other ethnic origin. These concentrations, however, are found only in the Windward Islands. The significance of the non-black farmers is not in their small population but in the range of crops they grow.

The Indians in St. Lucia, for instance, are concentrated in the southern part of the island, primarily around Black Bay, Augier and Balcar. The ancestors of these Indians came to St. Lucia as indentured labourers on the British owned sugar plantations. Through generations of intermarriage they have lost many of their cultural traits and phenotypic features. Be that as it may, some of the traditions, particularly those concerning food and food consumption still prevail: there are scattered fields of dry-land rice and a rather marked emphasis on back-yard gardening, especially in the cultivation of leafy vegetables and pulses - both of which are significant in the Indians' diets.

St. Vincent too has an enclave of Indian farmers in Richland Park. All the farmers, i.e. Blacks and Indians, cultivate bananas, but while the Blacks tend to emphasize the intercropping of tuber crops while the Indians intercrop with vegetables.

Mention must also be made of the Carib farmers in La Pointe, Choiseul in the south-western quarter of St. Lucia. These farmers cultivate mainly during the wet season (although the area has access to surface irrigation) and emphasis is on sweet potatoes, peanuts (which are rotated with the sweet potatoes), dasheen, and fruits such as mangoes and plums. Unlike other farming areas in St. Lucia, hardly any other rootcrop or vegetables are grown. Farm incomes are supplemented with incomes derived from fishing, pottery and employment in the neighbouring islands.

The majority of the farmers in all the islands are males. This fact does not, however, eliminate the importance of female farmers in the food-production systems. In fact, it is suspected that the actual number of female farmers is often not reflected in the data simply because many of the women prefer to classify themselves as housewives rather than farmers, despite the fact that they make the major farming decisions. Data from the 1970 population censuses of a number of the countries of the Eastern Caribbean show that women accounted for 13 percent of those classified in farming. In two countries more than 20 percent of this group were women: Montserrat (30%), St. Kitts/Nevis (24%). The same source indicates that 31 percent of other agricultural workers were women. These data, however, do not indicate whether part-time employment in agriculture was more prevalent among women than men.

102

	FARM MANAGERS, SUPERVISORS AND FARMERS			OTHER AGRICULTURAL WORKERS		
	Male	Female	Total	Male	Female	Total
<u>Windwards</u>						
Dominica	2,400	382	2,782	3,572	1,740	5,312
St. Lucia	3,540	733	4,183	4,408	1,908	6,388
St. Vincent	1,246	154	1,400	2,786	1,297	4,083
<u>Leewards</u>						
Antigua	9	9	18	1,702 ^{a/}	577 ^{a/}	2,279 ^{a/}
Montserrat	113	48	161	415	205	620
St. Kitts- Nevis	246	77	323	2,502	1,280	3,782

Table III - Employed Farmers and Farm Workers, by Sex, 1970.

Source: UWI/CRF (1976:Vol 4, Part 16) Data for Antigua are from a separate survey conducted by that country.

a/ These are figures for the total agricultural labour force, including the unemployed (whose number were probably small). Farmers, farm managers, and supervisors are not separated from farm workers. Using the definition employed by the other countries in the region, most of the Agricultural labour force in Antigua in 1970 would be classified as farmworkers (primarily in sugarcane, the production of which ceased the following year).

Although this is not a conclusive statement, the influence of sex on agriculture appears to be based on the level of education, level of risk aversion, the type of agricultural activity, and on the choice of crops cultivated. Women's role in the food production system is primarily geared towards the planting and production, processing, packaging and marketing of traditional food items for local consumption. Thus it is not surprising that many of the women farmers prefer to cultivate short-term subsistence food items which they themselves can market. This does not, on the other hand, eliminate women from cultivating export-oriented cash-crops, of banana, sugarcane, cocoa, coffee. Invariably, however, the constraints which all farmers in the Eastern Caribbean face seem to be magnified in the case of the women farmers.

129

Women are involved in multiple work roles: agriculture, child-care, home maintenance within the farm household. And, because of stereotypic notions of these roles, they confront special problems in becoming more efficient food producers. The immediate constraint facing women farmers is labour and capital facilities. The more physically demanding farm activities of land clearing and land preparation have to be performed by male labour which, in many cases, is not available from within the farm household itself. Consequently, the farmer has to depend on any available labour - hired, or friends and relatives from the community. Such dependence on labour from outside the farm-household for crucial farm activities often results in the farm activities not being completed in time for the subsequent activities to follow. Hence the level of production tends to be retarded. Examples which illustrates this point.

A farmer (64 years old) cultivates bananas and cocoa, in addition to a wide range of tubers and vegetables. Her holding is two acres in size and all the tree crops are fully established. Furthermore, she has a livestock component of pigs and poultry. She lives with an aged and sickly mother and is thus the sole contributor of family labour to the farm. From time to time she is aided by a little boy who lives with her occasionally. According to time series data on her farm activities (between April 1980 and March 1981), a total of 59 labour days were expended on the farm. Of the 59 days, the farmer contributed 29 days, the remaining 30 days came from hired labour and exchange labour. A total of 21 days of the hired labour and exchange labour went towards land clearing, land preparation and the construction of drains.

Another farmer (42 years old) cultivates a wide variety of vegetables and tuber crops on 1 acre of land which she share crops. In order to supplement her income from farming, the farmer runs a week-end meat stall, as well as a small liquor shop, more commonly referred to as a 'rum shop'. During the recording period, a total of 136 days was spent on the farm. Of this, the farmer's and farm family's labour constituted 67 days, the remaining labour days (71) were hired. Much of the hired labour went towards land preparation (61 days, as compared to 15 days of the farm family).

Another farmer (48 years old) works 4 acres of rented land. She cultivates a variety of vegetables, tubers, legumes and a scattering of bananas. And, she markets her produce at the central market. All six of her children are grown and contribute quite substantially to farm labour and to the farm family's income. Between May 1980 and May 1981 a total of 56 labour days were spent on the farm. Of this total, 44 days constituted labour from the farmer and her family, while only 12 days were hired. The use of hired labour in

165

this case was remarkably low because of i) the contribution of family labour, ii) there was no need for land clearing because the farm was already fully established, and iii) the land that was worked was flat and the farmer rented tractor services for land preparation.

Although statistical data to quantify the following statement is not available, our informal discussions with female farmers have revealed that many of the farmers have a very limited cash outlay which may mean that they are averse to risks and non-traditional allocations of resources and/or that credit is not available. Each farmer usually makes choices within the context of the household and is influenced by the household's needs and goals as well as by the resources available to the household. These resources include not only land, labour, and water, but also social and institutional resources such as information about agricultural methods, prices and risks, and access to credit, long-term land use, market infrastructure influence or political power necessary for successful agricultural adjustments. The resources available to a female farmer in the Eastern Caribbean are more limited than those to male farmers. Women receive less attention from the extension services than do male farmers; women farmers tend to be the heads of households with very little supplementary incomes from the family members; the social sphere within which the female farmer operates is also considerably more limited than that of her male counterpart - information is less readily available to her, and women receive less wages for agricultural work than men and her access to credit is more limited.

The mean age of the farming population in the Eastern Caribbean tends to be about 49 years. The number of farmers below 25 years of age is so small that it is negligible. In the Windward Islands the highest percentage of farmers tend to be between 44 years and 35 years, while in the Leewards it is more common to find an older farming population, i.e. between 56 years and 70 years. This difference in age is a result of the higher out-migration rates in the Leeward Islands, which, in turn, is related to the reduction in demand for labour in the production of crops for export in the absence of the development of the food production sub-sector.

Age	St.Vincent		Dominica		St.Lucia		Antigua		Montserrat	
	No.	%	No.	%	No.	%	No.	%	No.	%
25 & Less	5	4.2	2	1.6	3	2.5	3	2.5	2	1.6
26 - 40	28	23.3	26	21.6	33	27.5	12	10.0	12	10.0
41 - 55	48	40.0	41	34.2	53	44.2	42	35.0	29	24.2
56 - 70	34	28.3	43	35.8	29	24.2	49	40.8	57	47.5
70	5	4.2	8	6.6	2	1.6	14	11.7	20	16.7

Table 4 - Distribution of Farm Operators by Territory and Age
(UWI:1979;1980)

1-7

Some of the reasons for the relative high age of farmers in the Eastern Caribbean are i) migration of younger farm family members out of the farm; ii) decline in favourable attitudes towards farming; iii) dependence on non-farm employment for a substantial portion of household incomes; and iv) the lack of institutional incentives to increase production.

Recently, while conducting two separate surveys to assess the levels of production of peanuts and sweet potatoes in the west coast of St. Lucia CARDI noticed a marked increase in the number of young farmers. Whether or not this prevails in the other islands has yet to be seen, but the implications of the change in the population structure of the farming sector in the Eastern Caribbean will undoubtedly have consequences on the rate of acceptance of technologies and interventions. Younger farmers who have just begun the processes of trial and error in the development of their own specific farming systems appear to be more receptive to advice and changes than those older farmers who have developed set ways and attitudes. A farmer of St. Vincent (55 years old), for instance, insists on planting his bananas 10 to 12 feet apart on the argument that the further spacing will allow sunlight to reach the roots of the banana trees and thus kill any nematodes that may be present there. He is convinced of this and it appears that no amount of persuasion and advice will make him change his belief. Compare him to another farmer (29 years old) of St. Lucia who uses chemicals for weed and pest control and who is always seeking advice from extension officers.

	FARM MANAGERS, SUPERVISORS AND FARMERS			OTHER AGRICULTURAL WORKERS		
	Male	Female	Total	Male	Female	Total
<u>Windwards</u>						
Dominica	45.4	48.5	45.8	39.6	41.3	40.2
St. Lucia	43.6	43.8	43.6	37.9	39.2	38.3
St. Vincent	50.3	50.3	50.3	40.0	42.5	40.8
<u>Leewards</u>						
Antigua	n/a	n/a	n/a	n/a	n/a	n/a
Montserrat	55.7	53.2	55.0	47.1	47.5	47.3
St. Kitts	53.0	49.5	52.2	44.3	45.2	44.6

Table 5: Estimated Mean Age of Employed Workers in Agriculture, 1970.
Source: UWI/CRP (1976: Vol. 4, Part 16).

	AGE GROUPS ^{a/}			Total
	14 - 29	30 - 59	60+	
<u>Windwards</u>				
Dominica	492 (17.7)	1,723 (61.9)	567 (20.4)	2,782 (100.0)
St. Lucia	910 (21.8)	2,565 (61.3)	708 (16.9)	4,183 (100.0)
St. Vincent	121 (8.6)	856 (61.2)	423 (30.2)	1,400 (100.0)
<u>Leewards</u>				
Antigua	n.a	n.a	n.a	n.a
Montserrat	6 (3.7)	94 (58.4)	61 (37.9)	161 (100.0)
St. Kitts	27 (8.4)	182 (56.3)	114 (35.3)	323 (100.0)

Table 6: Age Distribution of Farm Managers, Supervisors, and Farmers, 1970:
Source: UWI/CRP (1976: Vol. 4, Part 16).

^{a/}- Number of individuals with percentages given in parentheses.

Country (Year of Census)	Number of Farm Holdings with Tenure by Tenure Category					Total
	Owned	Cash Rental	Share Tenancy	Mixed	Other ^a	
<u>Windwards</u>						
Dominica ('61)	6,614	1,390 ^b		580	83	8,667
St. Lucia ('71)	7,563	2,001	400	469	-	10,433
St. Vincent (72/73)	n/a					
<u>Leewards</u>						
Antigua (73/74) ^d	n/a					
Montserrat ('72	553	261 ^b		345	-	1,159
St. Kitts ('75) ^e	1,763	763	190	399	411	3,525

Country	Number of Acres by Tenure Category					Total
	Owned	Cash Rental	Share Tenancy	Mixed	Other ^a	
<u>Windwards</u>						
Dominica	n/a					
St. Lucia	66,667	2,049	874	2,411	-	72,001
St. Vincent	29,918	1,320	1,640	-	1,477	34,355
<u>Leewards</u>						
Antigua ^d	n/a					
Montserrat	3,844		688	1,348	-	5,880
St. Kitts	36,894 ^e	1,966	303	2,246	469	41,909

Table 1: Land Tenure Patterns, Agricultural Census Data.
Sources: Agricultural censuses of the respective countries

- a Mostly rent-free
- b Most of these farmers are probably cash renters
- c Total area held by farmers in various tenure categories minus owned area rented out.
- d The government of Antigua owns about 70% of the country's agricultural land. It is believed that about 75% of agricultural producers rent their lands from the Gov't.
- e Approximately 60% of the agricultural land in St. Kitts is government-owned.

In the development cycle of the family, farm families in the Eastern Caribbean are generally large.

No. of persons in Household	St.Vincent		St.Lucia		Dominica		Antigua		Montserrat	
	No.	%								
1 - 5	51	42.5	38	31.7	54	45.0	50	41.6	85	70.8
6 - 10	57	47.5	59	49.2	54	45.0	58	48.4	33	27.6
11 - 15	11	9.2	20	16.6	10	8.3	11	9.2	1	0.8
16 - 20	1	0.8	3	2.5	2	1.7	1	0.8	1	0.8
Total	120	100.0								

Table 7: Distribution of Farm Operators by Territory and Size of Farm Household.

Source: UWI/CARDI: 1979/1980.

	Total Population	Number of Households	Persons per Household
<u>Windwards</u>			
Dominica	69,549	15,148	4.6
St. Lucia	99,806	21,753	4.6
St. Vincent	86,314	16,940	5.1
<u>Leewards</u>			
Antigua	64,794	15,405	4.2
Montserrat	11,458	3,291	3.5
St. Kitts	44,884	11,236	4.0

Table 8: Average Household Size, 1970

Sources: UWI/CRP (1976: Vol. 9) and the Antigua census of population, 1970.

Referring to the tables above it is quite obvious that farm families in most of the islands average at least 6 persons in the household. This farm family average appears to be more than the average family size for the entire population in each country.

Family Structure

The predominant family structure of the Eastern Caribbean family population tends to be nuclear (man, woman and children) or stem (a nuclear family with an assortment of consanguinal or affinal relatives). In some instances all members of the family live in the same household; in other instances family members and their own families live in individual houses, but within the same compound. In the latter cases all members living within the same compound contribute to the same cooking-pot and work the same land.

Family structures in the Eastern Caribbean range from households composed and headed by women to those which include both men and women and where the leadership becomes quite ambiguous. Married relationships are the norm. This does not, however, eliminate the high incidence of common-law relationships or relationships where the man has visiting rights in a loosely structured alliance and in which two separate households are set up. It is also not uncommon to find fairly and institutionalised extra-marital relationships.

Matrifocal residence and the centrality of the mother's role in the kinship system is a common feature to the Black Caribbean community. This results from the loosely structured male-female relationships and the migration of men to seek employment outside the community. The household is therefore, flexible enough to permit women to function in both working and motherhood roles. Such familial systems allow the mother to become integrated into the labor force, while other members of the family assume child care responsibilities. Women usually have some kind of control over available economic resources - they have to work because of need. The need to work coupled with low levels of education serve as strong incentives for these women to take jobs in the marginal sectors which is characterised by the low paid labor of women. Income differentials between men and women headed households are substantial. While it has been stated that female heads of households usually look to their children for economic support, 50 percent of these women are still in their child bearing years. It is conceivable that these women continue to carry the economic burden of their children, not the other way round.

The majority of the children in the Eastern Caribbean complete their primary level of education and some of them go on to

secondary schools. Nonetheless, in most instances the children provide a valuable labor force for light farm activities and for tending livestock. We know of two farmers in St. Vincent, for instance, who rely on their children for harvesting. In fact one of the farmers usually tries to harvest during the weekend so that his children, who go to school outside the community, can return home to help.

But once the children leave school they appear to shy away from farm activities. The girls remain at home and perform household chores and look after their younger siblings, or seek employment in the non-agricultural sector. The boys remain idle or migrate to urban centers in search of unskilled employment. Some of them also migrate to the neighboring islands where the only employment they can obtain is agricultural employment. The curious phenomenon is that, while these boys refuse to help out in family farms, they accept farm employment elsewhere. They are usually transient migrants who are employed only seasonally (usually at harvest time). On their return home they live off their savings and make only minimal contributions to the family farm and to the community.

Although the size of the farm household will depend on the point in time in the development cycle of the family, farm families in the Eastern Caribbean are generally large.

Farm families in most of the islands average at least 6 persons in the household. This farm family average appears to be more than the average family size for the entire population in each of the countries. Very often as children marry and leave to set up their homes, the size of the household is maintained by bringing in other consanguinal and affinal relatives so that there is a ready pool of family labor which can be tapped for farm activities.

Although there appears to be slight variations in the use of family labor, the family is the main source of labor inputs in all small farms in the region. In a covering calendar year labor allocation in a sample of farmers was estimated to be as follows:

TYPE OF LABOR FORCE

	<u>FAMILY DAYS</u>		<u>NON-FAMILY DAYS</u>	
	<u>NO.</u>	<u>%</u>	<u>NO.</u>	<u>%</u>
St. Lucia	193	66.1	94.	33.9
St. Vincent	149	73.9	53	26.1
Antigua	164	93.6	11	6.4
Montserrat	104	65.1	55	34.8

Table: Average number of farm days by type of labor force
(one calendar year)

Source: Time series data, Project.

At a single glance, the farmer does not appear to be economically viable because of the underutilization of land. But on talking to the farmer it is realized that resource factor allocations and combinations had been given careful thought. Arrowroot is the main crop in the farming system but because of the fairly high cost of production resulting from hired labor (the farm family is made up of the farmer and his wife, both of whom are old), production is maintained at a level where the resource allocation makes the enterprise non-risky. Beyond this level, arrowroot production becomes a risky operation. Thus through trial and error the farmer had discovered that approximately three acres of arrowroot is the maximum that his farm resources can maintain. The utilization of land and the apparent lack of enthusiasm to practice intensive intercropping is easily explained by the farmer. The farmer feels that the present acreage under cultivation is more than sufficient to maintain himself and his wife. In addition to farm incomes, the farm couple received remittances from their children who live abroad. Farm incomes are low, so in order to achieve physiological subsistence level of income, some of the family members have to seek off-farm employment for part of the year.

1/15

Community Organisation

Small farm production and marketing decisions are made in a complex matrix of social and economic decisions. A small farm economy is one which links purchaser and producer, resource allocation, and product allocation in a network of ties which are personal. And personal relationships affect: (a) rights to the use of land; (b) the mobilization of land; (c) the objectives of the decision maker; (d) the accumulation of capital; (e) the choice of technology; and (f) the disposal of output.

All these personal relationships are determined at three different levels: the household, extra-household kinship ties, and community. Community influences affect factor inputs, technology, marketing, in addition to determining the social imperatives that control (or constrain) decision making. Furthermore, the community affects the structure of markets and of exchange relations. Simply put than, the farm family's decision making process does not only include choices made within the context of the household but within the larger social environment of the community too. The social environment comprises households in which either a nuclear or extended family resides, and a number of such household make up a village; several villages together comprise a district which has government institutions like a post-office, police station and schools.

An example, with reference to the importance of the social environment is that of a particular farming community in Montserrat. In this community there are a number of female headed households and consequently the proportion of female farmers is rather high. This has resulted in formalized exchange labor between the workmen - they share farm information and farm inputs. Indeed when one of them wants to try out a new technology she consults with the rest of her friends in the community. They have also organized themselves into cooperative marketing - they take turns to market the joint produce at the central market. Finally, there is also a well established system of food exchange so that the community is well supplied with food. Indeed many of them remarked that they would make sure that there is sufficient food in the community before they send their produce to the market.

Inasmuch as there are examples of well integrated communities there are also examples of communities where conflict prevails. A case in point is a series of neighboring villages in Choiseul in St. Lucia. These villages are served by an irrigation canal from the Delcer river. As is to be expected, the village closest to the source of the irrigation system benefits the most. In the dry

season especially, the farmers from this village block up the feeder canals which channel water to the villages lower down. And this action inevitably caused strife between the villages. Besides, this has resulted in the reduction of production levels during the dry season. Nonetheless, although intervillage ties are strained, intravillage ties have been strengthened - the canal has improved these relationships. Villages combine their labor resources towards the maintenance and upkeep of the length of the canal which transverses each of their villages.

The community provides a measure of security for the individual farming household. In times of personal distress, help is provided, individually and collectively, via community institutions like various friendly organizations and associations and benevolent societies. The comunal spirit is further enhanced in the joint sharing of such facilities as laundry facilities and standpipes; the church too is an important median for community integration.

Social Services and Facilities

In many of the farming communities in the Eastern Caribbean social services are generally inadequate, particularly with respect to secondary schools and medical facilities. On the other hand, provision shops, primary schools and recreation facilities are usually within easy reach. Infrastructural facilities need to be improved in the majority of farming areas. The general complaint of many farmers is that the drainage is poor and electricity, roads and telephone services are inadequate.

Housing facilities are normally very basic. Dwellings are constructed either with wood or wood and concrete. Built mainly during the last two decades, most of the farm family houses appear to be adequate. Room sizes are fairly standard, 8ft by 10ft. The kitchen is a separate structure at the back of the house. This is generally to facilitate the mode of cooking, i.e. with firewood, and to prevent smoke from filtering through the entire house.

There is no running water in many of the rural homes throughout the Eastern Caribbean. Most farm families receive their water supply from public standpipes. In some instances the river is the only source of water. Pit latrines, rather than indoor water closets are normal in all areas.

TRADITIONAL BELIEFS AND PRACTICES

The Eastern Caribbean is predominantly of African heritage and this heritage is reflected in certain facets of African religion and superstition associated with voodoo and obeah. This, together with the influence of Christianity and the McDonald Almanac is responsible for the series of superstitions and the great many myths associated with agriculture in the rural areas. As such, agricultural decision making becomes influenced by traditional beliefs and practices, not all of which, however, have a profound effect on farm management and farm practices. If anything, these traditional practices are psychological tools for overcoming the high level of risk associated with agriculture - a level of risk which the farmer cannot afford because his/her resources are extremely limited and he/she has no means of controlling the natural forces of hurricanes and droughts. Farmers carry out practices to ward off evil spirits and to prevent harm from falling on their crops and animals.

The myths and folklores associated with agriculture can be categorized as follows:

- i) those influenced by the moon;
- ii) those associated with evil spirits;
- iii) those of a more general nature and not associated with any of the above.

Most farmers plant their crops with the aid of the McDonald Almanac which prescribes planting dates according to the phases of the moon, i.e. planting is according to the size of the moon (full, half or quarter). As the moon is rising, planting is done between two to three days after the appearance of the moon, all planting is stopped between three and seven days. It is believed that the plant will grow together with the moon. During the waxing moon, the seed germinates and the stem grows towards the surface of the soil. It reaches its maximum weight in the full-moon. During the waning moon (i.e. as the moon begins to disappear) the plant will tend to grow downwards, thereby forming roots. Thus it is commonly believed that above ground' crops should be sown during the waxing moon and root crops (i.e. crops which produce below the ground) during the waning moon. Similarly, it is believed that bananas planted during the waning moon will result in deeper roots thus preventing the trees from being blown down easily. Some farmers believe that higher yields are obtained when pulses are planted in full-moon, green leafy vegetables on the other hand should be planted in the

105

first quarter if high yields are to be obtained, and in fruit trees, high yields are realised when they are planted on St. Catherine's day, i.e., on the 25th of November. Coconuts too are supposed to be affected by the moon. If coconuts are planted in the waning moon, the plant will be dwarfed.

Recently we have begun to notice the incorporation of lunar influences into improved farming practices. Some farmers in St. Lucia are of the opinion that weed control is influenced by the moon. If the weeds are sprayed with gramaxone when the moon is waning then better results are obtained.

Farmers in Dominica store their ground provisions according to the phase of the moon. Very often the produce is stored in pits and covered with leaf trash. It is believed that produce stored in this manner during a dark moon results in far less spoilage than produce stored during a bright moon: the moonlight attracts insects.

The effect of moonshine is not restricted to crops alone; some farmers believe that the moon influences the sex of the animals. It is presumed that a cow mated in the first phase of the moon is likely to produce a male off-spring. In the second phase the offspring is likely to be female and in the last phase, the off-spring can be of either sex.

Apart from moonshine traditions there is an entire array of other myths associated with evil spirits. The medicine men witch doctors ('gradeur' in St. Lucian and Dominican patois) are able to cast evil spirits or to cure ailments. Farmers believe that other people can prevent their crops from flourishing and their animals from reproducing. To prevent this evil eye, some farmers in St. Lucia plant a variety of peas known locally as 'pois chochon' in the corners of their fields; others employ a gardeur to mix a specially prepared concoction which is placed in either a green or blue bottle and then buried in the ground. The reasoning behind this myth is that for a person to place a spell on another's crop or animals he must be able to see his spirit. Placing a green or blue bottle in his fields obscures the gardeur's view of his opponent.

In St. Lucia we have sometimes seen a small replica of a coffin in farmer's fields. This practice according to one interviewee has no real power in itself, but serves to prevent larceny - St. Lucians interpret coffins and other mysterious objects as symbols of evil.

There are many other myths and traditions that we have documented elsewhere but which we shall not include here because of space. Be that as it may, we would like to emphasize here that in addition to all those superstitions and beliefs, farmers in the

Eastern Caribbean are generally god-fearing people. In fact a Vincentian farmer mentioned that, "The bible gives me the inspiration". This same farmer is unhappy about the way in which other farmers in his community follow a set pattern of farming with no initiative to improve upon the system and especially so if a crop is unsuccessful. He said, "Man must follow the bible, in of season, out of season, to catch the season a man must keep trying till his crop is successful".

The incorporation of mythical beliefs into farming operations does not have any profound influence on farm management and practices. Walking around a breadfruit tree during its bearing stage so that it will bear all year round, or driving a big nail into the trunk of a fruit tree so that it will bear faster does not have any significant scientific relevance. The significance, however, manifests itself in the psychological reasoning of farm failures, and of overcoming the risks associated with farming, risks the farmer has no control over. A farmer of St. Lucia for instance explained his third successive cabbage crop failure as the effect of an evil omen cast on his fields by his envious neighbors. In effect, the failure was due to water-logging caused by severe rains.

Farm practices become affected when these traditions impinge on the management of the farming system. If a farmer believes strongly on influences of the lunar system on his production system, then it is more likely that he will wait for the appearance of that lunar phase. This practice unfortunately affects timely planting, i.e. if a farmer has not prepared his land in time for the particular phase of the moon he is apt to wait 28 days till the phase appears again.

Irrespective of the fact that these myths and traditional beliefs have yet to be scientifically proven, the fact still remains that if agricultural development is to move ahead, efforts must be made to take into account these traditional practices as they relate to decisions. One cannot easily divorce the farmers from their already established patterns where they believe the myths have worked. They "know" that the nail in the trunk of the tree brings results but they are unable to articulate the arguments for the use of the nail scientifically. Most of these myths have been established by experience and observation and as such should be respected until proven false.

II. Social Soundness of FSR/D Project

The FSR/D Project is designed to facilitate the growth of a more diversified agriculture consistent with the changing political and economic requirements of the LDC's in the Eastern Caribbean. The emphasis on regional food production will most likely accelerate the relative shift in the structure of agricultural production from mono-cropping estates to multiple enterprise, small and medium sized farms. The project will be particularly concerned with developing technologies appropriate to the circumstances of target groups of farmers, i.e., all the factors of production which affect farmers' decisions with respect to a crop technology - their natural environment (soil type, rainfall); their economic environment (food production, product markets, price of inputs) and their own goals, preferences and resource constraints.

Almost all small farmers in the Eastern Caribbean have a goal of increasing incomes, broadly defined to include production for home consumption. Generally, farmers have a security goal of meeting subsistence requirements of their preferred food; they also want to avoid taking those risks that might endanger their subsistence or cash sources of income. Farmers reject available technologies not because they are conservative or ignorant, but because they rationally weigh the changes in incomes and risks associated with these given technologies under their natural and economic circumstances and decide that for them the technology does not pay.

While taking into account farmer circumstances the FSR/D methodology has been designed that it first determines whether farmers in a region are sufficiently alike to allow for a common set of experiments and common recommendations. No two farmers have identical circumstances. At the same time, however, a research programme cannot be established to provide recommendations for each farmer. It is therefore necessary to classify farmers with similar circumstances into recommendation domains - groups of farmers for whom we can make more or less the same recommendations with minor changes to be worked out at the household - farm level. Recommendation domains are usually defined on the basis of agro-climatic environments. The data from previous research indicates that agroclimatic conditions are frequently modified by the socio-economic circumstances of the farmer. Indeed, a recommendation domain may result from a complex interaction of agroclimatic and socio-economic factors. Therefore, a knowledge of farmer circumstances and how they affect crop technologies is a necessary element in identifying recommendation domains. In the final analysis then, one of the ultimate tasks of this project will

181

be to incorporate a knowledge of farmer circumstances into the design of technologies so that they are consistent with farmer circumstances and goals.

Previous CARDI research focussed primarily on describing individual farming systems and household characteristics --characteristics affect the type of on-farm research that is designed for the improvement of the farming practices and technologies. The characteristics referred to are those in addition to the biological and physical relationships that constitute a traditional system developed by the farmer himself/herself; a traditional system that does not only include the farmer's understanding of his/her own agroecological niche but which also includes the farmer's beliefs and customary practices, and his goals and motivations.

In light of the above, special attention will be given to understanding, in a comprehensive manner, some of those factors which affect the farmer's system. For example, if farmers in most areas of a country have always been growing their corn with pigeon peas, a more dynamic approach to improving farming systems would be to set up trials on corn and pigeon pea combinations rather than to introduce corn with sweet potato yields, it would be quite wrong to assume that he will react positively to growing corn with sweet potatoes; he could well be experimenting with his present corn and pigeon pea system.

By similar token in an area where heavy emphasis is placed on cash crops and sweet potatoes are grown primarily for home consumption, it is quite likely that less importance will be placed on improving present sweet potato cropping technologies. As one farmer succinctly summed up the situation, "We prefer to follow tradition and do like our fathers and grandfathers plant. They always been good that way". Yet this same farmer who specializes in tree crops does not hesitate to improve on the cropping system of his tree crops because, "Them trees bring money; the potatoe is to eat at home- we sell only what we cannot eat".

An understanding of small farmer constraints will enable the project to determine whether a new technology is suited to small farmers and what it will take to gain its adoption. To make these determinations, the project will first examine the farmer's existing production patterns and identify the physical, socio-cultural and political factors that influence his decision-making. After ascertaining the farmer's current activities and the pressures on him, the project will determine the changes required in behavior and resource commitment by small farmers if project activities are to be successful.

The gap between small farmer behavior and what is required by the project may be significant, entailing changes in agricultural practices, in the commitment of family labor, funds and land, and in patterns of cooperation and accountability. Whether a farmer will make these changes will depend on his perception of risk - which should be the primary consideration when studying how to bridge the gap between present and anticipated behavior. Through an active dialogue with local participants, it is possible to identify the major impediments in making the changes called for by the new technology. Once identified, it will be the responsibility of the project to insure that the interventions are designed in a way to provide the farmer with the motivation necessary to overcome the constraints to change.

Social Consequences and Benefit Incidence

The direct beneficiaries of this project will typically be households on small farms. The farm family will be the unit of analysis. A specific farming system arises from the decisions taken by a small farmer or farming family with respect to allocating different quantities and qualities of land, labor, capital and management to crops, livestock and off-farm enterprises in a manner which, given the knowledge the household possess, will maximize the attainment of the family goals.

Due to the low income generation of small farm agriculture in the Caribbean, members of farm households have to seek off-farm employment in order to supplement farm incomes. Small farmers in the Caribbean typically engage in other economic activities mainly because their earnings are too low to provide desired levels of living. Only a minority are full-time farmers, and a large proportion earn less than half their income from farming. In St. Lucia 36 percent of a sample of 200 small farmers (Momsen 1970: 81) worked off their farms; Mills (1976: 155-156), who surveyed 66 small holders in St. Kitts, found that almost all of them were employed as laborers on sugar cane estates during the five-month harvest period; Briely (1974: 65-66) found that 39 percent of the 292 small farmers he interviewed in Grenada obtained at least half of their income from off-farm activities; and the government of Antigua's (1977) survey of 100 small farmers found that 48 of the 92 farmers responding to questions on off-farm employment spent at least half of their labor time on such activities. All of this off-farm work is not due to the land constraint. At the farm level, land often is under- or unused because of the limits of what the household can cultivate with existing equipment. In addition, at the national level, there are idle and under-used lands that are not readily available to households due to land tenure and other policies.

Reviewing the literature on the Caribbean, and reviewing the primary data collected this far, it has come to our attention that the reliance on the 'small farmer' concept in the Eastern Caribbean becomes rather problematical, if not unrealistic. Instead of speaking of 'small farmers', perhaps we should use some other term (rural household) to describe the target population.

In 1980 or 1981 per capita income at market prices in the six countries ranged from US\$539 (GNP) in St. Vincent to US\$1,647 (GDP) in Antigua. The growth rate in per capita income has declined throughout these countries since 1978.

Although the data on income distribution are scarce the available evidence suggests that farm household incomes in the Eastern Caribbean are highly dependent on off-farm employment and on remittances. The fact that 70 percent of the farmers in the government of Antigua's survey (1976) have gross cash incomes from farm operations of EC\$1,000 (US\$370) or less suggests that part-time farming in Antigua is more important than full-time farming as a source of income. Similarly, unpublished data from the 1972 agricultural census show that only half of Montserrat's farm operators derived most of their income from farming.

<u>Source of Income</u>	<u>No. of Farmers</u>	<u>Percent</u>
Own farm	628	50.9
Working on other farm	14	1.1
Non-farm activities	590	48.0
<u>TOTAL:</u>	1,232	100.0

As would be expected landless farmers and those with less than one acre were even more dependent on off-farm employment.

In 1970 the economy-wide unemployment rate in the Caribbean Region was 7.9 percent (UWI/CRP 1976: Vol. 4, Part 16). Since 1970 unemployment rates appear to have risen in most, if not all the countries. In Dominica, a survey of 670 households in 1976 found the unemployment rate to be 22.7 percent and an additional 11.9 percent were found to be underemployed.

Open unemployment rates in agriculture were very low in 1970, averaging less than 1 percent of the agricultural labor force. Since most of the rural youth migrate from the farms to urban areas, or seek employment overseas, these very low rates of open unemployment are not surprising.

The purpose of this project is to improve farming and cropping technologies so that there is an increase in agricultural production per unit of land and per unit of labor. The project will also develop cropping systems for part-time farmers. It is therefore anticipated that the project will have an impact on the status of part-time farmers by providing improved technologies and farming methods. Consequently, even if land and capital remain limited, farming becomes an attractive enterprise in so far as i) farm incomes are increased, and ii) farming activities are made less arduous. Furthermore, since this project will be concerned with all types of food crops for internal markets as well as food and cash crops for regional and external markets, it is expected that the

project will have a positive impact on the economic status of the farm family. It is also expected that the improved level of income of the farm family will tend to stabilize family relationships.

Finally, given the information available from the previous research work and from the literature available, it is highly unlikely that the project will have any negative consequences for other social, economic or political groups. In fact, non-farm consumers, especially the low-income households, would share in the gains via larger quantities of basic foods at lower prices.

Women as Direct Beneficiaries

Special attention will be given to women in agriculture since women represent a substantial percentage of those engaged in agricultural production on small scale farmers in the Eastern Caribbean.

Women farmers in the Eastern Caribbean play a significant economic role in small-scale agriculture. They too are subject to general constraints faced by small farmers, but frequently in ways different than those that touch men. For example, the case of women farmers who have to let their bananas rot on their mountainous parcels of land because they were not able to find the necessary labor to head the bananas down to the road - a rather strenuous activity, considering the terrain of many of the small farmers in the Eastern Caribbean.

In addition, women, because of their multiple work roles, agriculture, child care, home maintenance within the farm household and because of stereotypic notions of these roles, confront special problems in becoming more efficient food producers. Although a substantial number of women are engaged in farm work, women farm operators on the average receive less income than men and many of the women classify themselves as 'housewives' rather than 'farmers'. Moreover, women receive less attention from the extension service than do male farmers. Thus, another important explanation for the food production/importation dilemma, which is frequently overlooked, is the 'female factor' in local food production.

According to the Brandt report: "Any definition of development is incomplete if it fails to comprehend the contribution of women to development and the consequences of development for the lives of women. Every development plan, policy or project has an impact on women and cannot succeed without the work of women." Consequently, the project will take particular care not to assume:

1. that the man is usually or always the principal farmer;
2. that the man alone controls decision making on the farm (women more frequently are responsible for the foods for internal exchange in local markets and the women tend to control the money from these transactions);
3. that because a woman says that she is a 'housewife', she is not the principal farmer and decision maker.

It will be extremely important when selecting farmers for on-farm trials that female headed houses will be represented because the types of modifications made in cropping systems will invariably have an impact on the use of women's labor. At the same time the type of crops that will be introduced will determine to some extent who will market the crop and control the income, i.e. women more commonly control the marketing of food crops for local consumption while men control the marketing of export crops. One of the objectives of the project is to increase the production of local subsistence crops so that the dilemma of increased imports and the loss of foreign exchange is reduced. It is therefore expected that the project will have a positive impact on the status of women.

Potential for Improved Farm Family Incomes through Private Sector Participation

The private agri-business sector serving the farm communities constitutes a potential vital force for increasing farm productivity levels. The proposed project will strengthen CARDI's ability to respond to the identified ways in which the private sector can be utilized to contribute to the objectives of the project.

Agricultural credit institutions in the Eastern Caribbean are relatively new. Subsequently the number of small farmers receiving credit is relatively small. And, the amount received by small farmers is so small that it does not permit them significantly to improve production technology.

The primary sources of credit in the Eastern Caribbean are: i) commercial banks, ii) producer associations, iii) private money lenders. Small farmers have little access to credit from commercial banks, for which small loans are unprofitable, and there are few viable cooperatives of small farmers which would give them access to this source of credit.

One of the ways in which the project will emphasize private sector participation will be through cooperation with the extension service in the encouragement of small scale cooperatives to provide necessary farm inputs for improved farm practices and techniques.

The cooperatives will be organized to function as local group organisations, which can be useful from many points of view. If the extension agent is giving general information and instructions, it is far more efficient for him/her to utilize groups. Organizing the farmers into locally managed cooperatives can often generate social pressures that encourage repayment. Finally, at a broader more political level when farmers are organized into local cooperatives they are more capable to fund local extension activities and to participate in local experiments by contributing land and their knowledge.

DETAILED FINANCIAL ANALYSIS

I. PERSONNEL COSTS

Base costs for personnel are as follows:

1. Technical Specialists

Salary:	US\$ <u>22,000</u>
<u>Benefits:</u>	<u>6,900</u>
Housing	4,400
Pension	2,200
Ins.	300
<u>Misc.</u>	<u>2,800</u>
TOTAL	<u>31,700</u>

2. Country Team

Country Team Leaders

Salary:	US\$ <u>18,000</u>
<u>Benefits:</u>	<u>5,500</u>
<u>Misc.</u>	<u>2,350</u>
TOTAL	<u>23,850</u>

Technicians

Salary:	US\$ <u>13,000</u>
<u>Benefits:</u>	<u>5,000</u>
TOTAL	<u>18,000</u>

3. Administrative Assistant

Salary:	US\$ <u>13,000</u>
<u>Benefits:</u>	<u>5,000</u>
TOTAL	<u>18,000</u>

Executive Secretary US\$14,400

Senior Secretary 7,000

Junior Secretary 6,000

Inflation is calculated at 10% per year, compounded

131

II. EQUIPMENT AND SUPPLIES

GENERAL OFFICE EQUIPMENT - PROJECT HEADQUARTERS (ST. LUCIA)

	US\$
1 - L-shaped Secretary's Desk	500
6 - Office Desks	2,000
1 - Small Table	50
1 - Utility Table	50
1 - Conference Room Table	200
Library/Office Shelves	1,000
12 - Conference Chairs	500
3 - Typist Chairs	500
4 - Office Chairs (Staff)	200
6 - Office Chairs (Guests)	200
2 - Typewriters	4,000
1 - Photocopier	5,000
1 - Gestetner Duplicator	3,000
1 - Guillotine	5,000
1 - Collator	2,000
2 - Filing Cabinets (4 drawers)	900
2 - Filing Cabinets (3 drawers)	600
10 - Filing Cabinets (2 drawers)	2,500
1 - Ring Binder	1,000
2 - Desk Calculators	300
10 - Pocket Calculators	200
4 - Programmable Calculators	2,000
2 - Heavy Duty Perforators	100
4 - Letter Stands	200
6 - Staplers	60
8 - File Trays - 3 tier	160
1 - Letter Scale	25
2 - Heavy Duty Staplers	100
1 - Metal Storage Cabinet	300
1 - Dictating Machine & Tape Recorder	1,000
	<u>33,645</u>
Miscellaneous	8,365
	<u>42,010</u>
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SPECIALIZED OFFICE EQUIPMENT - ST. LUCIA, ANTIGUA, TRINIDAD

Micro-Computer/Word Processor

System

Cost of System	7,500
Cost of additional systems	18,000
Power Protection	6,000
Air Conditioning & Building Arrangements	30,000
Spares - 2 years	18,000
Supplies - 2 years	12,000
Maintenance - 2 years	6,000
	<u>97,500</u>
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199

GENERAL OFFICE EQUIPMENT - ANTIGUA

	<u>US\$</u>
1 - Typewriter	2,000
4 - Office Desks	1,200
4 - Office Chairs	200
1 - Duplicator	3,000
1 - filing Cabinet (4 Draw)	450
4 - Filing Cabinet (2 Draw)	1,000
1 - Desk Calculator	150
2 - Pocket Calculators	40
2 - Programmable Calculators	500
	<u>8,540</u>
Miscellaneous	854
	<u>9,394</u>
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GENERAL OFFICE EQUIPMENT - COUNTRY FIELD TEAMS

4 - Typewriters	8,000
5 - Filing Cabinets (4 Drawer)	2,250
20 - Office Desks	6,000
20 - Office Chairs	1,000
5 - Desk Calculators	750
10 - Pocket Calculators	200
5 - Programmable Calculators	2,500
	<u>20,700</u>
Miscellaneous	2,070
	<u>22,770</u>
	=====

191

B. LABORATORY EQUIPMENT

	<u>US\$</u>
2 - Air Conditioning Units	2,000
2 - Refrigerators	4,000
2 - Deep Freeze	4,000
4 - Balances	2,000
4 - Scales	1,000
7 - Microscope	2,800
14 - Soil Test Kit	2,800
14 - Plant Tissue Kit	2,800
14 - pH Meter	1,400
14 - Soil Moisture Meter	1,400
7 - Insect Collecting & Mounting Kit (including Killing Jars, spreading Boards, etc.)	4,200
7 - Plant Press & Mounting Equipment	700
7 - Laboratory ware (includes Bottles, funnels, flasks, cylinders)	7,000
30 - Magnifiers	900
7 - Soil Sampling Kit (including soil samplers, bags, sample boxes, color charts, etc.)	<u>2,800</u>
Miscellaneous (Jiffy pots, labels, etc.) 20%	<u>39,800</u>
	<u>7,960</u>
	<u>47,760</u>

C. FIELD EQUIPMENT

	<u>US\$</u>
14 - Scales (Hanging) Heavy Duty	2,800
7 - Scales (Platform) Heavy Duty	4,200
30 - Scales (Small)	3,600
70 - Rain Guages	4,200
15 - Knapsack Sprayers	6,000
2 - Mist Blowers	7,000
2 - Small Tractors - 2 wheeled	12,000
2 - Rotavator	2,000
2 - Ploughs	2,000
2 - Harrows	2,000
2 - Cultivators	2,000
2 - Grain Seeder	1,000
2 - Bean Seeder	1,000
2 - Peanut Seeder	1,000
2 - Vegetable Seeder	1,000
60 - Job Planters	6,000
14 - Wheel Seeders	1,400
2 - Seed Cleaners, Processors	10,000
2 - Seed Dryer & Storage Equipment	10,000
7 - Bean Thresher	3,000
7 - Peanut Thresher	3,000
7 - Peanut Sheller	3,000
7 - Bean Sheller	3,500
2 - Peanut Oil Expeller	2,000
4 - Irrigation Equipment	40,000
4 - Camera	4,000
1 - Planter for Cassava Trials	6,000
1 - Harvester for Cassava Trials	5,000
1 - Clipper for Cassava	2,000
Drying Equipment	2,500
Miscellaneous (Tools & Equipment)	<u>122,000</u>
	<u>244,200</u>

1972

D. EXPERIMENTAL MATERIALS & SUPPLIES

Seeds e.g. vegetables

Planting material (Improved)

Fertilizers

Micronutrients

Starter solutions & Fertilizers

Soil amendments - Lime, gypsum, etc.

Secondary Nutrients

Insecticides

Fungicides

Nematicides

Rodenticides

Weedicides

Plant Stimulants - Hormones

Preservatives

Feeds

Fencing Wire

Above materials will be used over the life of the project.

Yearly costs are as follows:

Year 1	40,000
Year 2	85,000
Year 3	95,000
Year 4	100,000
Year 5	85,000
Total	<u>305,000</u> *****

FIELD STATION DEVELOPMENT

	<u>US\$</u>
1. Renovation of Existing Buildings	45,000
2. Office & Store-room Fixtures and additional electrical installations	30,000
3. Farm Machinery - Tractor & Implements	30,000
4. Irrigation Equipment	25,000
5. Equipment	10,000
6. Drainage System, Fencing.	40,000
7. Miscellaneous Equipment and Supplies	<u>20,000</u>
TOTAL	<u>200,000</u> =====

115

III. OPERATING EXPENSES

1. Administrative Expenses

	<u>\$/Year</u>
<u>St. Lucia</u>	
Rent	\$21,600
Utilities	\$12,000
Supplies	<u>\$ 6,000</u>
	\$39,600
<u>Antigua</u>	
Rent	
Utilities	\$ 6,000
Supplies	<u>\$ 4,000</u>
	\$10,000
<u>St. Kitts</u>	
Rent	
Utilities	\$ 2,000
Supplies	<u>\$ 3,000</u>
	\$ 5,000
<u>Nevis</u>	
Rent	
Utilities	\$ 2,000
Supplies	<u>\$ 2,000</u>
	\$ 4,000
<u>Montserrat</u>	
Rent	
Utilities	\$ 2,000
Supplies	<u>\$ 3,000</u>
	\$ 5,000
<u>Dominica</u>	
Rent	\$ 6,000
Utilities	\$10,000
Supplies	<u>\$ 4,000</u>
	\$20,000
<u>St. Vincent</u>	
Rent	\$ 6,000
Utilities	\$ 4,000
Supplies	<u>\$ 4,000</u>
	\$14,000

Countries' contribution of \$18,000 per year for office space for country teams in Antigua, St. Kitts/Nevis, Montserrat

OPERATIONAL EXPENSES (ON-FARM TESTS)

2. Research Systems

A.	<u>On-Farm Production Analyses</u>	<u>US\$</u>
1.	<u>Explorating Experiments</u>	
	2 Experiments per island per year x 7 islands x 4 years x \$1500/experiment =	98,000
2.	<u>Technology Screening</u>	
	3 Experiments per island per year x 7 islands x 4 years x \$1000/experiment =	89,000
B.	<u>On-Farm Testing of Alternatives</u>	
	3 Experiments per island per year x 7 islands x 4 years x \$2000 per experiment =	180,000
C.	<u>Validations</u>	
	2 Validation per island per year x 7 islands x 3 years x \$1000 per validation =	42,000
		<u>400,000</u>

Inflation is calculated at 10% compounded.

RESEARCH STATION OPERATING EXPENSES

	US\$/Year		
	<u>St. Lucia</u>	<u>Antigua</u>	<u>Total</u>
Labour (Casual) US\$1000/fortnight x 26 fortnights/year =	26,000	26,000	52,000
Materials & Supplies	13,000	13,000	26,000
Machinery, & Vehicle Maintenance	<u>6,000</u>	<u>6,000</u>	<u>12,000</u>
	<u>45,000</u>	<u>45,000</u>	<u>90,000</u>
Local Travel US\$6,000/country/yr. x 6 countries x 5 yrs.			

Inflation is calculated at 10% per year compounded.

1971

IV. TRAVEL

Regional

Average Trip	US\$500.00
Air Fare	\$400.00
Per diem for 4 days	\$400.00

Estimated Travel per year.

Project Leader - 24 trips	\$12,000/yr.
Technical - 116 trips	\$58,000/yr.
Country Team Leaders - 12 trips	\$ 6,000/yr.
Administrative Ass't - 12 trips	\$ 6,000/yr.

Inflation is calculated at 10% compounded per year.

V. TECHNICAL ASSISTANCE

I. Institutional Contract

Cost for FSR Specialist is calculated at 120,000 per year.

<u>Salary and Benefits</u>	<u>\$ 60,000</u>
<u>Support Costs</u>	<u>30,000</u>
Housing Allowance	10,000
International Travel	2,000
Shipment of Effects	10,000
Educational Allowance	2,000
Intra-regional Travel	6,000
Overhead (50% of S & B)	<u>30,000</u>

Short term Assistance

RMS and short-term Assistance is calculated at 12,000 per person month as follows:

Salary and Benefits	5,000
Per Diem	3,000
Overhead: (50% S & B)	2,500
Travel	1,000
Miscellaneous	500
	<u>12,000</u>

The utilization of technical assistance is calculated as follows:

	<u>Yr. 1</u>	<u>Yr. 2</u>	<u>Yr. 3</u>	<u>Yr. 4</u>	<u>Yr. 5</u>	<u>Total</u>
FSR Specialist	6	12	12	12	6	42
Research Management	3	6	6	6	2	27
Short-Term	2	9	9	9	6	36

Costs are as follows:

	<u>\$ (000)</u>					
	<u>Yr. 1</u>	<u>Yr. 2</u>	<u>Yr. 3</u>	<u>Yr. 4</u>	<u>Yr. 5</u>	<u>Total</u>
FSR Specialist	60	132	145	160		497
Research Management Specialist	36	79	87	96	102	400
Short-Term	<u>36</u>	<u>119</u>	<u>130</u>	<u>143</u>	<u>102</u>	<u>530</u>
	<u>132</u>	<u>330</u>	<u>362</u>	<u>399</u>	<u>204</u>	<u>1,427</u>

199

II. Design & Implementation of O&M System

Three specialists for two month period including O&M specialist, financial specialist, personnel specialist. Cost estimate is as follows:

Salary & Benefits	5.000 per month x3x2	30,000
Per diem	3.000 per month x3x2	18,000
Overhead (50% S&B)		15,000
Travel	2.000 x 3	7,000
Miscellaneous		<u>25,000</u>
		100,000

III. Workshops (\$60,000)

One consultant for approximately one month. Cost estimated at approximately \$15,000. Cost includes: salary, travel, per diem, overhead, estimated at \$12,000, (see estimates for short-term technical assistance) \$3,000 for workshop materials, preparational and miscellaneous expenses. Three workshops anticipated.

IV. Specialty Technical Assistance (\$180,000)

- a. Yearly Project Audit (30,000)
- b. Micro-Computer Technical Assistance

Estimates up to four person months of technical assistance will be needed to effectively utilize micro-computer systems. It is estimated T.A. will be in late year 2 \$50,000.

V. Other Assistance (\$200,000)

Technical assistance utilizing local or U.S. firms will be necessary to assist CARL with problems that will develop during the course of project implementation.

200

VI. Training

The cost of short courses is calculated at 5,000 per person month as follows:

Per Diem	3,000
Air Fare	800
Course	1,000
Miscellaneous	200
	<u>5,000</u>

The cost of Workshops is calculated at 12,000 per workshop as follows:
Assume 15 participants each workshop, Costs 6 days.

Per Diem	15 x 6 x 100 = \$ 9,000
Air Fare	15 x 200
	<u>3,000</u>
	<u>\$12,000</u>

Training Schedule is as follows:

	<u>Yr.1</u>	<u>Yr.2</u>	<u>Yr.3</u>	<u>Yr.4</u>	<u>Yr.5</u>
Long-term (person yrs.)		2	4	2	
Short courses	3	3	3	3	3
<u>Workshops</u>					
Planning	1	1	1	1	1
Evaluation Design		1			
Micro-Computers		1			
Implementation		1			
Project Management	1				
Extension	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
	3	5	3	2	1

261

CARDI FSR/D PROJECT
(538-0000)

DETAILED BUDGET

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
I. PERSONNEL COSTS						
<u>AID</u>						
Technical Specialists	158,500	261,524	195,784	105,477	-	721,285
Country Teams	344,000	283,800	208,120	114,466	-	950,386
Management Support	111,400	51,490	37,752	20,763	-	221,395
Sub-Total	<u>613,900</u>	<u>596,804</u>	<u>441,656</u>	<u>240,706</u>		<u>1,893,066</u>
<u>CARDI</u>						
Core	108,500	120,450	132,495	144,746	158,871	665,062
Technical Specialists	-	80,176	188,755	239,897	467,110	1,025,968
Country Teams	-	87,600	200,120	335,398	496,650	1,119,768
Management Support		64,060	90,042	120,510	155,100	429,712
Sub-Total	<u>108,500</u>	<u>352,226</u>	<u>611,442</u>	<u>890,551</u>	<u>1,272,731</u>	<u>2,240,510</u>
<u>Host Countries</u>						
Country Team	126,000	138,600	152,460	167,706	184,476	769,242
Sub-Total	<u>126,000</u>	<u>138,600</u>	<u>152,460</u>	<u>167,706</u>	<u>184,476</u>	<u>769,242</u>
PERSONNEL COSTS TOTAL	<u>648,400</u>	<u>1,108,690</u>	<u>1,227,558</u>	<u>1,320,963</u>	<u>1,474,207</u>	<u>5,579,818</u>

**CARDI FSR/D PROJECT
(538-0099)
DETAILED BUDGET**

	<u>YEAR 1</u>	<u>YEAR 2</u>	<u>YEAR 3</u>	<u>YEAR 4</u>	<u>YEAR 5</u>	<u>TOTAL</u>
II. <u>EQUIPMENT AND SUPPLIES</u>						
<u>AID</u>						
Office Equipment	74,174	87,450	21,780	-	-	163,404
Laboratory Equipment	47,760	-	-	-	-	47,760
Field Equipment	100,000	175,000	-	-	-	275,000
Experimental Materials/Supplies	30,000	70,000	80,000	90,000	35,000	305,000
Vehicles	100,000	-	-	-	-	100,000
Field Station Development	172,000	7,000	7,000	7,000	7,000	200,000
EQUIPMENT/SUPPLIES TOTAL	<u>523,934</u>	<u>339,450</u>	<u>108,780</u>	<u>97,000</u>	<u>42,000</u>	<u>1,111,164</u>
III. <u>OPERATING EXPENSES</u>						
<u>AID</u>						
Administrative Expenses	97,600	80,520	59,048	32,476	-	269,644
Research Expenses	42,000	109,000	123,000	124,000	102,000	500,000
Local Travel	36,000	39,600	43,600	42,916	52,707	214,783
Sub-Total	<u>175,600</u>	<u>229,120</u>	<u>225,608</u>	<u>199,392</u>	<u>154,707</u>	<u>984,427</u>
<u>CARDI</u>						
Administrative Expenses	-	26,840	59,048	97,429	142,894	326,211
Field Station Operation	90,000	99,000	108,900	119,790	131,769	549,459
Sub-Total	<u>90,000</u>	<u>125,840</u>	<u>167,948</u>	<u>217,219</u>	<u>274,663</u>	<u>875,670</u>

CARDI FSR/D PROJECT
(538-0099)
DETAILED BUDGET

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
<u>Host Countries</u>						
Administrative Expenses	18,000	19,800	21,780	23,958	26,353	109,891
Sub-Total	<u>18,000</u>	<u>19,800</u>	<u>21,780</u>	<u>23,958</u>	<u>26,353</u>	<u>109,891</u>
OPERATING EXPENSES TOTAL	<u>276,600</u>	<u>381,260</u>	<u>427,856</u>	<u>470,648</u>	<u>517,691</u>	<u>2,074,055</u>
IV. TRAVEL						
<u>AID</u>						
Regional	82,000	90,200	79,220	79,142	70,057	400,619
Sub-Total	<u>82,000</u>	<u>90,200</u>	<u>79,220</u>	<u>79,142</u>	<u>70,057</u>	<u>400,619</u>
<u>CARDI</u>						
Regional			20,000	30,000	50,000	100,000
Sub-total			<u>20,000</u>	<u>30,000</u>	<u>50,000</u>	<u>100,000</u>
Regional Travel Total	<u>82,000</u>	<u>90,200</u>	<u>99,220</u>	<u>109,142</u>	<u>120,057</u>	<u>500,619</u>
V. <u>TECHNICAL ASSISTANCE</u> - Total	<u>282,000</u>	<u>430,000</u>	<u>512,000</u>	<u>499,000</u>	<u>234,000</u>	<u>1,957,000</u>
VI. <u>TRAINING</u>						
Short courses	15,000	16,500	18,150	19,965	21,961	91,576
Workshops	48,000	52,800	43,560	31,944	17,692	188,996
Conferences	5,000	5,500	6,050	6,655	7,320	30,525
Training	<u>68,000</u>	<u>74,800</u>	<u>67,760</u>	<u>58,564</u>	<u>47,972</u>	<u>311,292</u>

-111-

CARDI: FSR/D PROJECT
(538-0099)
DETAILED BUDGET

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
I. A. PERSONNEL COSTS						
<u>Technical Specialists</u>						
Systems Agronomist	31,700	34,870	38,357	42,191	46,411	193,529
Systems Agronomist	-	34,870	38,357	42,191	46,411	161,829
Crop Protection Specialist	31,700	34,870	38,357	42,191	46,411	193,529
Weed Scientist	31,700	34,870	38,357	42,191	46,411	193,529
Horticulturist		34,870	38,357	42,191	46,411	161,829
Animal Scientist		34,870	38,357	42,191	46,411	161,829
Agricultural Economist	31,700	34,870	38,357	42,191	46,411	193,529
Agricultural Economist		34,870	38,357	42,191	46,411	161,829
Anthropologist	31,700	34,870	38,357	42,191	46,411	193,529
Agricultural Engineer		34,870	38,357	42,191	46,411	161,829
<u>Technical Specialists</u>	<u>158,500</u>	<u>348,700</u>	<u>383,570</u>	<u>421,910</u>	<u>464,110</u>	<u>1,776,760</u>
<u>Country Teams</u>						
Antigua (3)	62,000	68,200	75,020	82,522	90,774	378,516
Dominica (4)	80,000	88,000	96,800	106,480	117,128	488,408
Montserrat (3)	62,000	68,200	75,020	82,522	90,774	378,516
St. Kitts (3)	62,000	68,200	75,020	82,522	90,774	378,516
Nevis (2)	44,000	48,400	53,240	58,564	64,420	268,624
St. Lucia (4)	80,000	88,000	96,800	106,480	117,128	488,408
St. Vincent (4)	80,000	88,000	96,800	106,480	117,128	488,408
<u>Country Teams</u>	<u>470,000</u>	<u>517,000</u>	<u>568,700</u>	<u>625,570</u>	<u>688,126</u>	<u>2,869,396</u>

CARDI: FSR/D PROJECT
 (538-0099)
 DETAILED BUDGET

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
B. Management Support						
<u>Regional Office</u>						
Administrative Assistant	18,000	19,800	21,780	23,958	26,354	109,892
Executive Secretary	14,400	15,840	17,424	19,166	21,083	87,913
Senior Secretary/Computer Ap. (2)	12,000	13,200	14,520	15,972	17,569	73,261
Junior Secretary (3)	18,000	19,800	21,780	23,958	26,354	109,892
<u>Regional Office</u>	<u>62,400</u>	<u>62,640</u>	<u>75,504</u>	<u>83,054</u>	<u>91,360</u>	<u>380,958</u>
Administrative Assistant for Country Teams (7)	49,000	53,900	59,290	65,219	71,740	299,149
TOTAL	<u>111,400</u>	<u>122,540</u>	<u>134,794</u>	<u>148,273</u>	<u>163,100</u>	<u>680,107</u>

196

EASTERN CARIBBEAN FARMING SYSTEMS RESEARCH AND DEVELOPMENT PROJECT

ANNEX G

Page 6 of 10

BUDGET

CARDI CONTRIBUTION, RESOURCE STAFF

PERSONNEL	NO.	BASIC SALARY AND BENEFITS BY MONTH	MONTHS IN PROGRAM	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Executive Director	1	4,000	15	12,000	13,200	14,520	14,972	12,569	72,261
Director, Research & Dev.	1	3,500	15	10,000	11,550	12,705	13,976	14,641	54,945
Director, Finance & Admin.	1	3,500	15	10,000	11,550	12,705	13,976	17,569	72,261
Project Manager	1	3,500	60	42,000	46,200	50,820	55,902	61,492	256,414
Analytical Chemist	1	3,000	15	9,000	9,900	10,890	11,979	13,176	54,945
Post Harvest Technologist	1	3,000	15	9,000	9,900	10,890	11,979	13,176	54,995
Documentalist	1	2,500	15	7,500	8,250	9,075	9,983	10,980	45,788
Biometrician	1	3,000	15	9,000	9,900	10,890	11,979	13,177	54,946
			<u>165</u>	<u>100,500</u>	<u>120,450</u>	<u>132,495</u>	<u>144,746</u>	<u>158,271</u>	<u>665,062</u>

CARDI FSR/D PROJECT
(538-0099)

DETAILED BUDGET

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
II. <u>EQUIPMENT AND SUPPLIES</u>						
A. <u>Office Equipment</u>						
St. Lucia	42,010	-	-	-	-	42,010
Antigua	9,394	-	-	-	-	9,394
Country Teams	22,770	-	-	-	-	22,770
Office Equipment Total	<u>74,174</u>					<u>74,174</u>
B. <u>Micro Computer/Word Processor</u>	-	<u>87,450</u>	<u>21,780</u>	-	-	<u>109,230</u>
C. <u>Laboratory Equipment</u>	<u>47,760</u>	-	-	-	-	<u>47,760</u>
D. <u>Field Equipment</u>	<u>100,000</u>	<u>144,200</u>	-	-	-	<u>244,200</u>
E. <u>Experimental Materials/Supplies</u>	<u>40,000</u>	<u>85,000</u>	<u>95,000</u>	<u>100,000</u>	<u>85,000</u>	<u>305,000</u>
F. <u>Vehicles (8)</u>	<u>98,000</u>	-	-	-	-	<u>98,000</u>
St. Vincent (1)						
St. Lucia (2)						
Dominica (1)						
St. Kitts (1)						
Montserrat (1)						
Antigua (1)						
Barbados (1)						
G. <u>Field Station Development</u>						
1. <u>Renovation of Buildings</u>						
St. Lucia	40,000	-	-	-	-	40,000
Antigua	35,000	-	-	-	-	35,000
Renovation of Buildings Total	<u>75,000</u>					<u>75,000</u>

CARDI FSR/D PROJECT
(538-0099)

DETAILED BUDGET

	<u>YEAR 1</u>	<u>YEAR 2</u>	<u>YEAR 3</u>	<u>YEAR 4</u>	<u>YEAR 5</u>	<u>TOTAL</u>
2. Farm Machinery						
St. Lucia	<u>30,000</u>	-	-	-	-	<u>30,000</u>
3. Irrigation Equipment						
St. Lucia	10,000	-	-	-	-	10,000
Antigua	15,000	-	-	-	-	15,000
Irrigation Equipment Total	<u>25,000</u>					<u>25,000</u>
4. Equipment	<u>2,000</u>	<u>2,000</u>	<u>2,000</u>	<u>2,000</u>	<u>2,000</u>	<u>30,525</u>
5. Drainage, Fencing	<u>35,000</u>	-	-	-	-	<u>35,000</u>
6. Operating Equipment	<u>5,000</u>	<u>5,000</u>	<u>5,000</u>	<u>5,000</u>	<u>5,000</u>	<u>20,000</u>
Field Station Development Total	<u>172,000</u>	<u>7,000</u>	<u>7,000</u>	<u>7,000</u>	<u>7,000</u>	<u>200,000</u>

CARDI: FSR/D PROJECT
(538-0099)
DETAILED BUDGET

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
III. Operating Expenses						
A. Administrative Expenses						
St. Lucia	39,600	43,560	47,916	52,707	57,978	241,761
Antigua	10,000	11,000	12,100	13,310	14,641	61,051
St. Kitts	5,000	5,500	6,050	6,655	7,320	30,525
Nevis	4,000	4,400	4,840	5,324	5,856	24,420
Montserrat	5,000	5,500	6,050	6,655	7,320	30,525
Dominica	20,000	22,000	24,200	26,620	29,282	122,102
St. Vincent	14,000	15,400	16,940	18,634	20,497	85,471
<u>SUBTOTAL</u>	<u>97,600</u>	<u>107,360</u>	<u>118,096</u>	<u>129,905</u>	<u>142,894</u>	<u>595,855</u>
B. Research Expenses						
<u>SUBTOTAL</u>	<u>22,000</u>	<u>89,000</u>	<u>103,000</u>	<u>104,000</u>	<u>82,000</u>	<u>400,000</u>
C. Field Station Operating Expenses	<u>90,000</u>	<u>99,000</u>	<u>108,900</u>	<u>119,790</u>	<u>131,769</u>	<u>549,459</u>
D. Local Travel	<u>36,000</u>	<u>39,600</u>	<u>43,560</u>	<u>47,916</u>	<u>52,707</u>	<u>219,783</u>

-117-

CARDI: FSR/D PROJECT
(538-0099)
DETAILED BUDGET

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
IV. Regional Travel						
Project Leader	12,000	13,200	14,520	15,972	17,569	73,261
Technical Specialists	58,000	63,800	70,180	77,198	84,918	354,096
Country Teams	6,000	6,600	7,260	7,986	8,785	36,631
Administrative Staff	6,000	6,600	7,260	7,986	8,785	36,631
SUBTOTAL	<u>82,000</u>	<u>90,200</u>	<u>99,220</u>	<u>109,142</u>	<u>120,057</u>	<u>500,619</u>
V. Technical Assistance						
FSR Specialist	60,000	132,000	145,000	160,000	-	497,000
Research Mgmt. Specialist	36,000	79,000	87,000	96,000	102,000	400,000
Other Short-term	36,000	119,000	130,000	143,000	102,000	530,000
O & M System	100,000	-	-	-	-	100,000
Specialty	50,000	100,000	150,000	100,000	30,000	430,000
TECHNICAL ASSISTANCE TOTAL	<u>282,000</u>	<u>430,000</u>	<u>512,000</u>	<u>499,000</u>	<u>234,000</u>	<u>1,957,000</u>
VI. Training						
Short Courses	15,000	16,500	18,150	19,965	21,961	91,576
Workshops	48,000	52,800	43,560	31,944	12,692	188,996
Conferences	<u>5,000</u>	<u>5,500</u>	<u>6,050</u>	<u>6,655</u>	<u>7,320</u>	<u>30,525</u>
TRAINING TOTAL	<u>68,000</u>	<u>74,800</u>	<u>67,760</u>	<u>58,564</u>	<u>41,973</u>	<u>311,097</u>

-118-

ADMINISTRATIVE ANALYSIS

This analysis is divided into two segments. First a review and analysis is conducted of the project's major implementation organizations to assess whether a project like this could be implemented with no management technical assistance. This analysis will include a summary review of organization structure, staffing and management. Since USAID has recently completed a similar type project with CARDI in the last year, the analysis will also include a review of evaluation and audit findings on implementation-related matters. Second, an assessment will be made of the specific project organization arrangements, staffing, and management plan for the FSR/D project.

In each case a conclusion is given based on the empirical findings of the analysis.

I. Assessment of Current Institutional Capacity and Performance

Various institutions will be instrumental in implementing the FSR/D project. These include CARDI, and the Ministries of Agriculture in the Caribbean and particularly in the seven participating project countries. Salient institutional features of each are analyzed below from the perspective of whether an FSR/D type project could be implemented successfully without a management and institutional strengthening technical assistance component built into its design.

1. The Caribbean Agriculture Research and Development Institute (CARDI)

The Caribbean Agricultural Research and Development Institute (CARDI) was established in late 1974, as a regional institution of the CARICOM members, to perform agricultural research and development functions in support of their development. CARDI's institutional roots are much older, however, and have contributed to its current status.

a. Historical Development of CARDI

CARDI's institutional roots go back to the earlier part of this century when the Imperial College of Tropical Agriculture (ICTA) was established in Trinidad in the early 1920's. ICTA was unequalled in its reputation as the foremost centre for agricultural teaching and research in the tropical world. However, ICTA's research concentrated on export crops like sugar cane, cocoa and banana.

In 1955, the Regional Research Center (RRC) was established by Governments of the Commonwealth Caribbean to pursue research on a wide range of food crops. It was conceived that such a regional centre would achieve the best utilization of limited resources, including agricultural scientists in conducting research based on the needs of the Region. The headquarters of the RRC was St. Augustine, Trinidad. There was also an outstation in Jamaica. Research on all aspects of crop improvement, e.g. plant breeding, pest, disease and weed control, land use, etc., was conducted on a range of crops including yams, sweet potato, cassava, maize, pigeon peas, tomato and other vegetables. The animal production program was geared to investigating local feeds and feeding systems. A range of services such as soil and plant analysis and statistical services were provided to the member states and research teams in the Region. Cocoa research continued throughout this period. The need for more concerted research on commodities like citrus and banana led to the formation of specialized independent units.

Around 1966, the Regional Research Center ceased to function as a separate school of agriculture and was integrated into the new Faculty of Agriculture of the University of the West Indies, also located at St. Augustine. Though integrated, RRC staff members were designated as Research Fellows with a mandate to do fulltime research, with very limited teaching responsibilities. RRC budgets were separated from UWI's and some conditions of service were different from those of their University counterparts, but they worked on the same research program.

In 1974, following a 2-year study and reorganization exercise, the Caribbean Agricultural Research and Development Institute was formed as the successor organization to the Regional Research Center. Several major changes distinguished CARDI from the RRC. These are:

- 1) CARDI became an autonomous regional organization, but is still affiliated with the University of the West Indies.

- 2) All member states of CARICOM became financing members of CARDI.
- 3) Linkages were established with relevant regional organizations and member states with a Board of Directors consisting of representatives from:
 - (i) Member States;
 - (ii) University of the West Indies;
 - (iii) CARICOM Secretariat;
 - (iv) Caribbean Development Bank; and
 - (v) University of Guyana.
- 4) Besides research, development was added as an integral function, requiring an outreach capacity to the territories of the member states, particularly the LDC's.
- 5) Teaching functions of CARDI staff were restricted to the supervision of post-graduate programs relevant to the research needs of the member states.
- 6) Research programs were reorganized on a commodity basis with a multi-disciplinary team approach to suit the developmental needs of the Region.

b. Institutional Mandate of CARDI

The objectives of CARDI are:

- 1) to provide for the research and development needs of the agriculture of the Region as identified in national plans and policies;
- 2) to provide an appropriate research and development service to the agricultural sector of Member States;
- 3) to provide and extend the application of new technologies in production, processing, storage and distribution of agricultural products of Member States;

214

- 4) to pursue for specified periods long-term research in pertinent areas;
- 5) to provide for the coordination and integration of the research and development efforts of Member States where this is possible and desirable;
- 6) to undertake teaching functions normally at the post-graduate level, limited to the development of the relevant research by any Member State; and
- 7) to seek to achieve the optimum decentralization of facilities.

At their meeting in Belize in June of 1976, the Standing Committee of Ministers of Agriculture gave the Management of CARDI three major directives. These were:

- 1) to improve the productivity of the agricultural sector to minimize the dependence of the Region on foreign imports;
- 2) to seek additional sources of funding from external donor agencies; and
- 3) to decentralize its operations.

At the January, 1982 meeting the Ministers:

- 1) authorized CARDI to borrow money but not to lend;
- 2) approved the appointment of a Director of Research and Development, a Director of Finance and a Director of Administration; and
- 3) ratified the decision made by the Board of Directors that the Institute would handle its own finances.

c. Organization and Administration

CARDI's member countries include the twelve English-speaking countries of the Commonwealth Caribbean Community (CARICOM): Antigua, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts/Nevis, St. Lucia, St. Vincent and Trinidad and Tobago. These countries have a broad spectrum of agricultural zones which differ in soil type, rainfall pattern, flora and fauna; have a range of farm types varying from small holdings to large mechanized estates and from "slash and burn" farming to sugar cane monocropping; and have very different economic conditions and resource endowments.

1) Structure

The governing body of CARDI is the Standing Committee of Ministers responsible for agriculture of the member countries.

A Board of Directors comprises representatives of the member countries, the Caribbean Development Bank, the CARICOM Secretariat, the Universities of Guyana and the West Indies and the Executive Director (ex officio).

The Executive Director has overall operational responsibility for managing CARDI. Under the Executive Director, there are two lines of authority: (a) research and development, and (b) administration and finance. Implementation of the work program is the responsibility of the Director of Research and Development.

There are Head of Units (HOU) in the five large territories while the seven smallest countries are grouped into two units each with a Head. HOUs are responsible for local finance and administration and for relations with local institutions. HOUs are appointed as scientists and are expected to have a full research and development program.

Where a project or series of country projects are of sufficient importance, a program leader is appointed to oversee the work. He is responsible for research and development activities in all the countries involved, with the local HOUs providing logistical support and helping with local interagency coordination.

2) Staffing

CARDI has 80 professional staff, of whom approximately half are relatively junior (i.e. first degree for diploma plus experience). There are 35 senior scientists and 5 fulltime professional staff in administration. Professional staff have increased from 25 when the Institute was established in 1975.

All professional staff are, in theory, on call to any country or project. In practice, however, it is the experienced senior staff who are usually required to service projects/programs in several countries as well as respond to technical "fire fighting" requests from Ministries of Agriculture and other agencies.

The distribution of staff in late 1982 was as follows:

	<u>Senior</u>	<u>Junior</u>
Administration	3	2
Ag. Engineering	2	1
Agronomy	13	30
Information	1	1
Livestock	5	2
Plant Portection	6	4
Social Sciences/ Statistics	4	4
Soils	2	1

In addition, there are approximately 200 supporting staff, including scientific technicians, library assistants, clerical workers and field staff.

3) Decentralization

CARDI had responded to the charge from the Board of Governors (1976) to decentralize as illustrated by changes in the location of professional staff:

	<u>1975</u>	<u>1983</u>
Antigua	-	4
Barbados	4	6
Belize	-	2
Dominica	-	1
Guyana	-	3
Jamaica	2	7
Montserrat	-	1
St. Kitts/Nevis	-	1
St. Lucia	-	2
St. Vincent	-	2
Trinidad & Tobago	<u>18</u>	<u>20</u>
TOTAL	24	52

CARDI presently works on 10 field stations, 2 of which are directly related to the farming systems research project. CARDI is considering additional decentralization steps through further reduction of research personnel and technical activities at central headquarters.

4) Cooperating Institutions

CARDI works with both national and regional, public and private sector institutions.

The Ministries of Agriculture are the main cooperants. In the larger countries, where the national research system is better developed, CARDI supplements the work of the Ministry of Agriculture. But it takes a lead role in the smaller countries. Projects are generally developed and implemented jointly.

Joint projects are also undertaken with commodity associations (e.g. Windward Islands Banana Growers Association). Staff of the University of the West Indies have undertaken many projects on contract with CARDI.

5) Finance

CARDI is funded by the 12 member countries on the basis of an agreed formula. In addition, research contracts and grants are obtained. At present approximately one half of the US\$5 million budget is from external sources (i.e. not from the member countries:)).

2/13

CARDI experiences cash flow problems with its core budget. During the past two years approximately one half of the annual core budget has been outstanding. Different countries have failed to meet their contributions over time.

Agencies which are supporting CARDI include: Barclays Bank International, Canadian International Development Agency, Caribbean Development Bank, European Development Fund, International Development Research Center (Canada), United Nations Development Program and U.S. Agency for International Development.

d. Work Program

1) Small Farm Systems

CARDI is placing major emphasis on the development of farming systems for small farms. This emphasis reflects the numerical importance of small farmers in all territories served by the Institute; their prime role in the production of food for local consumption; their considerable potential for increased output; the need of their occupants for improved living standards; and the relative failure of research organized upon the basis of single commodities and traditional disciplines to have an impact on this group in the past.

The effect of this emphasis has been to make CARDI scientists more aware of the problems faced by farmers and to enable them to test new techniques under farm conditions.

2) Continuing Commodity Improvement

The general aim is to remove constraints to production and to develop alternative production systems that can lead to greater efficiency and productivity.

For crops, improvement may involve one or more of the following aspects:

- introduction and screening in one country of a large number of new varieties of one crop (from international institutes, etc.);

- evaluation of a few selected varieties in each country with a particular interest in that crop;
- production and distribution of planting material of the improved varieties;
- development of improved production practices likely to be appropriate for farmers growing the crop. This may involve different plant spacing, disease control, pest control, weed control, irrigation, etc.
- testing of these practices on farms; and
- development of production practices for new situations.

Crops on which the Institute is presently working include:

- Legumes: cowpea, red kidney bean, peanut, soya bean.
- Cereals: maize, sorghum, wheat.
- Vegetables: tomato, cabbage, onions, garlic, carrot, egg plant.
- Root crops: yam, cassava, sweet potato, tannia, dasheen, arrowroot, white potato.
- Miscellaneous: pineapple, sugar cane, cotton.

For livestock, the emphasis is on the utilization of agricultural and industrial by-products in animal feeding and the production and, where appropriate, conservation of improved forage legumes and grasses. Seed of selected forages is produced and distributed to farmers and assistance given with the establishment and management of the crop.

The Institute also responds to requests from other agencies for solving specific problems. These problems are of an ad hoc nature and cannot be anticipated or budgeted in advance. This feature sometimes reduces CARDI's ability to respond quickly to a request, as human and financial resources are already extended.

220

Problems can sometimes be solved by one technical assistance visit, while others may be longer-term, involving some fundamental research. Projects of a longer-term nature which are now in progress include:

- control of coffee berry borer (Jamaica);
- control of burning disease of tannia (Windwards); and
- control of monkey crop damage (Barbados).

The work program in each country is designed in conjunction with the local Ministry of Agriculture and other agencies. In some countries there is a National Coordinating Committee for Agricultural Research, which is the natural forum to work this out. CARDI has stimulated the formation of some of these committees. In countries without a Coordinating Committee contact has to be with the individual agencies.

CARDI then develops individual country projects (i.e. aspects of the work program) into regional programs, where this is appropriate, thus ensuring coordination of effort and trying to avoid duplication. In formulating the work program CARDI also attempts to incorporate the priorities identified in the (CARICOM) Regional Food and Nutrition Strategy, details of which are still being developed.

e. Administrative Assessment

In assessing CARDI, the design team relied heavily on several recent studies that provide insight into the institution's current organizational structure and managerial/administrative systems. These include the 1982 USAID Evaluation of CARDI's previous Small Farm Multiple Cropping Systems Research Project, AID's financial audit of this same project, and CARDI's 1983 Management Audit. Highlights of these reviews are presented here; original sources should be referenced for details.

1) USAID's Recent Project Implementation Experience with CARDI

From 1970 to 1982 USAID supported CARDI by funding a 2 million dollar Multiple Cropping Systems Research Project. The AID sponsored Evaluation of that project made the following observation in CARDI's overall administrative structure:

201

Policy Direction

The Executive Director's role in policymaking and liaison with regional Governments is clearly defined. He has established communication linkages with numerous donors to broaden the resource base for CARDI.

Technical Direction

The Director of Research and Development is responsible for integrating people and resources into effectively functioning teams for research. The technical management of staff activities, projects, and communications does not appear to be clearly organized. A clear line of management should be established at each level for communication purposes.

Administration and Financial Management

The Director of Administration and the Director of Finance are responsible for general administration and financial control. The specific responsibilities of these positions should be clearly defined and communicated to all CARDI headquarters and field staff. There is also a need to refine the process of fund authorizations and accountability. The team recognizes the difficult communication problem between Trinidad and the various territories.

Project Coordination

As a Regional Organization, CARDI staff members interact with Ministries, Universities, Private Sector Organizations, Cooperatives, and individual farmers. This interaction occurs both at the institutional/administrative level and at the individual staff level. There are presently two coordinating groups which guide and coordinate CARDI activities.

A Policy and Review Committee has been established at the Trinidad Unit and similar committees are being considered for Guyana and Jamaica. This committee is composed of policy level representatives of CARDI, the University, and the Ministry of Agriculture; the committee has the authority to coordinate, review, and approve all project activities in the particular country.

A Territorial Advisory and Review Committee functions at the country level and involves the Ministry of Agriculture, CARDI agribusiness groups, and farmers. This group agrees on project areas and reviews ongoing project activities.

CARDI Staff Performance and Evaluation

The evaluation team believes that there is a need for CARDI to search for ways to improve communication and foster a more challenging attitude to excellence and diligence in research.

Linkages with the University of West Indies

There are a number of active linkages between UWI and CARDI. In most instances, these linkages stem from the needs of a given CARDI project to secure the support and counsel of the expertise available in UWI. These linkages often involve consulting arrangements for UWI staff. This arrangement is preferred by UWI staff in lieu of a collaborative inter-institutional agreement.

An important linkage exists between CARDI and UWI's graduate student program. UWI graduate students involved in CARDI research can improve relationships between CARDI and UWI. The university statutes require that graduate student research is under the direct guidance of UWI major professors. Graduate students may work on CARDI projects if the project meets the research standards of the University and if the research activity furthers the goals of a CARDI project.

The evaluation report's overall assessment was that: "CARDI has taken a number of steps to improve its administration and management. In the final analysis, excellence in research management can only be achieved through a long process of gaining experience in the design, implementation, and management of ongoing research projects and programs".

USAID also contracted with an auditing firm, Price Waterhouse, for an accounting audit in early 1983. The auditors cited several areas where accounting practices need improving, and made recommendations to that effect (see Appendix I to this Annex for a copy of the overall findings and specific recommendations). The auditors attributed most deficiencies to inadequate staffing and supervision of CARDI field staff. They also pointed out that substantial improvement was evident in the last two years of the project.

20

2) CARDI's Management Audit

In December, 1982 CARDI commissioned a Management Audit to review and assess the operation of the Institute with respect to its efficiency and effectiveness in serving the Region. The audit covered the broad range of CARDI's organization and management issues. Due to its timeliness and comprehensiveness, the Executive Summary is attached as Appendix II.

For the purposes of this administrative assessment, the following points made by the Management Auditors -- both in the report and during personal conversations -- are pertinent:

- (a) CARDI, as the leading agricultural institute in the English-speaking Caribbean, has substantial growing pains in the organization and management area. These are in three main areas:
- financial support from member countries has not kept pace with the expansion of core technical and administrative operations;
 - CARDI currently lacks an organization and management structure appropriate to its kind of institution; and
 - there is a lack of a determined and consistent approach (i.e. decentralization) in carrying out its mission.
- (b) These growing pains need not be fatal if institutional strengthening actions are initiated and effectively executed.
- (c) There is considerable manifest and latent good will and support for CARDI throughout the Region, based both on the Institute's potential and actual service to member states.

204

2. Caribbean Ministries of Agriculture

With Caribbean country populations ranging from 11 thousand in Montserrat to over 2 million in Jamaica, the sizes and configuration of the Ministries of Agriculture vary markedly. The MOA and private sector research and extension staffing patterns for the key countries in the FSR/D project are given on Table 1. Thus in several countries, CARDI actually serves as the MOA research staff arm of the country.

Although patterns differ, this description of the organization and staffing in St. Lucia is typical of the medium sized LDC's in the Region:

"The St. Lucia MOA, (the official title is Ministry of Agriculture, Lands, Fisheries and Cooperatives), has broad responsibilities in the areas of agricultural services, lands, fisheries, and cooperatives. Organizationally, it is divided into a General Administration and four major departments and a large number of sections or functional units, Table 2.

While the Ministry has a broad responsibility in the sector, it is prevented from effectively performing its duties because of limited funds for developmental activities and serious shortages of experienced, highly motivated technicians and managers throughout the various divisions. A serious weakness of the Ministry exists in planning. Well-conceived and documented medium- or long-range sector plans do not exist. Selection of priorities, out of the large number of possible activities the Ministry can engage in, is not evident. Scarce personnel and funds are not focused on achievement of specific sector (and national) goals.

105

TABLE 1

MINISTRY OF AGRICULTURE RESEARCH AND EXTENSION STAFFING

	<u>Extension Staff</u>	<u>Research Staff</u>
Antigua	9	2
St. Kitts/Nevis	7	0
Montserrat	4	0
Dominica	20	3
St. Lucia	24	5
St. Vincent	<u>10</u>	<u>1</u>
	<u>74</u>	<u>11</u>

PRIVATE ORGANISATIONS

	<u>Extension Staff</u>	<u>Research Staff</u>
Antigua	0	0
St. Kitts/Nevis	6	2
Montserrat	0	0
Dominica	10	1
St. Lucia	10	15
St. Vincent	<u>10</u>	<u>2</u>
	<u>36</u>	<u>20</u>

226

TABLE 2

STAFFING AND BUDGET OF THE MINISTRY OF AGRICULTURE (FY 1982/83)

Department/Section	Budget (000 EC\$)	Professional	Staff Sub- Professional
General Administration	1,025.4	10	15
Agricultural Services	6,700.3		
Administration		4	1
Extension		55	2
Research/Training		22	8
Engineering		10	-
Livestock		10	-
Veterinary		11	1
Statistics		3	1
Land Reform		14	3
Forestry		21	3
Land and Surveys	614.2	26	3
Fisheries	555.5	8	3
Cooperatives	<u>374.5</u>	<u>9</u>	<u>3</u>
	9,269.9*	203	28

Source: FY 1982/83 Estimates of St. Lucia, Ministry of Finance.

* This figure represents 6.7 percent of the total FY 1982/83 recurrent budget.

227

Training opportunities, to upgrade the present staff and to prepare young people for careers in modern, technically sophisticated agricultural production and marketing, are limited. The closing of the Jamaican School of Agriculture eliminated an important means to train senior agricultural staff. In-service training is poorly organized, particularly for inexperienced field-level staff."

The overall assessment is that the Ministries of Agriculture research functions and staffing is very minimal in the key participating countries. CARDI will not be able to easily find a large number of local staff to assist with project implementation activities.

3. Overall Assessment

CARDI, working closely with member countries and AID, needs to take major responsibility for implementing the FSR/D project. Our conclusion is that, due to the complexity and integrated nature of this project:

Conclusion #1:

The current structure, staffing and management arrangements of the proposed implementation organizations, without any technical assistance designed into the project, is clearly inadequate to successfully implement a project of this nature and scope.

II. Feasibility of the FSR/D Project Organization and Management Plan

As indicated earlier in this assessment, CARDI and AID's starting point for the new project is a mixed one from an implementation perspective. The AID Evaluation Report cited several classes of problems with the previous project that could be expected to repeat themselves if preventive action is not taken. Likewise, the audit reports have singled out many areas of needed improvement in CARDI's overall structure and management. On the more positive side, CARDI has confronted its shortcomings and is looking for ways to continue improving its regional technical performance while it goes about putting its administrative house in order.

213

In the FSR/D design effort, considerable attention was given to designing a project that is both realistic, given CARDI's limited staffing and experience, and economically productive for the Region as a whole. This has necessitated that more time than is usual be given to the "organization and management of implementation" issue. This issue has taken two forms: (1) strengthening CARDI's long-term ability to sustain a productive and FSR/D program on a region-wide basis, and (2) designing a feasible project organization structure and management plan. Briefly, our approach on the latter point has been to build in sufficient implementation management, technical assistance to assure that CARDI performs adequately in this area, both in the short-run with the assistance of external consultants and in the long-run with the assistance of CARDI's internal staff who have been effectively trained during the first two years of the project.

In assessing whether this plan is feasible, three issues deserve attention. First, is the project organization appropriately placed -- with adequate delegations of authority -- in the organization? Second, is the internal project organization suitable to carry out the planned activities. Finally, is managerial competence and skill to successfully guide the project toward the accomplishment of its purpose? These issues are addressed below.

Issue #1: Project Organization Placement

The two major project components, although fused operationally, take place in different geographical locations and in different inter-CARDI units. The technology generation/transfer activities are primarily carried out at the sub-regional, country and farm household level. A large part of the institutional strengthening effort, with the notable exception of the project management sub-component, will be carried out at headquarters level. The latter activity will need to have the direct support of and involvement by CARDI senior level staff, while the former will primarily be linked to the research arm of CARDI.

To successfully carry out activities in both components of the project, the project organization has to have adequate access to both the Executive Director for institutional strengthening purposes and the Director of Research and Development for technology improvement purposes. Thus, the organization needs a dual authority structure with component integration being handled at the Project Manager level.

The current organizational placement is sufficient for these purposes. The Project Manager will be set up in matrix form where the Executive Director will retain overall responsibility for the institutional strengthening effort and delegate authority for the overall technology improvement to the Director for Research. The Project Manager will receive a full delegation of management authority for relevant project activities. This includes planning, supervision, and financial decisions and control.

Issue #2: Internal Project Structure and Staffing

Overall, the internal project organization and structure appears feasible. The Project Manager is being given ample authority and resources to manage internal activities and monitor/forge the necessary external linkages that will be required in this project. The effort requires a fulltime Project Manager at least during the first two years of the project due to the numerous activities and disperad geographical locations involved, and that is accorded for in the staffing plan. The only potential difficulty is the origin of staff to work with consultants on the institutional strengthening activities. Arrangements still need to be worked out with CARDI whereby headquarters staff can be temporarily and/or permanently assigned to this project activity to assist with the institutional strengthening activity.

Issue #3: Managerial Competence and Skill

The final link in the implementation chain is the managerial competence and skill of key project actors. Considerable attention has been given to designing an effort that is realistic given the managerial resources that already exist in CARDI supplemented by technical assistance and training. The strategy is to provide sufficient technical assistance in implementation as it is needed, and to structure the T.A. in such a way that managerial capacity is built into the project for continued use during the latter stages of the project. That is, a project management system for implementing the project is a major internal sub-component of the project. This system is designed to serve the dual project objectives of implementing the technology generation/transfer component of the project and strengthening CARDI's overall ESR/D program within the framework of our improved institutional structure.

Our assessment of this management plan is that it adequately addresses the start-up and technical operations

implementation requirements. The suggested procurement arrangements and consultant schedules do not appear to overtax CARDI's limited technical capacity. However, key actors will also need to assure that the "institutional strengthening" and "Project management/administrative" sub-components do not in themselves become "the tail that wags the technical improvement thrust of the project". As we have said before, the technical improvements need to be the leading performance edge of the project by which the final worth of all other activities is judged. Provisions have been made in the project's management and monitoring plan to assure an appropriate balance is maintained, with the final criteria always being long-term farm level agriculture productivity improvements.

Conclusion #3

The FSR project as currently designed has sufficient resources, an appropriate organization structure and a workable management plan to assure a high probability of implementation success.

In summary, the assessment concludes that the FSR/D project is now feasible from an administrative perspective. A final note of caution, is in order, however. Projects represent evolving sets of activities and processes and are subject to continual changes in this internal and external environment. Thus, administrative feasibility issues are not once and for all considered and then put to rest. Rather, they must be continuously monitored and dealt with on a day-to-day basis.

UNITED STATES OF AMERICA
AGENCY FOR INTERNATIONAL DEVELOPMENT
SMALL FARM MULTIPLE CROPPING SYSTEMS RESEARCH PROJECT
STATEMENT OF RECOMMENDATIONS FOR IMPROVEMENT OF PROCEDURES

1. GENERAL AND ADMINISTRATIVE PROCEDURES

- (a) Budgets for expenditures should be prepared for each country at least on an annual basis and budgetary controls exercised by the Project Leader.

For this recommendation to be effective, comprehensive guidelines need to be prepared detailing the expenses which will qualify for reimbursement under Phase II, and the types of expenditure to be classified under specific budget headings. In addition, the Project Leader should submit to the Project Manager an annual report of receipts and expenditures by country showing comparison with budget.

This recommendation will allow for better control over project funds, avoid any misunderstanding of which expenses can be claimed including their classification, and facilitate an evaluation of the financial performance of each country together with the adequacy of the budgets for the following year.

- (b) An accounting procedures manual should be compiled setting out guidelines for expenditure approval together with standardised systems to be implemented in all countries. A training programme for accounting personnel from the countries should be organised prior to the start on Phase II.

Although proposals for accounting systems were submitted to USAID to comply with Section 4.1 (c) of the Grant Agreement, no standard systems were implemented until late in the project and these were set up by the Administrative Assistant. The systems to be adopted in Phase II should be documented formally and adhered to, thereby resulting in standardised documentation, ledgers and filing systems for all participating countries.

Due to financial restrictions CARDI does not employ qualified accounting personnel in all member countries but rather secretaries with limited accounting knowledge. The training program would allow, both for the introduction of the accounting procedures manual, as well as for further training in basic accounting functions such as bank reconciliations.

- (c) An initial advance should be made to each country at the start of Phase II and any further reimbursements should be made based on the monthly expenditure statements submitted.

During Phase I, advances were made on an ad-hoc basis and not on the basis of monthly expenditure statements. This recommendation will allow Country Field Team Leaders to better plan their cash flows and will encourage monthly statements to be submitted on a timely basis to achieve reimbursement.

- (d) Resources required to be provided by CARDI under the grant agreement, including costs borne on an "in-kind" basis, should be monitored on a monthly basis and a statement of such resources submitted to the Project Manager.

During Phase I, there was no evaluation of resources provided by CARDI. If these contributions are required by the Grant Agreement for Phase II, it is important that actual resources made available are properly monitored.

- (e) There should be a distinct cut-off of expenditure incurred for the period from the Project Assistance Completion Date for Phase I (November 30, 1982) to the effective start-up date for Phase II.

Expenditure relating to the project activities since the Project Assistance Completion Date have been funded by CARDI. It is important that only expenses incurred after the start-up of Phase II be included for re-imburement from USAID. To accomplish this, it is suggested that all bank accounts relating to USAID be cleared at the start-up date.

2. CENTRAL CONTROL PROCEDURES

- (a) A separate budget heading should be established for travel outside the member countries of CARDI. Procedures should provide for all travel to be approved in writing by the Project Leader prior to the date of travel with formal trip reports submitted with expenditure claims.

Under Phase I all travel expenditure was classified as intra-regional. A distinction will allow extra-regional travel costs to be closely monitored by the Project Manager.

Although documentation could be found to support intra-regional travel expenses, there was very little evidence to indicate the objectives and results of the trips including any conclusions and/or recommendations arising therefrom. Central control over travel expenditure will help to maximise the benefits of such expenditure and ensure that adequate documentation of the activities and achievements of such travel is maintained.

Where possible, the objective of the travel should be linked to the annual work plans, and trip reports should be brief and concise with references to technical reports where applicable.

.....3/

2/22

- (b) The Administrative Assistant should maintain a cumulative record of both disbursements to and expenditure claims from individual countries. The surplus or deficit for each country as shown by this summary should be reconciled on a monthly basis to the balance on the bank statement.

This recommendation will allow for good central control over the activities of the individual countries since any errors or omissions on expenditure statements would be highlighted easily and could be investigated on a timely basis.

- (c) The Administrative Assistant should make periodic visits to each country to ensure that the accounting systems and controls are operating satisfactorily.

Initially, these visits should be made on a quarterly basis. Further visits can be planned as considered necessary by the Project Leader, but each country should be reviewed at least twice annually. A formal work program should be compiled and a report including recommendations for improvements submitted to the Project Leader after each visit.

- (d) Any amendments made by the Project Leader to expenditure claims submitted by each country should be communicated in writing to the relevant Technical Coordinator and Country Field Team Leader and adjusted on the following month's statement.

During Phase I, changes made centrally were not communicated to the relevant Country Field Team Leaders for adjustment. This should be done in Phase II to ensure that the cumulative expenditure reported by each country will agree with amounts submitted on the claim to USAID, giving a correct comparison of actual versus budgeted expenditure.

3. INDIVIDUAL COUNTRY PROCEDURES

- (a) Separate bank accounts for USAID funds should be maintained in each member country participating in Phase II of the project. Formal bank reconciliations should be prepared on a monthly basis and submitted with a copy of the bank statements to the Administrative Assistant for review.

As shown in Appendix I, during Phase I, some countries operated one bank account for receipts and expenditures relating to more than one project. Separate bank accounts should be maintained solely for USAID funds as this, coupled with the submission of formal bank reconciliations, will lead to greater control and monitoring of such funds, thereby facilitating the control set out in recommendation 2(b) above.

254

- (b) The monthly statements of expenditure submitted by each country should be in the same format as the aggregate statement submitted to USAID. These statements should be reviewed for reasonableness by the Technical Co-ordinator before submission to the Project Leader.

Such a standardised format of reporting will facilitate the central monitoring of actual versus budgeted expenditure by country as well as the preparation of the consolidated report. Analyses of the various expenditure categories should be submitted with the statements together with comments on cost levels as appropriate.

The Technical Coordinator will be familiar with project activities in each of the countries under his supervision and, as such, should be able to ensure that reported expenditure is in line with the activity levels in each country. Where applicable, he should include relevant comments on expenditure levels when submitting the statements to the Project Leader.

- (c) The minimum functions considered necessary to be performed by key personnel involved in Phase II are set out in Appendix II.

These functions are based on the organisation chart of CARDI personnel as at the Project Assistance Completion Date for Phase I (Appendix III). Should there be any changes in organisational structure for Phase II, these functions should be assigned to personnel with corresponding authority levels.

In addition, greater control over utilisation of project funds will be achieved by defining limits for approval of expenditure for each authority level.

U.S.A.I.D

APPENDIX I

CHART OF OPERATIONAL BANK ACCOUNTS IN PHASE I

<u>COUNTRY</u>	(1) <u>SEPARATE</u>	(2) <u>COMBINED</u>
Antigua	/	
Dominica	/	
Grenada	/	
Montserrat		/
Nevis		/
St. Kitts	/	
St. Lucia		/
St. Vincent		/
Trinidad	/	

(1) One bank account maintained solely to receive and disburse funds relating to USAID project.

(2) One bank account maintained to receive and disburse funds relating to both USAID and other projects undertaken by CARDI.

121

ORGANISATION CHART

<u>POSITION</u>	<u>MAIN FUNCTIONS</u>
PROJECT LEADER	<ol style="list-style-type: none">(1) Reporting to Project Manager on all matters relating to the project activities, including administrative, technical and budgetary control coordination.(2) Submission of monthly statements to Project Manager for authorisation.(3) Review and approval of monthly statements submitted by individual countries.(4) Authorisation and monitoring of travel expenditure.(5) Authorisation of applications for salary increments for submission to Executive Director of CARDI.
ADMINISTRATIVE ASSISTANT	<ol style="list-style-type: none">(1) Preparation of aggregate monthly statements of expenditure.(2) Implementation and control of accounting systems in participating member countries.(3) Maintaining project accounts and preparation of monthly statements for St. Lucia.
TECHNICAL COORDINATORS	<ol style="list-style-type: none">(1) Coordination and monitoring of technical activities for the countries under their supervision.(2) Review of monthly statements of expenditure for each country under their supervision to ensure that these are in line with project activities being undertaken.
COUNTRY FIELD TEAM LEADERS	<ol style="list-style-type: none">(1) Control of technical activities in the respective member countries.(2) Responsibility for submission of monthly statements, including written comments on cost levels, to project headquarters via the technical coordinator.(3) Recommending salary increments for any field team members under their control.

237

CARDI MANAGEMENT AUDIT

EXECUTIVE SUMMARY

INTRODUCTION

The Board of Directors of the Caribbean Agricultural Research and Development Institute through the Executive Director, commissioned on December 9, 1982 a Management Audit to review and assess the operations of the Institute with respect to its efficiency and effectiveness in serving the Region.

The audit covered the following:

- the relevance of the objectives to the changing needs of the Region;
- the relevance of the work programme;
- the adequacy of the resources to carry out the work programme;
- the appropriateness of the competence and organisational structure to deliver the services required;
- the financial arrangement and state of affairs with respect to contribution by member governments, compensation package for staff and the financial management by the Institute;
- the relationship with the University of the West Indies and
- the role and management of the Central Analytical Laboratory Services in Trinidad & Tobago.

SUMMARY OF FINDINGS

Overview of CARDI

CARDI as an organisation, although well conceived, did not establish definitive administrative forms and substance at the onset. As a consequence, CARDI's structure and administration have not evolved to become an established, well organized entity. The work programmes for 1980-1985 were generally over-ambitious with respect to the resources available and the achievements have been inconsistent in quality. In the absence of self-evaluation or external assessment, there appears to have been no deliberate effort by management to correct these deficiencies.

Since its inception, CARDI has grown from the original centralized Institute with a few out-stations, into a decentralized organization in 12 territories even though there has been no real change in its budget. Because of the skewed staff to project ratio supported by core funds, CARDI had to aggressively seek project funds

to put its many employees to work. Some projects were not consistent with the Institute's objectives. This has resulted in a mixed portfolio of projects, some of dubious relevance to the Region. In spite of this situation, CARDI currently possesses a cadre of professionals who can be oriented to pursue tasks which are consistent with its terms of reference.

The fact that CARDI has secured the commitment of approximately US\$15 million from external funding agencies for specific projects over the next three years, is evidence of its need for reliable support from the regional Governments through the consistent provision of core funds.

The core operations of CARDI should therefore be made secure in order that the Institute can fully utilize the funds already pledged.

To augment the prospects of stable funding for CARDI the consultants have proposed that a CARDI Trust be established. Draft proposals are presented in the text.

CARDI's contribution to innovations in tropical agriculture is not commensurate with its life span, calibre of staff, resources and financial expenditure.

OPERATIONAL

The Institute has been completely out of line with respect to modern management practices, systems and procedures. A number of specific recommendations regarding organization, manpower and industrial relations have been proposed with respect to the relationship between CARDI and the UWI it is recommended that a new Agreement be negotiated to make CARDI an affiliated organization united in spirit and work but with discretely separate and distinct administration and finance. The UWI should be encouraged to continue to serve as landlord.

The Central Analytical laboratory is currently a drain on the Institute's financial resources. The decision on its future should be based on its ability to provide cost-effective services to CARDI, competitive with other Regional suppliers of such services.

A comparative assessment of the availability and cost of these services within the Region, must be undertaken. CARDI's goal must be to obtain laboratory services on a least-cost basis and not to control the Central Analytical Laboratory at any cost.

239

FINANCIAL AND DEVELOPMENT OPTIONS

Within the limits of the \$7.0 million budget CARDI can incorporate a management structure to handle its own finances.

CARDI in such a context would be basically a corporate body of expertise, to fully utilize this expertise, project funds would be required from National Governments and the agricultural industry.

On the basis of the current work programme (1980-85) the complement and composition of professional staff is inadequate. A 54% increase in professional and technical staff would be required to realize these plans. This would involve an increase of \$3.7 million over current budget of which \$1.13 million would be for salaries and \$2.1 million to finance research material.

The improved benefits which are proposed for other institutions in the Region (e.g. UWI) when applied to the 1982/83 revised CARDI budget, would result in budgetary requirements of \$10.0, \$11.7 and \$12.9 million for the next 3 years. Should there be the desire to immediately achieve the optimum complement of manpower the projected cost would be \$12.4, \$14.8 and \$16.9 million for the respective years.

RECOMMENDATIONS

A number of recommendations have been made with respect to policy, operation, organization, personnel management, manpower, industrial relations, work programme and administration which are summarized as follows:

Policy

- 1) CARDI's priorities be broadened to aggressively service private sector agriculture;
- 2) CARDI's research requisites be funded at the level of 20-25% of core salaries;
- 3) CARDI's core budget be increased to maintain real annual value;
- 4) National Governments to adhere to a payment schedule to facilitate CARDI's cash flow;
- 5) A new arrangement to be negotiated with the UWI to make CARDI an affiliate institution with independent finance and administration;
- 6) CARDI's Board of Directors to include a greater representation from the agricultural industry (farmers and agro-industry);
- 7) A Chairman of the Board to be appointed;

- 8) CARDI TRUST to be tabled for examination and detailed development;
- 9) Board Meetings to be held quarterly for at least the next 18 months to ensure implementation;
- 10) CARDI to schedule the consultant's inputs in the programme of implementation and institutional development.

Operational

- 1) Suspend academic and other external duties of staff (teaching etc) pending the satisfactory performance of substantive duties in research and development;
- 2) CARDI aggressively service non-government agriculture to encourage private support for research and development;
- 3) Management training to be offered key employees on an emergency basis in order to expedite implementation of recommendations.

Objectives

Develop and update appropriate strategies for CARDI in the context of changing Regional needs and international economic realities.

Manpower

- 1) The professional manpower requirement to be rationalized in terms of quantum and mix of skills;
- 2) Develop institutional strengthening programmes for staff training and development as a priority;
- 3) Recruit staff to develop CARDI's capability in accounting, audit personnel, project planning, evaluation and general management.

Industrial Relations

Rationalize union activities and examine a system of joint bargaining for possible implementation.

Work Programme

- 1) Develop and implement project management and administrative systems;
- 2) Work programmes to be based on stated national and/or regional priorities and needs;
- 3) Consultation with national ministries of Agriculture on final work programmes to be mandated and made formal rather than optional;

- 4) Establish and use project preparation capability;
- 5) Establish and use project evaluation capability.

Administration Paper-Work

- 1) Develop and implement clerical and paper work systems;
- 2) Examine the feasibility of computerization;
- 3) Develop and implement communication and management information systems.

SUMMARY

CARDI as the leading agricultural research and development Institution in the English-speaking Caribbean has experienced growing pains in three main areas:

- * financial support has not kept pace with the growth of core operations;
- * lack of management appropriate to a rapidly expanding multinational organization;
- * lack of determined and consistent approach in carrying out its objectives.

The Institute, however, continues to attract Regional and external support, attract international calibre professional staff and make a few outstanding contributions to the agricultural industry of the Region.

To cope with developments to the end of the decade a number of recommendations have been made to strengthen the Institute especially in the areas of financial management and support, administrative management and a more sensitive service to the sector. An innovative recommendation to stabilize the financial support is the establishment of a CARDI TRUST.