

Report to the Board  
of Directors of CARDI

**ANALYSIS, EVALUATION  
AND PROPOSALS  
FOR STRENGTHENING CARDI'S  
REGIONAL CAPACITY**



International Service for National Agricultural Research

The International Service for National Agricultural Research (ISNAR) began operating at its headquarters in The Hague, Netherlands on September 1, 1980. It was established by the Consultative Group on International Agricultural Research (CGIAR), on the basis of recommendations from an international task force, for the purpose of assisting governments of developing countries to strengthen their agricultural research. It is a non-profit autonomous agency, international in character, and non-political in management, staffing and operations.

Of the thirteen centers in the CGIAR network, ISNAR is the only one which focuses primarily on national agricultural research issues. It provides advice to governments, upon request, on organization, planning, manpower development, staff requirements, financial and infrastructure requirements, and related matters, thus complementing the activities of other assistance agencies. Additionally, ISNAR has an active training and communications program which cooperates with national agricultural research programs in developing countries.

ISNAR also plays an active role in assisting these national programs to establish links with both the international agricultural research centers and donors.

ISNAR is supported by a number of the members of CGIAR, an informal group of approximately 30 donors; it includes countries, development banks, international organizations, and foundations. In 1986, funding for ISNAR's core program was provided by Australia, Belgium, Canada, European Economic Community, Federal Republic of Germany, Ford Foundation, France, Ireland, Italy, Netherlands, Philippines, Spain, Sweden, Switzerland, United Kingdom, United States Agency for International Development, and the World Bank.

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# **Report to the Board of Directors of CARDI**

CARDI is an autonomous regional  
institute established by the  
governments of the Caribbean  
community.

## **ANALYSIS, EVALUATION AND PROPOSALS FOR STRENGTHENING CARDI'S REGIONAL CAPACITY**

**August 1985**

The logo for the International Service for National Agricultural Research (ISNAR). It features the letters 'ISNAR' in a bold, italicized, sans-serif font. The 'I' and 'S' are connected, and the 'A' has a unique shape with a horizontal bar.

**International Service for National Agricultural Research**

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ANALYSIS, EVALUATION, AND PROPOSALS FOR STRENGTHENING  
THE CARIBBEAN AGRICULTURAL RESEARCH AND DEVELOPMENT INSTITUTE  
(CARDI)

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The Mission realizes that the conclusions and recommendations included in the report may not coincide with the views of some of the individuals with whom discussions were held. However, the Mission team members hope that their conclusions and recommendations, which are a combined view of the team, will have the support of the majority of the administrators and scientists in the CARICOM-CARDI environment.

The Mission team members are solely responsible for the content of this report.

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ACRONYMS USED IN THIS REPORT

ACORBAT	Association for Collaboration in Banana Research in the Caribbean and Tropical America
AGRICOLA	Agricultural On-Line Access
AGRINTER	Inter-American Agricultural Information
AGRIS	Agricultural Research Information Service
AMP	Agricultural Marketing Protocol
AVRDC	Asian Vegetable Research and Development Center
BMC	Barbados Marketing Corporation
CAB	Commonwealth Agricultural Bureaux
CAEP	Caribbean Agricultural Extension Project
CAL	Central Analytical and Pesticides Laboratory
CARDATS	Caribbean Rural Development Advisory and Training Service
CARDI	Caribbean Agricultural Research and Development Institute
CARDILS	CARDI Literature Service
CARICOM	Caribbean Community
CARIFTA	Caribbean Free Trade Association
CARIRI	Caribbean Industrial Research Institute
CARIS	Agricultural Research Information System
CARONI	Caroni Sugar Estates Limited (Trinidad government-owned)
CDB	Caribbean Development Bank
CFC	Caribbean Food Corporation
CFTC	Commonwealth Fund for Technical Cooperation
CGIAR	Consultative Group on International Agricultural Research
CIDA	Canadian International Development Agency
CIMMYT	International Maize and Wheat Improvement Center
CIP	International Potato Center
CORU	Cocoa Research Unit (UWI, Trinidad & Tobago)
EC\$	Eastern Caribbean dollar
ECS	Eastern Caribbean States
ECLA	Economic Community of Latin America
ECLAC	Economic Community of Latin America and the Caribbean
EDF	European Development Fund
EEC	European Economic Commission
FAO	Food and Agriculture Organization
FSRDP	Farming Systems Research and Development Project
GDP	Gross Domestic Product
GUYSUCO	Guyana Sugar Corporation
IARCs	International Agricultural Research Centers
ICTA	Imperial College of Tropical Agriculture
IDB	Inter-American Development Bank
IDRC	International Development Research Center
IITA	International Institute of Tropical Agriculture
INIBAP	International Institute for Bananas and Plantains
ISNAR	International Service for National Agricultural Research
LDC	Less-Developed Country
LIDCO	Livestock Development Corporation (Guyana)
MDC	Medium-Developed Country
MINAG	Ministry of Agriculture
MUCIA	Mideastern Universities Consortium for International Activities
NACO	National Agricultural Corporation (St. Kitts)
NARI	National Agricultural Research Institute (Guyana)
NARS	National Agricultural Research Systems

O & M	Organization and Management
ODA	Overseas Development Administration (U.K.)
OECS	Organization of the Eastern Caribbean States
OFA	Oils and Fats Agreement
RAC	Research Advisory Committee
R & D	Research and Development
RFNS	Regional Food and Nutrition Strategy
RFP	Regional Food Plan
RRC	Regional Research Center
SCL	SYSTEMS Caribbean Limited
SECID	South-Eastern Consortium for International Development
TA	Technical Assistance
TAC	Technical Advisory Committee
TT\$	Trinidad & Tobago dollar
TT-MOA	Trinidad & Tobago Ministry of Agriculture
UG	University of Guyana
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
UWI	University of the West Indies
WICBS	West Indian Cane Breeding Station
WINBAN	Windward Islands Banana Growers' Association

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## EXECUTIVE SUMMARY

### 1. INTRODUCTION

On 24 April 1985, the Caribbean Agricultural Research and Development Institute (CARDI) formally requested the International Service for National Agricultural Research (ISNAR) to review and evaluate the quality and relevance of the scientific and developmental work of the Institute in the light of its existing mandate and of the expressed needs of the national agricultural research and development services of the member countries of the Caribbean Community (CARICOM).

The review was carried out during June 1985, at which time the review Mission visited twelve of the thirteen CARICOM countries and conducted full discussions with ministries of agriculture, senior ministry personnel, the Universities of the West Indies (UWI) and Guyana (UG), national agricultural research and extension service personnel, project executing agencies, international and regional bodies concerned with agricultural development, donors, and CARDI staff. The organization and management of CARDI was also reviewed to complement the impression of the working environment of CARDI, and a wealth of documentation from numerous sources was studied. The Mission received courteous cooperation and considerable assistance from all of its contacts and formed an impression of widespread interest in its undertaking.

This report presents the findings of the ISNAR Mission and makes recommendations for changes in, or reorientation of, CARDI's objectives and program for possible improvements in its structure, organization, and management, and in possible means of overcoming other identified constraints to its more efficient operation. The report consists of five principal sections, following this Executive Summary -- a procedural Introduction; the Setting for Agricultural Research in the CARICOM Region; the Characteristics and Functioning of CARDI; CARDI's Regional Program Content and Balance; and Proposals for Strengthening CARDI's Regional Capacity. This summary assumes a broad general knowledge of the Caribbean agricultural system and the place of CARDI within that system and devotes itself in the main to presenting the conclusions and recommendations of the Mission with the reasoning leading thereto. It follows the same sequence as the main report.

Due to the limited time available for the Mission, it concentrated on CARDI's own management and program at the expense of more in-depth analysis of the research systems with which CARDI cooperates in 12 separate states.

### 2. THE SETTING FOR AGRICULTURAL RESEARCH IN THE CARICOM REGION

There are wide variations in the contribution of agriculture to GDP within the CARICOM region, from 30.2% in Dominica to 2.7% in Trinidad & Tobago. The relative contribution of agriculture has remained stable

since 1979 in most countries, although a downward shift is noted in Guyana. Traditionally, the CARICOM countries form part of the classical sugar-based economies, and cane still remains the most important crop although a steady decline in acreage, production, and exports continues. Bananas are second in importance, accounting for the bulk of the 17% of exports taken up by fruit and vegetables, although production and export are also in decline.

Similar negative trends are recorded for most crops, total production having dropped by 28% during the past six years despite increases of 19% in grain legumes and 13% in vegetables. Exports are chronically depressed, and food production is not keeping up with population growth. Analysis of the complexity of reasons responsible for this situation reaches the conclusion that future prospects will continue to be poor for the traditional export commodities and that, with some few exceptions, high costs of food production preclude massive increases in output. It is concluded that in the foreseeable future only a "second best" technological strategy will be applicable to the region. The recently adopted Regional Food and Nutrition Strategy (RFNS) can, if taken seriously, have great potential impact in stimulating regional efforts, especially in research, and emphasizes the need for a cohesive and coordinated approach.

Some good opportunities for technical development exist, especially in those countries with the largest reserves of, as yet unexploited, land and water resources. Nearly all the countries of the region have excellent potential for tree crops, selected legumes, oilseeds, root crops, and livestock/dairy enterprises. Speedier economic integration would accelerate their development.

The technological strategy to be adopted will need to be increasingly market-orientated and thus selective and highly dependent on competent market research. Similarly, high priority needs to be given to technological research where output is currently lagging behind market demand, such as in bananas and coffee in Jamaica, coconut in several countries, and rice in Guyana.

The orientation of research strategy in the Caribbean must be towards profitability and eventual income rather than towards maximum yields, and better identification of the target population of each effort in research will help to set the parameters of the effort.

There is sufficient similarity in agricultural systems in the Caribbean to occasion surprise that, to date, few effective research networks have been established, with the exception of some major plantation industry activities such as cane breeding. Appearances would suggest that networking will form an ideal approach to the beneficial division of labor and maximization of effect from scarce resources in the Caribbean. While in recent years the international centers -- especially CIAT, CIMMYT, and CIP -- have become increasingly active in the Caribbean Basin, the multinational approach and networking in agricultural research

in general is still in its infancy. As will be seen in subsequent portions of the Mission's report, CARDI plays an important role in the Leeward and Windward Islands, and in Belize, specific but lesser roles in the larger medium-developed countries (MDCs), a very limited role in overall region-wide research servicing exchanges of materials and information, and relatively little in regional research coordination. It is, however, necessary to place CARDI within the context of other research conducted and sponsored by other organizations throughout the CARICOM countries. Besides CARDI, there are only three institutions which can be said to have a truly regional scope: the West Indian Cane Breeding Station (WICBS) located in Jamaica, the Windward Islands Banana Growers' Association (WINBAN) located in St. Lucia, and the University of the West Indies Faculty of Agriculture, mainly at St. Augustine in Trinidad. National agricultural research systems (NARS) in the Caribbean are a combination of public governmental bodies, generally parts of ministries of agriculture, some quasi-governmental or parastatal organizations, and privately-sponsored, generally commodity-specific institutions.

The activities of all of these organizations are examined in the report, and attention is drawn to CARDI's relations with them. The general conclusion emerges that a clear role exists for CARDI in the context of CARICOM research and the nature of this role, within the overall setting, is developed.

### 3. CHARACTERISTICS AND FUNCTIONING OF CARDI

#### 3.1 Background and Mandate

The mandate of CARDI may be summarized as follows:

"To provide an appropriate decentralized region-wide agricultural research and development service which supplements national services, emphasizes technology application, provides post-graduate teaching and effects as necessary and desirable the coordination and integration of regional agricultural research efforts."

CARDI has recently attempted to interpret its mandate in the context of the Caribbean Food and Nutrition Strategy (CFNS) adopted by CARICOM as a guiding principle for food production activities. The "mission statement" requires CARDI "to contribute to agricultural development through the generation and dissemination of appropriate technology for the benefit of the Caribbean people" and to execute its mission principally by developing and demonstrating appropriate technology for increasing production, productivity, and utilization of food commodities for domestic and export markets.

This statement of intent adequately accommodates CARDI's far-ranging programs, which encompass food legumes and cereals, root crops, vegetables, cotton, animal production, and additional programs in soil

and water management, integrated pest management, and engineering. It does not, however, help to focus CARDI's role as a regional center of excellence and, giving emphasis to food production, could impose a constraint on CARDI if it should require to expansion of its work on problems of regional importance affecting non-food crops.

The Mission believes that the basis of CARDI's strategy lies in that clause of its mandate which requires CARDI to "provide an appropriate research and development service to the agricultural sector of Member States." The question of what is appropriate to the agricultural development of the region, and the member states of that region, leads the Mission to propose a sharpening of CARDI's focus by periodic definition of appropriate roles for CARDI.

### Recommendation

- \* That the existing mandate of the Institute, as embodied in the enabling legislation, be maintained, but that from time to time the Governing Body authorize the issuance of a "strategy statement" aimed at clarifying, for the accepted period of validity of that statement, what is regarded as "... an appropriate research and development service ..."

Following its deliberations, the Mission formulated an outline of what it considers an appropriate strategy for CARDI over the next decade. This is presented in Chapter 4.

### 3.2 Structure

The Mission noted a number of essential units missing from CARDI's structure, and appropriate sections of the report carry recommendations to remedy those omissions. Specifically, these proposals relate to the provision of a Research Advisory Committee to the Board; an Executive Committee of the Board to guide and assist the Executive Director, and perhaps most importantly, an internal planning, project development, and evaluation unit to present policy guidelines, plan programs and projects, and conduct subsequent monitoring and evaluation.

### 3.3 CARDI Organization Management and Finances

The Mission found that there was considerable dissatisfaction at the level of the Board of Governors, particularly among the advisers to the ministers, with the consistently late arrival of CARDI documentation. This often precluded proper consideration of the issues involved. The Mission therefore urges not only early presentation of documentation but the regular preparation of an imaginative presentation of a single important aspect of CARDI's activities in order to capture and stimulate interest.

The same criticism was received from members of the Board of Directors and the same remedy may be proposed. The infrequency with which the Board of Directors met in the past has also not been conducive to members playing a full part in the guidance of CARDI's affairs. The organization of Board meetings is, as is customary, in the hands of the Secretariat to the Board which is provided by CARDI management. Constitutionally, the Board should meet twice a year. This schedule of meetings has not been properly maintained, the period between meetings on one occasion stretching to 16 months. The fairly frequent changes in membership, frequent attendance by alternates, lack of agricultural-research-related experience, and the absence of technical and managerial advisory bodies to the Board have further militated against the Board being able to adopt a firm line on the policy, organization, and management of CARDI.

Arising from an evaluation of its Farming Systems Research Project in 1982, CARDI is currently being assisted by a research management specialist from the South-Eastern Consortium for International Development (SECID) and under the same project agreement has recently had a management systems review covering four fields, Project Management, Personnel Management, Communications, and Internal Audit. The proposals for improvement are basically sound and are currently being adapted to CARDI's needs and modified by an internal Task Force on Organization and Management (O & M) aided by the SECID advisers. The Mission believes that, as modified, they will prove workable, and urges their early implementation.

CARDI's core financing position has deteriorated so badly in the last five years as a result of delayed and curtailed government subventions that it is no exaggeration to state that it is presently facing bankruptcy. Over TT\$6 million is currently owing to the Institute (nearly one year's total requirements); salaries remain unpaid; project counterpart funding is not fully met, and research funded purely from core funds has to be reduced; and as a result, considerable loss of credibility occurs and regional and international prestige is being forfeited.

### Recommendations

- \* That the member governments nominating Board of Directors members give attention to the desirability of continuity on the Board, achievable by personal rather than ex-officio appointment.
- \* That the Board of Governors appoint a small (3-4 members) Executive Committee of the Board of Directors to support and guide the Executive Director between sessions of the Board.
- \* That the appointment of a Research Advisory Committee be speedily effected, along the lines recommended by the Steering Group.

- \* That the recommendations for management systems proposed by SYSTEMS Caribbean Limited (SCL) and modified by SECID and the CARDI Task Force be adopted.
- \* That management training courses be arranged for those members of CARDI senior staff likely to remain in, or aspire to, management positions.
- \* That member governments take urgent steps to make good the arrears of annual subventions to CARDI and bring currently due payments up to date, in order to ensure the maintenance of CARDI as a viable institution of their own creation.

#### 3.4 Program and Budget Presentation

The Mission found considerable difficulty in obtaining a firm grasp of CARDI's comparative expenditures on its many program activities due to the absence of any single presentation of related program and budget (or expenditure) elements. Until the most recent one-volume presentation of the Program of Work, this was contained in three separate volumes, apparently directed to three separate audiences, while the budget was, and still is, presented in a separate volume with little or no cross reference to the program. CARDI is therefore advised to modify its programming and budgeting processes to facilitate the presentation of an integrated statement.

#### Recommendation

- \* That CARDI adopt, as a matter of urgency, the already recommended computerized system of program budgeting to facilitate presentation, monitoring, and control of program-related allocations and expenditures.

#### 3.5 Policies, Priorities, and Planning

CARDI has attempted to define a research policy on the basis of its original broad objectives, its "mission statement", and the concepts and goals of the Regional Food and Nutrition Strategy (RFNS). (See Annex 1). Unfortunately, the resulting statement is expressed in as broad terms as the original mandate of CARDI. That CARDI has itself recognized the difficulties of clarifying its role in the formulation of a policy statement is evident from the last paragraph of its Research Policy, which states:

"Given CARDI's mission, its original objectives and those of the RFNS and development taking place within the region, a basis has been provided for formulating a research policy that is responsive to the needs of member governments."

Given that a policy framework for CARDI's priority setting and program planning is somewhat rudimentary, it is not surprising that the program objectives of CARDI's eight program elements are expressed very broadly in that the major goals of the Work Program reflect simply the national goals of member countries. It is difficult to identify a regional research program as such, since no regional research priorities appear to have been expressed. In other words, the what, the where, the what with, and the by whom aspects of programming have not been adequately addressed. Fortunately, a number of CARDI regional staff have made informed judgments regarding what needed doing and have achieved, in some cases, quite considerable success.

The Mission notes that priority setting and strategy is better handled in the less-developed countries (LDCs) where CARDI is better integrated with governments and in the Farming Systems Research and Development (FSRD) Project, where the systematic selection of priorities is built into the project methodology. Even in the LDCs, however, the number of lines of work is considered to be much too large (e.g., to improve 300 different technologies in three years), and there is no staff agreement on the correctness of the approach. Priority setting is least satisfactory in the medium-developed countries (MDCs) where CARDI's role is not well defined and, at headquarters, where shortage of funds has precluded even an attempt at assigning meaningful priorities for the mobile group of specialists.

The Mission feels that every attempt must be made by CARDI to achieve a consolidated more narrowly focused program based on a new definition of its strategy. This would inevitably require the phasing out of some programs and the reinforcing of others.

A formal internal mechanism to undertake this task (a Planning and Systems Development Unit) has already been recommended by SECID. The Mission endorses this in principle, and urges the early establishment of the unit with modification in its role, title, and placement. Its initial staffing should be one senior scientist (preferably with previous planning experience) and an economist. Externally, the proposed Research Advisory Committee should assist the Board in reaching decisions on future programming.

#### Recommendations

- \* That for the next decade (1985-95), CARDI strategy be based on the following: that CARDI recognize a clear distinction between needs of the LDCs and MDCs in view of the development of research cadres in the latter. Thus, to reduce work in the MDCs with a strong science base to those problems of regional significance which can be conducted with advantage in MDCs (especially in Trinidad & Tobago alongside UWI), and to specialist consultation.

- \* That CARDI, as a matter of urgency, set medium- to long-term planning objectives for itself and establish means to reach them.
- \* That CARDI establish and work on those regional priorities which are of importance to a number of countries rather than attempt to respond indiscriminately to country requests.
- \* That the priority areas for CARDI research other than farming systems, should be animal production, including livestock improvement, forage seed improvement and production, pasture improvement and management, and crop improvement, including vegetables, oilseeds, food legumes, root crops, tree crops, including fruit, and eventually other commercial export crops.
- \* That CARDI set up an internal planning unit, with appropriate external assistance on a periodic basis.

### 3.6 Monitoring and Evaluation

With the exception of major special projects, the monitoring and evaluation of CARDI's activities (especially "core" financed programs) has been of an ad hoc and somewhat haphazard nature. The newly recommended project and program management system made clear provision for adequate monitoring and evaluation of all projects. It is important that the outputs of the system be acceptable to donors and, to the extent possible, alleviate the necessity of duplication. The Mission suggests that compatibility with agricultural research requirements be sought before the system is adopted.

#### Recommendation

- \* That in order to avoid duplication, the project monitoring and reporting system adopted be compatible with donors' and agricultural research requirements.

### 3.7 Human Resources and Personnel Policies

CARDI staff fall into three distinct categories, depending on whether they were former Regional Research Center (RRC) staff, were recruited by CARDI into "core" posts, or were recruited to fill fixed-term posts on special project funding. Two forms of contract exist as a result: the "letters of appointment" of the RRC, which specify St. Augustine as a duty station; and the fixed-term, renewable contracts of CARDI, which specify "CARICOM countries" as duty area. Present contracts of former RRC staff reflect terms and conditions renegotiated with CARDI staff union soon after the formation of CARDI and thereafter at three-year

intervals. A legal means of amending them should be sought in fairness to the rest of the staff. At the same time, attention should also be given to the anomalies created by differential granting of tax-free privileges, etc., between member countries of the CARICOM Group. Staff rules, drawn up for CARDI, have remained in draft form for four years and although use in this draft form have not always been followed. Little or no attention has been paid to the need for job descriptions (except in the FSRD Project) or staff assessment (even prior to increment or promotion). Contact and discussion between management and staff have not been satisfactory, and unpaid arrears of tribunal awards, failure to negotiate new salary scales and latterly, late payment of even current salaries, resulting from CARDI's precarious financial situation, have all contributed to lower staff morale. The Institute, since its inception, did have an Assessment and Promotions Committee advisory to the Executive Director.

One staff privilege which the Mission felt to be an unwarranted drain on the Institute's resources (especially under CARDI's present financial situation) was the right to three months of study leave every three years, together with paid passages for the senior staff member and his family, to almost any country in the world, using the basis of return economy passages between the Caribbean and London for deciding the quantum.

While the new personnel management system prepared by SCL will, if adopted, creates an improved situation, it will not take care of all the requirements thought desirable by the Mission. Additional recommendations are appended.

### Recommendations

- \* That the personnel structure and policies of the Institute be revised in accordance with SCL recommendations.
- \* That early attention be given to correcting the anomalies created by the existence of at least two different forms of senior staff contract.
- \* That regular management/staff meetings be instituted at an early date to facilitate a better two-way flow of information.
- \* That the rules governing "study leave" be revised to make the granting of such leave conditional on performance assessment, and at wider intervals.

### 3.8 CARDI's Facilities

The Mission found that CARDI's physical facilities were adequate, although certain outstanding and vexing questions of title (treated elsewhere) still remained to be settled. Indeed, a very good impression

was created by the ability of staff, especially at less well-endowed sites and centers, to turn out a consistently good standard of work with the barest necessities of facilities and equipment. In general, buildings are utilitarian and unadorned and well in keeping with a rural, small-farm environment. Certain items of equipment, particularly optical instruments, pest control apparatus, and vehicles are still required in some units, and the Mission would suggest, once a modest project is drawn up, that the needed additional support be sought.

A major responsibility of CARDI lies in the maintenance of the old soils and pesticides laboratories, the Central Analytical and Pesticides Laboratories (CAL), now threatened with closure. This closure, although undoubtedly justified, could be costly to CARDI in redundancy and severance payments.

The laboratory is in a sad state of maintenance and most of the analytical instruments are old and need to be either replaced or repaired. The technical staff are experienced, knowledgeable of modern methods of analysis, and have proved that they can perform satisfactorily.

The main problem of CAL lies in the marked decrease in the number of samples submitted and the low output of results in terms of number of samples per year.

The Mission believes that the lack of prompt return of results to the users - researchers, other institutions, and producers - has been one of the causes for the continuous decrease in the number of samples submitted. No laboratory can perform adequately without funds for reagents, other laboratory materials, and proper scientific equipment maintenance. The staff and technical support is thus underutilized although a payroll liability.

Although the Mission agrees that the laboratory is one of CARDI's major assets in which there is considerable financial investment and that laboratories are needed to support CARDI's activities, it recognizes the economic constraints under which CARDI is operating, and the low output makes CAL uneconomical to maintain.

#### Recommendations

- \* That CAL be closed down. An internal task force should reassess CARDI's needs for analytical services and whether these are better met by a much smaller but up-to-date laboratory, equipped for rapid analyses, or by contracting out the work to another laboratory. Other users of CAL should be consulted any may wish to support a joint facility.

- \* That CARDI prepare a specific project aimed at making good the deficiencies in its physical plant and equipment.

### 3.9 CARDI's Relations with Member States and NARS

Marked differences were noted by the Mission between CARDI's relationships in the MDCs and LDCs. Relations were particularly good in the Eastern Caribbean States and Belize, where CARDI personnel either function as the only research resource available to the ministries of agriculture or fulfill a complementary role. The Mission found that, in these states, CARDI frequently takes a very low profile, insisting on the visibility of the NARS. The dilemma facing CARDI in such a situation, wishing to maintain a low profile and yet needing recognition to enhance its own credibility, was well understood.

In the MDCs, the situation is somewhat different. There are few joint activities, and CARDI teams have been criticized for conducting programs which duplicate those of the NARS and have been said to have been instituted without reference to the national staff. Where this has occurred, it reflects lack of an effective mechanism for consultation and agreement of CARDI's work program with the NARS concerned.

The Mission noted, in particular, that working relationships between CARDI and Ministry of Agriculture staff in Jamaica were not satisfactory. The Mission believes that this situation would have been avoided if there had been more effective liaison between CARDI and Ministry staff. In Jamaica, there is an Advisory Committee and in Trinidad & Tobago, the Government has a Policy Review Committee and a Liaison Committee.

Greater attention should be given by CARDI to the involvement of NARS personnel (especially in the MDCs) through these committees in its program planning. New proposals for programming, and external participation in the process, are planned and an appropriate opportunity to improve matters is thus offered.

### Recommendations

- \* That two or three members of the country NARS be selected to participate in CARDI's proposed Research Advisory Committee and represent the NARS, on a rotational basis for a period of two or three years.
- \* That a firm effort be made to achieve better working relations between CARDI and the Ministry of Agriculture in Jamaica.

### 3.10 Relations with the University of the West Indies (UWI)

CARDI's relations with the University have suffered from the way in which the Institute grew out of the former RRC during a rather long transitional period, instead of following a clean break with tradition and starting afresh.

The constitution of CARDI leaves the question of affiliation with the University, and the form this should take, as well as arrangements for accommodation on the UWI campus, to negotiation by the Executive Director. Given that in the period immediately before CARDI's establishment, the policy was to integrate RRC with UWI, the new institution found itself already a de facto subsidiary body of the UWI Faculty of Agriculture. This fact was emphasized by the preponderance of Board membership (three representatives) allocated to UWI. Furthermore, those former staff members of RRC who joined CARDI (some of whom still remain) included some of the better University teachers, with heavy post-graduate teaching commitments. These were soon curtailed, in the interests of CARDI's heavier emphasis on research and to the detriment of the University teaching program.

Three other factors impair relations with UWI. First, under the agreement establishing CARDI, the property of the RRC vested in the University on behalf of RRC, should have passed to CARDI. Movable assets have been so passed, but, because of disagreement on their ownership, fixed assets (buildings) have not, and CARDI is now being charged rent for new quarters allocated to it. Original title deeds to buildings erected for RRC are missing. Second, CARDI agreed that the University should handle its accounts in Trinidad for a 20% servicing charge. This sum was accepted until, in periods of poor cash flow when contributions were slow in coming in, CARDI bypassed this arrangement in favor of direct accounting. CARDI's own financial controls were not of the best, and at one time it was in arrears to the University on all three campuses occupied. Third, Governors of the Board of CARDI decided to reduce the UWI membership on the Board from three to one. This required a constitutional change which has been effected and ratified, but this also results in a deaffiliation of CARDI from UWI.

It is clear to the Mission that one of CARDI's first and foremost requirements is to seek unbiased assistance in the reformulation of a logical and mutually acceptable relationship with UWI. Close liaison and collaboration, on a mutually supportive basis, are important for the furtherance of the work of both organizations and the region they serve.

#### Recommendation

- \* That, as a matter of urgency, an arbitration mechanism be established to renegotiate an agreement between CARDI and UWI (Faculty of Agriculture) and resolve outstanding differences between them.

### 3.11 Relations with Donors

CARDI's relations with the donors to its core program, its member countries, have been examined above. Unfortunately, in a period of financial difficulties for member countries, their expressed support for CARDI has not always been matched by timely payment of their contributions to the Institute and has led to CARDI's present financial problems.

As the only viable executing agency of research work on behalf of the Eastern Caribbean LDCs, CARDI has been able to attract considerable special project funding from 11 different donors outside the Caribbean. All but one of these were contacted, and a general concern about CARDI became apparent. The reasons are the state of CARDI's management structure, the worsening state of CARDI's core financing, which precludes it from making good its counterpart obligations, and the inability of CARDI to remain competitive in the job market, because of currently tenuous career possibilities. Donors recognized that CARDI's situation simply mirrored a general attitude towards agricultural financing in the region but nevertheless sought an improvement in CARDI's finances, which for some would be a condition of further assistance.

The Mission concluded that donor support was likely to continue, for the sake of the region, but might remain at a lower level until a better-defined strategy was formulated, management improved, and core financing placed on a sound basis, through regularity in meeting obligations by the member governments.

A need for CARDI to better coordinate its special project funding became clear. Ample opportunities exist at regular forums in the region to ensure contacts between CARDI and its donors meeting together, and it is urged that such opportunities be sought on a regular basis.

#### Recommendation

- \* That CARDI take advantage of existing forums in the CARICOM region to convene regular meetings of its principal donors to ensure coordination of its special project funding.

### 3.12 Relations with Extension Services

Excellent relations are maintained with the two major regional extension projects, CAEP and CARDATS, and the Mission gained a very favorable impression of the volume of inputs which CARDI is putting at the disposal of these projects. As these inputs usually take the form of "technology packages" disseminated by the extension projects, little credit accrues to CARDI as the originator, with the consequence that an erroneous impression is often gained of CARDI's actual involvement. The same

situation prevails at the national level in some countries in which all materials are channelled through, and emanate to, the NARS or the ministry of agriculture. The resulting dilemma for CARDI has already been mentioned.

CARDI's role vis-à-vis extension and extension services is often confused with its developmental role, and is taken as the "D" in the "R & D" role of CARDI. Prime examples of development work were seen in Belize, where CARDI has developed an indigenous peanut industry to the level of processing plant and marketable surpluses, and in Barbados, in the pasture development program with the Agricultural Development Corporation and the private sector. Difficulty was expressed in properly assessing development activities due to the problems inherent in analyzing CARDI's program and budget documents. Observations suggest that the activity is considerable, within CARDI's resource constraints, and is being approached in the proper way, combining field research and outreach in the same terms. It appears necessary for CARDI to address the question of what constitutes its development role and to present its programs in such a way as to make this clear.

#### Recommendations

- \* That CARDI clearly define its concept of "development" in the context of its regional work.
- \* That work in the LDCs should continue to be adaptive research and developmental, but development activities should not be increased above the present level while research is slow in generating new technology.
- \* That development work in the LDCs should continue to be confined to those activities in which CARDI has a special advantage.

#### 4. CARDI's Regional Program Content and Balance

##### 4.1 Introduction

CARDI does not clearly spell out its differential role in the MDCs and LDCs; neither is there any indication of the balance intended as between research and development or between regional and country-specific work. Consequently, the Mission's analysis of CARDI's programs was conducted without any yardstick indicative of an expected norm.

##### 4.2 Work in the LDCs

CARDI's activities in the LDCs are dominated by the farming systems research project. The Mission found the project, now in its second phase, to be well-conceived and following sound principles in the

adoption of activities. The work is appropriately adaptive, and is conducted with competence and enthusiasm. However, despite the careful procedures followed in setting work programs, resources are still spread too thinly as a result of the wide range of activities pursued (over 120 activities in eight countries), reducing the opportunity to reach successful conclusions. A reassessment of priorities (as already recommended), more emphasis on experiment station trials, better-designed trials, and a greater degree of coordination of activities, utilizing the network principle, could result in greater effectiveness.

### Recommendations

- \* That CARDI establish firm guidelines on the priority to be given to the different activities of country teams, review the program of each team, and reduce each to a manageable number of projects.
- \* That greater emphasis be given to experiment station trials in order to provide improved backup to the FSRD program.

### 4.3 Work in the MDCs

CARDI has yet to make a niche for itself in the MDCs where national research services are numerically strong and are able to look for donor support in research fields where they are weak and supply national staff for training overseas or for counterpart training by scientists supplied to fill key positions under technical assistance. A regional research institute is not essential for the furtherance of their research programs and, in three of the four MDCs in which CARDI works, there is undoubtedly a feeling that CARDI duplicates activities of national programs, or does what they could do just as well. This suspicion has often resulted from the way in which CARDI has presented programs to governments for their approval rather than discuss them beforehand. While CARDI liaises with its government counterparts, decisions are not always transmitted within the national system.

Even so, some excellent work has been carried out by CARDI staff, especially in Jamaica and Barbados, where entomologists and a livestock specialist have made extremely valuable contributions on problems of both national and regional significance. Similarly in Guyana, a forage program provides a role for CARDI in which it has comparative advantage. In Trinidad, the unit has backstopped the government's food crops sugar diversification and citrus rehabilitation programs. Headquarters-based senior scientists have contributed significantly to the successful yam and peanut programs.

Much of the rest of CARDI's work in the MDCs is routine run-of-the-mill evaluation and multiplication work carried out by CARDI either to

maintain a presence or to absorb locally provided funds to short-term needs of individual governments. It is undoubtedly competently done, but is an inappropriate or inefficient use of CARDI's resources.

If CARDI is to make further real contributions to agricultural research and development in the MDCs, it will need to redirect further support to lines of work in which it has recognized expertise and experience not available to national agricultural research services and, therefore, where it has something worthwhile to offer. CARDI will lose credibility if it extends its activities too widely and into areas where the work can be as well done by national scientists and where it appears to compete rather than to support.

#### Recommendation

- \* That CARDI needs to rethink its role in the MDCs. It should not attempt to do what national agricultural research systems are able to do as well. CARDI should seek to provide an input only into lines of work in which it has, or can develop, an advantage as a regional institution.

#### 4.4 Specialist Research

##### 4.4.1 Biological sciences

The Mission noted that CARDI has a wide range of expertise in agronomy, soil science, plant protection, and animal production. In addition to those staff filling specialist support positions (e.g., to the FSRD Project), country team members include entomologists, pathologists, soil scientists, and animal scientists. A number have very considerable and valuable experience of the Caribbean.

The work of the agronomists in the Eastern Caribbean who provide backup support to the FSRD Project is seriously limited by their various administrative and coordination duties and the lack of support staff. Further assistance is also required by the entomologist (stationed in Barbados) if his work in the Eastern Caribbean is to be properly extended to a truly integrated pest management program. The excellent work of other country team specialists has already been commented on and reference has been made to the stultifying effects of lack of operational funds on the output of the headquarters group of specialists.

The Mission concludes that there is a wealth of specialist expertise among CARDI staff, but that, through lack of core resources, much of its potential is wasted. But the Mission feels that, with firm leadership, more could be achieved even in the present situation. Where specialist staff have free time because of inability to do research, they could, for example, be profitably occupied in producing advisory handbooks and aids (e.g., the identification of pests and diseases and their control).

### Recommendations

- \* That the specialist groups, particularly in St. Lucia, be strengthened, the better to backstop work in the LDCs.
- \* That the present personnel of the Trinidad & Tobago headquarters units be temporarily redeployed to the extent necessary to better contribute to CARDI's work program, pending proposed reorganization.

#### 4.4.2 Socioeconomics

CARDI is weak in the social sciences, assigning under 4% of its resources to such work. The headquarters team has no economist, and although the FSRD Project has an anthropologist and an economist, and a second economist is assigned to the Trinidad & Tobago country unit, none provides the input badly needed in policy formulation, priority setting, and program planning. While this service, essentially requiring inputs from a macroeconomist, could be carried out on a consultancy basis, a more important need at headquarters is for a production economist to assist in the targeting of research within the small-farm spectrum of the whole CARICOM group. Such a service could adequately be provided by a practical production economist servicing the full CARDI network with the assistance of national collaborators. Arrangements are in hand for the provision of the required additional social science input called for in the FSRD Project, but in order to relieve the social anthropologist of a large workload (75% of time) in market economics, the assistance of a full-time marketing economist is strongly recommended. There is a marked lack of integration of social scientists with the biological scientists in the FSRD Project. Multidisciplinary teamwork is the essence of such a project, and the Mission urges its early establishment.

### Recommendation

- \* That CARDI strengthen its work in market economics and production economics, and use social science expertise for planning, as well as for research support.

#### 4.4.3 Support services

The research support services of CARDI, located at the headquarters, comprise biometrics, statistics, analytical and pesticide chemistry, library/documentation, and soil science/editorial. Biometrics services are excellent and have recently been strengthened by a technical assistance appointee to be stationed in Jamaica. The only constraint to more effective use of the biometrics service is the dearth of travel funds at present. It must be noted with surprise that the statistician who provides a data analysis service does not work on a team basis with

the biometrician. The Mission recommends, therefore, that this unsatisfactory situation be rectified. The situation of the analytical services working out of the CAL has been referred to elsewhere. The library and documentation service provides literature reviews, current contents bits, searches, etc., and provides access to AGRIS, CARIS, AGRICOLA, and other data bases. Microfiche service is available, and the installation of computer peripherals has permitted the production of a computerized cumulative accession listing. Complete reliance on outside funding will make the future of this service questionable, and there is an extremely important need to ensure its continuity.

#### Recommendations

- \* That the information/communication role of CARDI be strengthened to permit elaboration of a significant data base of use to the region.
- \* Some 57 support staff were inherited from RRC/UWI when CARDI was formed in 1975, incorporating the Central Analytical Laboratory (CAL). These staff represent a group of well-trained and experienced personnel but are very costly and superfluous to CARDI's operations in Trinidad. It is recommended that this group be reduced as a matter of high priority and a corollary to closing down CAL.

#### 4.5 Development Activities

There is no clear boundary between research and development. In the context of its study, the Mission has taken the division between the two activities to be at the point where the main purpose of an activity ceases to be information collection. Thus, even at the extension stage of farming systems work, CARDI's role is, or should be, the collection of information about the effectiveness of improved strategies and is, thus, research.

Most of CARDI's development work is in the LDCs, although dairy development in Guyana, and pasture and forage development in Trinidad & Tobago and Barbados, provide exceptions pointing up programs in which CARDI is properly using its special expertise.

Four major developmental programs in the Eastern Caribbean provide the bulk of CARDI's development work. Forage seed production and pasture improvement centered in Antigua provides a logical extension of CARDI's research and experience to assist slender extension services. A soil and water management project also centered in Antigua, while worthy as a project, is not a logical project for CARDI, which has no special expertise in this area. However, it is being satisfactorily carried out and should provide useful extendable technology. Nevertheless, the Mission believes that CARDI should avoid such commitments in future. A

small-dairy project in Dominica is also of doubtful significance to an organization of CARDI's size. The projects on yam planting material in Barbados, and the peanuts/soya work in Belize, are ideally suited to CARDI.

CARDI's development activities are rightly focused on the LDCs. However, if the institute is to function correctly as a regional research and development institute, it must focus on activities in which it has a special advantage rather than responding to the availability of special project funding. It could, for example, function with advantage as an outreach arm for several international agricultural research centers (IARCs) wishing to extend their activities to new locations in the Caribbean region.

#### Recommendations

- \* That CARDI should not seek or accept special project funding in fields in which it has no special advantage.
- \* That CARDI strengthen its association with those IARCs having programs of significant importance to the region, acting in a liaison function especially on behalf of the LDCs.

#### 4.6 Training

CARDI's main emphasis in training should be short in-service courses or workshops; short-term attachments to CARDI staff; supervision of postgraduate students; and collaboration with UWI in training extension officers. In practice, training activities have arisen as opportunity presented itself.

CARDI staff at headquarters have continued to lecture, supervise students, and act as internal examiners for UWI. CARDI staff also provide an teaching input and materials for bulletins -- to the UWI/CAEP and CARDATS projects. Training provision for technical staff and farmers exists in the European Development Fund (EDF) soil and water project. The major training activity is in the FERD Project through the attachment of counterpart staff to CARDI teams.

While mainly unplanned and uncoordinated, CARDI's training activities are not insignificant but constitute as much as the Institute should attempt in its present circumstances. As and when the financial situation improves, CARDI should plan to increase the provision of opportunities for postgraduate research work in collaboration with UWI.

#### 4.7 Program Balance

In examining the balance of CARDI's program, the Mission observed that the present state of balance was not so much the result of interpretation of its mandate as of opportune availability of special project funds. Its restricted financial circumstances have reduced both headquarters core activities and field station backup research to an inadequate level. A ready partial remedy will be to off-load the burden of the Central Laboratory.

The Mission believes the balance between R & D to be just about correct in the LDCs and has made recommendations to ensure maintaining this balance by restricting further developmental work and reducing the spread of research coverage. Fields in which CARDI has special advantages and expertise, such as pasture/forage, vegetables, and oilseeds, should be emphasized. An attempt must be made to rectify the omission of fruit tree research, of high regional importance, and gradually to move into other tree crops and perennial export commodities for which there is great demand. Concomittant reassessment of root crops work and the doubtful future for cotton should also be considered.

Recommendations have already been made for a clarification of CARDI's role in the MDCs and for restricting activity there to strictly regional problems and specialized consulting. Clearly, any expansion into new fields would need to be accompanied by appropriate funding or balanced by reductions in another sector.

The restructuring and streamlining of CARDI is an essential requirement for any improvement.

The quality of CARDI's work is highly variable. Note has been made of the excellent work in entomology at several sites; of the high professional standards of the pasture and oilseeds programs, and excellent backup provided in biometric work. Unfortunately, much of the core research lacks funding, constraining the experienced and well-qualified staff to labor in a climate of despondency unconducive to any productive work. Farming systems work has been a slow starter through lack of understanding of the methodologies involved, but current indications suggest cautious optimism regarding future outputs. Social science work has been rather weak to date, and proposals have already been made for its improvement. Much of the rest of CARDI's work is somewhat pedestrian and of only moderate quality. It is hoped that the recommendations for sharpening and consolidating the program will assist in effecting improvement.

5. PROPOSALS FOR STRENGTHENING CARDI'S REGIONAL CAPACITY

5.1 Introduction

CARDI's present adverse situation has arisen from:

- i) Lack of clear direction from its Board.
- ii) Too broad a mandate and lack of well-defined guidelines; too ready a response to different short-term needs of both LDCs and MDCs; no clear policy on the relative emphasis to be given to R & D and lack of a continuum between the two; failure to effect the coordination and integration of regional agricultural research.
- iii) Lack of appropriate leadership in priority setting and all aspects of organization and management.
- iv) Lack of reliable core funding.

CARDI cannot be expected to survive as a credible regional R & D institution unless sweeping changes are made and its core finances are guaranteed and fully recognized by the MDC governments as, in part, a contribution towards operations in the LDCs. The LDC governments, too, must meet their financial obligations.

5.2 Options for Action

Whichever of the following options is found most acceptable, it must be emphasized that the Mission's main aim was to seek a means to improve CARDI service in agricultural research to the member countries of CARICOM. For such an improvement to be realistic, it must depend on an acceptable level of operational funds; in other words, on an improved personal emoluments/operations ratio. The Mission does not believe this to be achievable with the present levels of core staffing and core funding, as even if all arrears were paid up and current financing was brought up-to-date, there would still remain a considerable deficit. For this reason, the Mission has repeatedly stressed in the foregoing chapters the real need for CARDI to be slimmed down, especially in Trinidad & Tobago, as a first step towards improvement. Coupled with this retrenchment, one would like to see an earnest of good faith from the member governments themselves in making good the deficiencies in their financing of CARDI. There is little hope of obtaining continuing external financing in the face of lack of support from the Institute's own members.

Option 1: To maintain the status quo.

To maintain CARDI's present organizational structure and proceed with present plans to improve the efficiency of administrative procedures, personnel management, financial and accounting systems; to develop and implement project management and documentation systems; to establish project preparation and evaluation capabilities, and establish a Research Advisory Committee made up of members of the international agricultural research community.

The Review Team does not consider this to be a practical option at present levels of governmental funding. It does not face up to the fundamental problem of finance and program direction. Foremost of the budget issues is the drain on core resources caused by the large number of relatively unproductive staff (approximately 54) in Trinidad & Tobago. The cost of their emoluments alone diverts core resources from support of work in the LDCs and other MDCs and does not leave enough funds for meaningful work to be carried out by the headquarters staff and the Trinidad & Tobago unit, leaving them relatively unproductive. Any remedial measures which do not take account of this problem will only delay what is likely to be CARDI's inevitable bankruptcy. Previous attempts at auditing/evaluation have avoided the issue.

Option 2: To close down CARDI, phasing out existing projects.

The dissolution of CARDI would create severe problems for the LDCs. The MDCs, however, maintain that they do not depend on CARDI. Their agricultural research services are numerically strong. However, the LDCs depend on CARDI to conduct what is in effect their national agricultural research and to provide an institution through which donors can most effectively channel aid.

Even in the MDCs, CARDI could play a very positive role in highly selected research areas. The region would lose a potentially important connecting link in research. Furthermore, for all its weaknesses, CARDI does provide some stability and contributes to the retention and effective use of Caribbean agricultural scientists.

For these reasons, the team believes that CARDI must continue to exist but, if it is to be viable, must be streamlined and focused on a limited number of priority research areas of regional significance, and networking where it has a special advantage.

Option 3: CARDI restricted to the LDCs.

One solution would be to further slim down CARDI to a regional organization working exclusively for the LDCs: the Eastern Caribbean States and Belize, consisting of a small administrative unit, a core of

specialists and outposted staff. As at present, there would be about 16 country team members working on the R & D problems of eight countries, and a restricted number of activities. A major role would be to ensure LDC participation in regional research network activities.

Even such a slimmed down CARDI (about 30 professional officers) would require continued financial support from the MDCs if it were to be viable. Furthermore, the LDCs would have to be in a position to provide a high percentage of core cost on a regular basis. The initial costs would be high in terms of redundancy and severance payments but this problem will need to be addressed, probably sooner rather than later, with the existing organization or whatever reorganization is attempted.

Option 4: An LDC CARDI amalgamated with WINBAN Research Department.

The merging of a streamlined CARDI (Option 3) with the research services of WINBAN (6 specialists) has merit, extending CARDI activities to a major export crop and giving WINBAN access to a wider range of expertise. It is recognized that WINBAN operates essentially in four banana-growing Windward Islands.

Option 5: Refocused regional CARDI servicing the LDCs and concentrating strictly on a few regionally significant and specialist activities, including the MDCs.

CARDI could still play an effective role in the MDCs of the region by providing support in fields where it has, or would be justified in developing, special expertise. These are on-farm research, forage, commercial commodities, and fruit tree crops.

CARDI would aim to set up and lead networks in those fields where it has special advantage. Under this option, it would have two main functions: backstopping farming systems activities in LDCs, and leading specific network activities in such crops as fruit trees, cocoa, coconut, bananas, and animal production.

Specific work would be undertaken in the MDCs at the request of governments and paid for by their contributions. Some strengthening of core staff would be needed, and consequently any activities added would need to be accompanied by appropriate added funding.

The existing staff can best be used in an interdisciplinary role. More use could be made of the resources of regional ministries of agriculture, universities, national and international agencies.

In support of Option 5, it would be desirable for CARDI to reestablish its accord with UWI in order to obtain further additional specialized technical support as required.

## Chapter 1

### 1. INTRODUCTION

#### 1.1 Background and Origin of the Mission

The mission to review and evaluate the Caribbean Agricultural Research and Development Institute (CARDI) was undertaken in response to a formal request made in April 1985, to the International Service for National Agricultural Research (ISNAR) by the Chairman of the Board of Directors, the Honorable G. Kennard.

Prior to the formal request, informal contact had been established with CARDI officials. During a meeting held in Trinidad & Tobago in April 1983, which was attended by the Director General and a Senior Research Officer of ISNAR, Dr. William K. Gamble and Dr. Fred Haworth, respectively, the Executive Director of CARDI, Dr. Joe Bergasse, outlined the main problems CARDI had been facing. Later on, during the Centers' Week held in Washington, D.C., in November 1983, discussions were continued with Dr. Samsundar Parasram, then Director of Research and Development of CARDI, with regard to the possibility of conducting a program audit of CARDI.

By a letter dated 13 February 1984, the Executive Director of CARDI requested "that ISNAR carries out an audit of CARDI's program of work and work with us to develop a proposal for funding such an audit."

In July 1984, Dr. Carlos Valverde, Senior Research Fellow, ISNAR, visited Trinidad & Tobago. At that time, Dr. St. Clair Forde, Director of Finance and Administration and Acting Executive Director of CARDI, and Dr. Ralph H. Phelps, by then CARDI's Director of Research and Development reiterated that a review of the whole system was a necessity and that the decision to involve ISNAR had been approved by the Board of Directors.

Finally, in December 1984, during a meeting of the national agricultural research institutions of the Caribbean held under the auspices of ECLA, and with the previous authorization of the Director General of ISNAR, preliminary discussions were held with the newly appointed Executive Director to work out the strategy for carrying out an ISNAR exploratory mission to CARDI during the first two weeks of March 1985.

During the period from 10-20 March 1985, a rapid exploratory trip was made to CARDI headquarters and to Jamaica, Barbados, and St. Lucia in order to make initial contacts and to assess whether ISNAR could collaborate with the regional institution and the CARICOM countries in seeking alternative ways of strengthening and improving the agricultural research of the region.

The outcome of previous contacts and interactions and the formal request of the Chairman of the Board of Directors of CARDI resulted in the decision by the Director General of ISNAR to proceed with a review and evaluation mission to CARDI which took place from 2-26 June 1985.

Since the time that CARDI expressed its interest in having ISNAR review and evaluate its agricultural research activities, it became more evident that the officials of CARDI were eager to cooperate with ISNAR, especially following the appointment of the new Executive Director, Dr. Samsundar Parasram, in early December 1984.

## 1.2 Terms of Reference of the Mission

The major objective of the Mission was to review and evaluate the quality and relevance of the scientific and developmental work of CARDI in the light of its existing mandate and of the expressed needs of the National Agricultural Research and Development Services of the Member Countries of the CARICOM Group.

In pursuance of its objective, the Mission was to make a detailed examination of the following aspects of CARDI's establishment and activities:

- i. the results of the last five years of research activity, the extent to which those results have been promulgated and applied to agricultural development, and the relevance of such development in the Caribbean region;
- ii. the current processes of planning and programming within CARDI, to include the relevance, scope, content, and long-term goals of existing and planned programs of research and development in the context of its mandate and of the immediate and long-term agricultural development plans of the Caribbean (CARICOM) region and its individual constituent nations;
- iii. the effectiveness of CARDI's endeavors in the field of technology transfer and of its information and documentation services vis-à-vis its client countries;
- iv. the adequacy of currently available resources to implement CARDI's existing program;
- v. the efficiency of its programming and budgeting in relation to available resources of both core and special project funds and the adequacy of its expenditure controls and accounting processes;
- vi. the methodology of its priority-setting within the constraints of budget and the continuing appropriateness of current program content and balance as between major fields of research, between research and development, and between its client countries;
- vii. the effectiveness of intra- and interdepartmental coordination within the Institute and of interinstitutional relations and coordination of activities within client countries;
- viii. the constraints which may be hindering the achievement of CARDI's objectives;

- ix. in the light of the foregoing, the continuing relevance and appropriateness of CARDI's broad mandate in the context of the changing economic situation of agricultural development in the Caribbean (CARICOM) region.

It was agreed that, on the basis of its review, ISNAR would direct its report and recommendations to the Board of Directors of CARDI with its views on the need for changes in, or reorientation of, the objectives, program or program elements of the Institute, on possible improvements to its efficiency, and on means of overcoming identified constraints to its efficient operation. The observations and recommendations which are made by ISNAR will be reviewed by the Board of Directors of CARDI and the Standing Committee of Ministers responsible for agriculture, but will in no way commit either CARDI or ISNAR to particular actions.

### 1.3 Composition of the Mission Team

The team experience included competence in agricultural research organization; national and regional agricultural research administration and management in different political situations; agricultural research programming, monitoring, and evaluation; human resources development and management; industrial and field food crops; farming systems research; rural socioeconomic analysis, agricultural economics research, and financing of agricultural research.

The following members were appointed to the Mission:

- \* Dr. Carlos Valverde S., Senior Research Officer, ISNAR, Head of Mission.
- \* Mr. Brian N. Webster, Consultant, agricultural research organization.
- \* Mr. Kenneth R.M. Anthony, Consultant, tropical agricultural research.
- \* Dr. Thomas F. Carroll, Consultant, agricultural development planning and policy analysis.

### 1.4 Methodology

In view of the complexity of the region involved and the large number of countries to be visited -- 12 in total -- careful planning and organization of the review and evaluation process was needed, to overcome the severely limiting time and resource constraints.

The review and evaluation was carried out in a total period of four weeks, during which time the four-man team divided into two groups and visited the countries of the CARICOM.

The Mission based its program of activities on two main premises:

1. a close interaction with the CARDI establishment in the different countries; and

2. a program of visits in each country, which included dialogues with the ministers responsible for agriculture and/or high-ranking officials of the ministries of agriculture of the region; the international and national agricultural research systems; other related public and private institutions; and the donor community.

The review and evaluation was undertaken in four stages:

- \* Data collection and study. This stage included direct visits of the Mission team to the different activities of CARDI in the field, the laboratories, and the CARDI unit headquarters of the CARICOM countries visited. Special attention and time was given to talks with CARDI professionals and for the collection of relevant literature, project documents, and reports. The program of visits in each country included the national agricultural research activities, extension services, activities of the University of the West Indies (UWI), farmers; national and regional institutions -- both public and private -- which are associated either directly or indirectly with research and the transfer of technology. Visits were paid to the international and bilateral donor and executing agencies engaged in technical cooperation. In addition, the team had frequent formal and informal meetings, discussions with professional experts and political figures from the agricultural sector. In all cases, relevant data, comments, and information were collected to the extent available.
- \* A review stage. Reviews of the relevant documentation and discussion of the main findings among the Mission members. At this stage, the main ideas and some of the still-existing doubts were discussed thoroughly with the CARDI officials and staff members at the Trinidad & Tobago headquarters.
- \* Assessment of the main findings and preliminary discussion of the conclusions and recommendations.
- \* Formal drafting of the Mission's report.

The first two stages of the review and evaluation process were carried out while the Mission was in the CARICOM-Caribbean region from 2-26 June 1985. The third and fourth stages were carried out at ISNAR headquarters in The Hague, Netherlands, where the entire Mission worked full-time from 2-19 July 1985.

### 1.5 Structure of the Report

The report of the Mission comprises an executive summary, five chapters, and additional annexes.

Chapter 1. "Introduction" presents a brief account in the Mission's activities in carrying out the review and evaluation of CARDI, the terms of reference and methodology used.

Chapter 2. "The Setting for Agricultural Research of the Caribbean Community (CARICOM) Countries." This chapter reviews the main features of the CARICOM-Caribbean agricultural sector and the activities being

carried out to develop agricultural technology in the region. It does not pretend to be exhaustive in view of the abundant existing reports and literature on this subject, but sets the main issues and researchable agricultural areas.

Chapter 3. "Characteristics and Functioning of the Caribbean Agricultural Research and Development Institute (CARDI)." This chapter presents the Mission's diagnosis of the regional organization and management of the Institute. It analyzes its structure and organization; program and budget presentation; the planning process (policies and priorities); monitoring and evaluation; human resources and personnel policies; and facilities. Attention is given to CARDI's relationship with the national research systems and extension services of the CARICOM countries, the University of the West Indies -- Faculty of Agriculture (UWI), and the donor community.

In each of the areas of concern, the critical points and positive features of the regional system are identified, conclusions and/or recommendations being presented as required.

Chapter 4. "CARDI's Regional Program Content and Balance" reviews the main characteristics of the CARDI research program in both the less-developed countries (LDCs) and the so-called medium-developed countries (MDCs), and its relevance both at country and regional levels.

The chapter discusses and highlights the main research areas, the development activities, and the training component, and presents the opinion of the Mission in relation to program balance and the quality of CARDI's work.

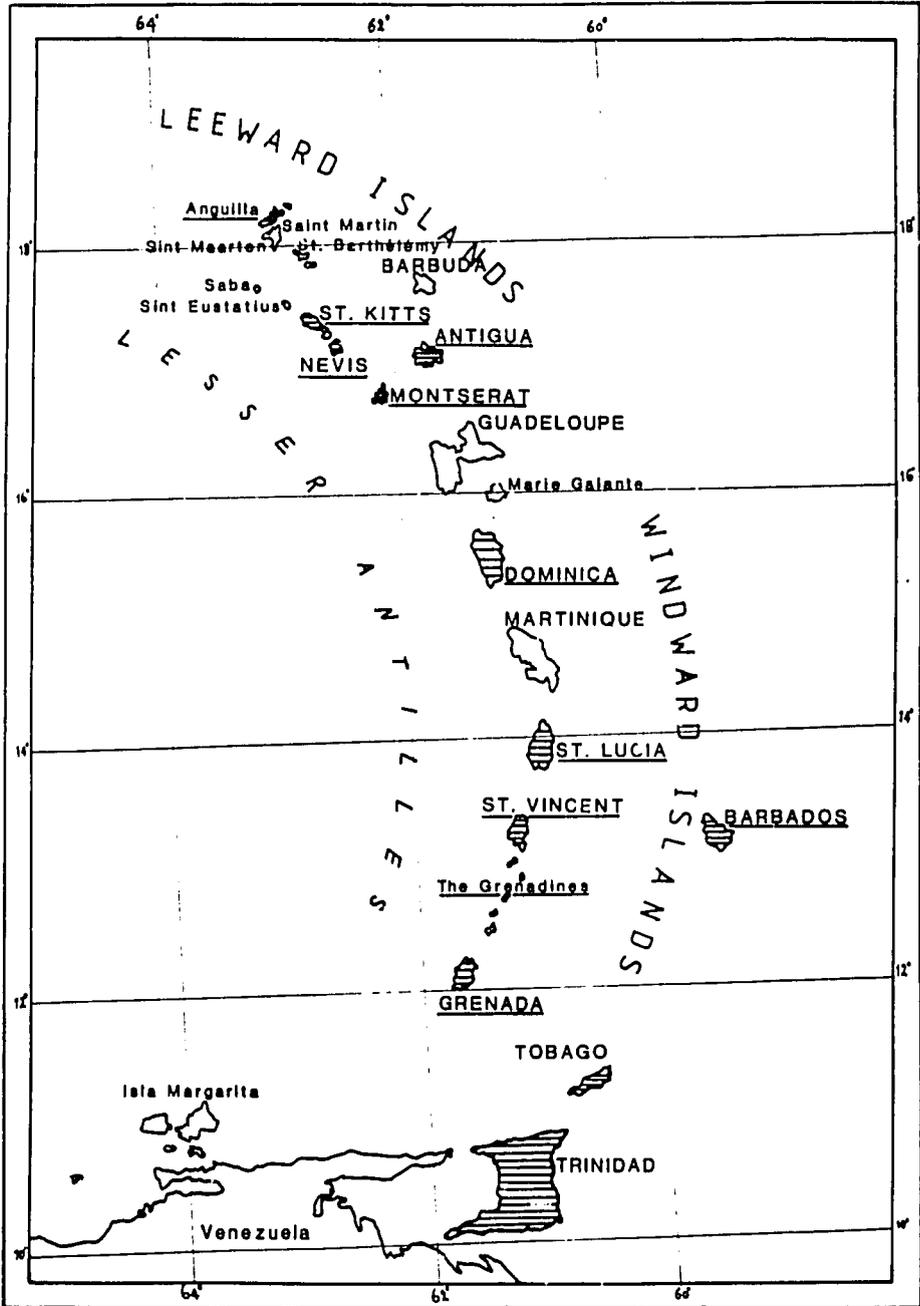
Chapter 5. "Proposals for Strengthening CARDI's Regional Capacity" summarizes the Mission's views on what could be the future orientation of CARDI's activities (options).

The annexes contain various items of information which complement or add to the report, and other relevant data or information which the Mission felt should be included.

Map 1. CARICOM countries served by CARDI ( Shaded )



Map 2. CARDI served Leeward and Windward Islands 



## Chapter 2

### 2. THE SETTING FOR AGRICULTURAL RESEARCH IN THE CARIBBEAN COMMUNITY (CARICOM) COUNTRIES

#### 2.1 Overview of CARICOM Agriculture

The 12 CARICOM countries have a total population of about 5 million, of which 4.5 million are in the five larger territories (MDCs) and 0.5 million are in the seven smaller islands (LDCs). (See Maps 1 and 2.) Approximately two-thirds of the population is rural. With the exception of Trinidad & Tobago and Barbados, the GDP per capita averages around US\$1,000. Some 2.2 million hectares (ha) in the region are in farms (numbering 300,000), of which 0.6 million ha are cropland. About 90% of all farms are under 4 ha, but they account for only one-quarter of the acreage. (Tables 1 and 2.)

The importance of agriculture in the economy of the region can be described in terms of contribution to GDP, employment, and trade. With respect to the share of agriculture in GDP, there are wide variations within the region, ranging from a high of 30.2% in Dominica to a low of 2.7% in Trinidad. The countries may be divided into three groups:

1. GDP of agriculture less than 10%:  
Antigua, Barbados, Jamaica, Montserrat, and Trinidad & Tobago.
2. GDP of agriculture between 10 and 20%:  
Belize, Grenada, St. Kitts/Nevis, St. Lucia, and St. Vincent.
3. GDP of agriculture greater than 20%:  
Dominica, Guyana.

The relative contribution of agriculture has remained stable since 1979, and the countries have remained within the groups described above, with the exception of Grenada, which has shifted from a higher share of agriculture to the middle group.

Historically, the anglophone Caribbean countries were part of the classical sugar-based economies. Sugar remains the single most important crop in the region, although there has been a steady decline of production and exports. The sugar output of approximately 800,000 MT is now only about 60% of what it was two decades ago. Bananas are second in importance; the current output is about 200,000 MT.

Agriculture accounts for a relatively large share of the labor force (see Table 3). In seven countries, over 20% of the labor force is in farming; in two countries, between 10-20%; and only in Trinidad & Tobago and Barbados is it under 10%. Between 1970-80, there appears to have occurred an actual increase in the share of the agricultural labor force, a rather unusual trend in the world, especially, since productivity in agriculture, as elsewhere, is much lower than in other sectors.

Table 1. Basic statistics on 16 Caribbean countries.

	GNP at Market Prices (millions of US dollars) 1983	Population (thousands) 1983	GNP Per Capita (US\$) 1983	Growth Rate (%)			Life		Infant Mortality		Primary School	
				GNP 1973-82	Population 1973-82	GNP per capita 1973-82	Expectancy at birth (years)		Rate (aged under 1)		Enrollment	
							1970	1982	1970	1982	1970	1982
Antigua and Barbuda	140	78	1730	6.2	1.2	4.9	n.a.	72	21	32	n.a.	80
Bahamas	900	222	4060	1.8	1.3	0.5	66	69	36	32	n.a.	99
Barbados	1020	260	3930	3.4	0.4	2.9	69	72	40	26	108	115
Belize	170	153	1140	6.4	2.1	4.2	60	65	51	45	n.a.	85
Dominica	80	81	970	1.7	1.1	0.6	n.a.	74	58	20	123	n.a.
Grenada	110	114	990	3.8	1.1	2.6	67	69	33	15	90	108
Guyana	410	801	520	-0.5	0.8	-1.3	63	68	57	41	99	95
Jamaica	2940	2264	1300	-2.6	1.4	-4.0	67	73	32	10	119	99
Montserrat	30	13	2360	5.3	0.6	4.7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
St. Lucia	130	125	1060	5.5	1.6	3.9	n.a.	69	60	30	n.a.	95
St. Kitts & Nevis	40	53	820	1.9	0.9	1.0	64	63	48	53	n.a.	n.a.
St. Vincent and the Grenadines	90	102	860	3.8	0.8	3.0	n.a.	69	56	45	97	90
Surinam	1280	363	3520	4.4	-0.7	5.1	64	65	51	34	131	103
Trinidad & Tobago	7870	1140	6900	5.6	0.3	5.2	66	68	34	26	107	94
Dominican Republic	8170	5908	1380	4.5	2.9	1.5	57	62	90	65	95	109
Haiti	1700	5300	320	3.7	1.8	1.9	49	54	143	110	53	69

Source: The World Bank, 1985.

Table 2. Summary of basic economic data for LDCs, 1982.

		Grenada	St. Vincent	St. Lucia	Dominica	Antigua	Montserrat	St. Kitts/Nevis
- GDP at factor cost '000	(EC\$ m)	298	173	312	159*	291	68	138
- Growth in GDP 1981-82	(%)	5.5	n.a.	5	12*	7.8	1.4	n.a.
- GDP per capita 1983	(US\$)	870	860	1,060	970	1,730	2,360	820
- Major component of GDP		Agriculture	Government	Government	Service	Transport	Service	Service
- GDP due to agriculture	(%)	32	17	14	26	7	5	20
- Recurrent budget	(EC\$ m)	81	69	133	63	120	24	62
- Capital budget	(EC\$ m)	136	28	59	119	n.a.	13	131
- Inflation 1981-82	(%)	7	8	5	n.a.	12	10	9
- Agric. GDP for export	(%)	60	80	60	29	9	10	50
- Agric. GDP for domestic consumption	(%)	40	20	40	71	91	90	50
- Value of exports	(EC\$ m)	50	70	112	66	26	7	61*
- Value of imports	(EC\$ m)	151	172	319	128	324	55	129*
- Exports as % of imports		33	41	35	52	8	13	47*
- Food imports '000	(EC\$ m)	42	58*	67	30	85	10	25*
- Food as % of all imports		28	37*	21	23	26	18	19*
- Exports as % GDP		17	40	36	39*	9	10	48*
- Imports as % GDP		51	99	102	81*	111	81	105*
- Food exports as % of total exports		83	72	48	51	3	3	70
- Population '000		106	113	124	74	77	12	45
- Crude increase	(%)	1.5	2.3	2.6	2.2	n.a.	0.8	1.5
- Increase net of migration	(%)	n.a.	1.7	n.a.	0	1.3	0	0
- Under 15 years old	(%)	n.a.	n.a.	< 50	50	31	30	n.a.
- Largest employer		Service	n.a.	Agriculture	Service	Service	Service	Agriculture
- Employment in agriculture	(%)	25	n.a.	43	23	9	10	33
- Total land area '000	(Ac)	85	96	152	193	69	25	65
- Land area farmed '000	(Ac)	22	34	72	35	17	2	14
- Number of cattle, sheep, and goats		21,740	21,8000	35,300	13,000	39,500	11,400	32,980
- Number of small farmers '000		5.6	7.8	10.4	5.2	5.0	0.8	3.5
- Typical farm size	(Ac)	< 5	< 4	< 5	< 5	1-2	< 1	< 5
- Number in household		5	6	6	6	> 6	5	5
- Income range	(EC\$)	< 5,000	< 5,000	< 5,000	2,500	< 5,000	72,500	2,500
- Ministry of Agriculture staff		n.a.	60	234	147	136	47	102
- Extension staff		n.a.	17	55	36	40	7	14
- MINAG recurrent budget	(EC\$ m)	3.0	n.a.	6.7	4.4	5.0	1.6	2.6
- Ditto as % National recurrent budget		3.7	n.a.	5.0	7.0	4.2	7.0	4.1

\* 1981 Data

Source: Soil and Water Consumption - Windward and Leeward Islands. (Basic Table) Report prepared for CARDI by Atkins Land Water Management 1983. United Nations, ECLAC, Agric. Statistics, Caribbean Countries, 1984.

Table 3. Employment in agriculture as a percentage of the total labor force.

	1970	1980
Antigua and Barbuda	10.6	...
Barbados	9.9	8.3
Belize	19.2	34.2
Dominica	22.9	27.3
Grenada	19.6	22.9
Guyana	13.2	16.8
Jamaica	15.8	26.5
Montserrat	11.5	12.0
St. Christopher and Nevis	20.4	25.2
St. Lucia	21.5	23.3
St. Vincent & the Grenadines	15.4	20.3
Trinidad & Tobago	7.1	8.4

Source: CARICOM.

Turning now to trade, the overall value of extra-regional exports of agricultural products is about EC\$900 million, or 10% of all exports. However, without Trinidad & Tobago, where agriculture's share of exports is only 2-3%, exports account for about 50% of foreign exchange earnings. This ranges from a high in Grenada (99%), Dominica (95%), Belize (80%), and St. Lucia (80%), to a low of Jamaica (15%) and Barbados (12%). In Barbados, the share of agricultural exports dropped sharply during the past five years, as a result of economic development in other sectors, including light industry.

In value terms, the leading agricultural exporters were Jamaica and Guyana, with export values of about EC\$250 million each, followed by Trinidad & Tobago (EC\$130 million) and Belize (EC\$125 million). Sugar and sugar products still account for 60% of exports of the region. Fruits and vegetables (mostly bananas) account for 17%; coffee, cocoa, and spices for 10%; and rum for 9%. The bulk of the sugar exports are in three countries: Jamaica, Guyana, and Belize. Banana exports in 1982 were about 145,000 MT, with St. Lucia accounting for approximately one-third of the total. Exports of nontraditional fruits and vegetables are rising, although still relatively small in volume. (See Tables 4, 5, 6, and 7.)

In view of extremely low world market prices for sugar (as low as 20 cents/lb) and poor future prospects, all of the countries are anxious to rationalize and diversify production from their sugar lands. Only access to protected markets with artificially high prices has kept their sugar earnings up.

With respect to imports, the region is traditionally a high food importer, with extra-regional food imports amounting to around EC\$2 billion. The import bill is dominated by livestock products (EC\$570 million) and cereals (EC\$440 million); the two categories accounting for 56% of all imports (cereal imports are mostly wheat). Fruit and vegetable imports run to about 10% (EC\$200 million), animal feed is 7% (EC\$150 million), while oilseeds, animal oils and fats, and vegetable oils and fats together account for 6% of imports (EC\$130 million). The region has a negative food balance of about EC\$1 billion.

Intraregional trade in agricultural products is now around EC\$200 million. Trinidad & Tobago is the largest CARICOM importer, accounting for about half of all intraregional trade. Forty percent of Trinidad & Tobago's CARICOM imports are rice, and 20% fruits and vegetables.

The prospects for the region's traditional exports are not favorable, with the exception of some tree crops, like coffee and cocoa. All countries are searching for nontraditional exports, such as fish, starchy roots, oilseeds, or fruits. For import substitution, gains have been made in recent years in fruits and vegetable production, poultry, grain legumes, copra, and fish. However, these still constitute a relatively small share of imports, in which livestock products and cereals predominate. Hence the importance of forage-based animal production and of grain legumes. Soya imports, for example, are currently running to 100 million. (See Tables 8, 9, and 10.)

In spite of the relative importance of agriculture in the CARICOM region, the performance of agricultural production is poor, and much of it is in a state of chronic decline. The worst trends are for the traditional export crops: since 1965, sugar exports have declined by 60% and banana exports by 50%. These negative trends have continued in recent years; since 1977, sugar output has dropped by 20% and banana production by 17%. But the general decline is virtually across the spectrum of all crops; total crop production has dropped by 28% during the past six years, rice by 59%, other cereals by 65%, spices by 44%, and coffee by 34%. The only increases were registered by grain legumes, up by 19% and by vegetables, up by 13%. There are, of course, considerable fluctuations in output due to weather and other factors, but all analysts agree that CARICOM agriculture is in poor condition. Not only is production for export chronically depressed, but food production is insufficient to keep up with population growth. (See Table 11).

The reasons for this state of affairs are complex. Adverse world markets and post-independence adjustment problems are clearly among the external factors. But here, perhaps more than anywhere else, agriculture is beset by fundamental structural problems, which together with technical and institutional weaknesses adversely affect the whole environment within which farming takes place. Land tenure and land distribution is a basic obstacle to development. Traditionally, land-holdings in the Caribbean area have taken the form of either very large estates involved in commercial, export-oriented agriculture, or very small farms which account for a small share of the total farmland. The estate sector is in serious decline, with many of the former plantations having been taken over by governments or quasi-governmental institutions. Estates may be technologically advanced, but they do not result in efficient land or

Table 4. Caribbean -- Volume of sugar exports ('000 tons).

	1977	1978	1979	1980	1981	1982	1983	1984
Antigua & Barbuda	-	-	-	-	-	-	-	-
Bahamas	-	-	-	-	-	-	-	-
Barbados	99.5	77.8	83.0	113.0	58.6	68.5	67.3	82.0
Belize	n.a.	111.6	91.6	97.2	90.4	98.1	109.1	150.0
Dominica	-	-	-	-	-	-	-	-
Grenada	-	-	-	-	-	-	-	-
Guyana	207.7	280.4	264.0	248.1	264.6	250.2	213.2	201.1
Jamaica	209.8	193.0	187.7	131.8	121.3	138.3	136.7	121.8
Montserrat	-	-	-	-	-	-	-	-
St. Kitts & Nevis	n.a.	36.3	36.8	31.5	28.9	31.5	25.3	28.0
St. Lucia	-	-	-	-	-	-	-	-
St. Vincent & the Grenadines	-	-	-	-	-	-	-	-
Trinidad & Tobago	141.7	102.9	88.1	64.0	67.1	41.2	50.8	52.5

Source: World Bank.

Table 5. Caribbean -- Value of sugar exports (US\$ millions).

	1977	1978	1979	1980	1981	1982	1983	1984
Antigua & Barbuda	-	-	-	-	-	-	-	-
Bahamas	-	-	-	-	-	-	-	-
Barbados	28.2	26.9	32.5	60.7	29.9	34.4	22.4	30.6
Belize	23.9	32.9	31.5	47.7	42.6	32.8	34.2	38.7
Dominica	-	-	-	-	-	-	-	-
Grenada	-	-	-	-	-	-	-	-
Guyana	72.8	92.0	90.4	120.8	108.8	87.7	69.3	58.8
Jamaica	63.4	59.5	56.9	54.7	46.5	49.3	57.3	45.7
Montserrat	-	-	-	-	-	-	-	-
St. Kitts & Nevis	9.4	11.8	11.3	14.4	14.7	11.1	10.0	11.6
St. Lucia	-	-	-	-	-	-	-	-
St. Vincent & the Grenadines	-	-	-	-	-	-	-	-
Trinidad & Tobago	34.8	22.4	35.2	28.0	27.1	21.9	23.4	25.1

Source: World Bank.

Table 6. Caribbean -- Volume of banana exports ('000 tons).

	1977	1978	1979	1980	1981	1982	1983	1984
Antigua & Barbuda	-	-	-	-	-	-	-	-
Bahamas	-	-	-	-	-	-	-	-
Barbados	-	-	-	-	-	-	-	-
Belize	10.4	9.9	16.0	15.0	10.5	10.0	10.1	n.a.
Dominica	30.4	37.0	16.0	8.1	27.1	27.5	29.3	-
Grenada	14.0	14.2	14.6	12.9	10.6	10.6	9.8	9.9
Guyana	-	-	-	-	-	-	-	-
Jamaica	74.9	72.7	63.9	33.1	18.1	21.2	23.0	10.8
Montserrat	-	-	-	-	-	-	-	-
St. Kitts & Nevis	-	-	-	-	-	-	-	-
St. Lucia	41.4	47.8	48.2	32.8	42.9	41.7	53.3	69.2
St. Vincent & the Grenadines	26.2	31.0	22.3	18.8	29.8	25.0	27.3	-
Trinidad & Tobago	-	-	-	-	-	-	-	-

Source: World Bank.

Table 7. Caribbean -- Value of banana exports (US\$ millions).

	1977	1978	1979	1980	1981	1982	1983	1984
Antigua & Barbuda	-	-	-	-	-	-	-	-
Bahamas	-	-	-	-	-	-	-	-
Barbados	-	-	-	-	-	-	-	-
Belize	1.5	1.7	3.4	3.5	2.2	2.1	2.4	2.5
Dominica	6.9	9.2	4.4	3.0	9.1	10.0	11.2	-
Grenada	3.2	3.4	3.7	4.1	3.7	3.4	3.2	3.0
Guyana	-	-	-	-	-	-	-	-
Jamaica	13.9	17.3	18.2	9.2	4.3	4.7	6.8	2.5
Montserrat	-	-	-	-	-	-	-	-
St. Kitts & Nevis	-	-	-	-	-	-	-	-
St. Lucia	9.5	12.1	13.5	10.5	14.7	15.6	20.8	25.4
St. Vincent & the Grenadines	5.6	7.3	5.9	6.3	10.1	9.0	9.7	-
Trinidad & Tobago	-	-	-	-	-	-	-	-

Source: World Bank.

Table 8. Imports of selected commodities -- CDCC countries (1982).

	Onions		Legumes		Meat and Meat Products				Dairy Products <sup>1)</sup>		
	Volume	Value	Volume	Value	Meat Fresh, etc.		Processed		Canned, etc.		
	MT	US\$'000	MT	US\$'000	MT	US\$'000	MT	US\$'000	MT	US\$'000	
Antigua and Barbuda	240	150	65	84	1,292	2,130	165	510	150	420	1,252
Bahamas	350	130	200	200	5,970	13,870	1,050	2,520	1,600	4,700	5,050
Barbados	1,733	602	1,300	1,000	6,619	11,463	1,940	2,848	1,070	2,481	1,441
Belize	861	678	205	206	586	605	588	822	756	1,764	5,986
Cuba	8,023	1,689	119,176	54,557	22,755	30,266	n.a.	n.a.	47,197	89,143	41,915
Dominica	120	52	220	180	1,275	1,507	10	40	230	405	1,300
Dominican Republic	4	38	84	15	10,425	11,443	455	362	14	18	7,238
Grenada	268	137	162	108	2,207	1,875	249	564	205	439	2,515
Guyana	-	-	3,635	2,428	20	20	n.a.	n.a.	4	10	8,048
Haiti	n.a.	n.a.	600	360	800	1,250	n.a.	n.a.	160	425	12,180
Jamaica	1,100	440	500	450	32,150	19,300	910	1,155	5,710	16,290	13,000
Montserrat	60	31	n.a.	n.a.	382	461	30	62	41	120	449
Netherlands Antilles	1,300	600	400	440	17,050	32,950	920	2,250	2,600	7,000	14,300
St. Christopher/Nevis	190	95	90	80	1,105	1,140	195	310	95	250	992
St. Lucia	428	210	445	499	4,202	4,799	226	464	285	763	2,256
St. Vincent + the Grenadines	242	107	192	157	510	1,225	16	62	312	789	839
Surinam	2,000	800	3,700	1,800	441	460	1,000	1,700	1,000	1,200	1,650
Trinidad & Tobago	6,598	2,798	12,078	8,336	15,246	38,036	2,922	4,431	2,878	7,742	34,381
<b>TOTALS</b>	<b>23,517</b>	<b>8,557</b>	<b>142,052</b>	<b>70,900</b>	<b>123,035</b>	<b>172,800</b>	<b>10,776</b>	<b>18,100</b>	<b>64,307</b>	<b>133,959</b>	<b>154,792</b>

1) Refers to milk and cream only.

Source: FAO Trade Yearbook 1983. Data for 1982 imports.

Table 9. Three-year average sugar production for periods 10 years apart in some Caribbean sugar-producing countries.

Country	Production, thousands m.t. (3-year average)			Principal operator of industry	Principal operator of sugar research
	1959-61	1969-71	1979-81		
Cuba	6,198	6,348	7,510	Government	Government + University
Dominican Republic	931	1,011	1,107	Government + Private	Government + Private
Haiti	59	64	58	Private	Private
Puerto Rico	971	379	171 <sup>1</sup>	Government	Government + Private
US Virgin Islands	11	0	0	-	-
Jamaica	420	391	244	Government* + Private	Government*
Leeward + Windward Islands	84	36	37	Government*	Government*
Barbados	168	148	116	Private	Government* + Private
Trinidad	218	230	117	Government*	Government*
Guyana	319	372	307	Government*	Government*
French Antilles	246	182	114 <sup>1</sup>	Private	Private
Belize	21 <sup>2</sup>	64	106	Private	Private
Mexico	1,509 <sup>2</sup>	2,485	2,819	Government + Private	Government
Guatemala	78 <sup>2</sup>	188	447	Private	Private
El Salvador	51 <sup>2</sup>	128	224	Private(?)	Private(?)
Honduras	22 <sup>2</sup>	59	176	Private	Private
Nicaragua	64 <sup>2</sup>	153	202	Private + Government	Government + Private
Costa Rica	65 <sup>2</sup>	153	205	Private	Government + Private
Panama	27 <sup>2</sup>	77	204	Private + Government	Private + Government
Venezuela	219 <sup>2</sup>	454	336	Government+ Private	Government + Private

<sup>1</sup> Excluding 1981

<sup>2</sup> Excluding 1959

\* In anglophone industries, government generally operates through an autonomous corporation or board with research attached to a ministry of agriculture or by a specialist research institute. Hence, governments do not directly subscribe to the W.I. Central Sugar Cane Breeding Station.

Source: D.I.T. Walker, West Indian Sugar Cane Breeding Station.

Table 10. Rice area, production, and yield for the producing countries of the Caribbean region. (Averages for period 1969-1971 and for 1979-1981).

Country	1969-1971			1979-1981			Yield Change %
	Area x 10 <sup>3</sup> ha	Production x 10 <sup>3</sup> t	Yield t/ha	Area x 10 <sup>3</sup> ha	Production x 10 <sup>3</sup> t	Yield t/ha	
<b>Caribbean</b>	437	939	2.15	486	1543	3.17	47.44
Cuba	164	309	1.88	151	474	3.14	67.02
Dominican Republic	80	206	2.58	110	402	3.65	41.47
Haiti	38	81	2.13	51	101	1.98	(7.00)
Jamaica	-	1	-	1	2	2.00	-
Trinidad & Tobago	4	10	2.50	9	25	2.78	11.20
Belize	2	4	2.00	4	9	2.25	12.50
Guyana	109	195	1.79	96	282	2.94	64.25
Surinam	37	131	3.54	61	246	4.03	13.84

Source: FAO Statistical Data, Production Year Books.

Table 11. CARICOM production (Food crops) tonnes.

	1977	1978	1979	1980	1981	1982	1983	% Change 1977-1983
Bananas	250,061	276,260	245,781	165,659	-	215,882	208,907	- 16.8
Other starchy food	367,503	436,752	391,663	322,221	-	297,685	324,572	- 11.6
Grain legumes	12,004	16,353	13,747	13,933	-	13,322	14,343	+ 19.2
Rice	376,701	322,470	256,160	102,324	-	190,134	156,929	- 58.5
Other cereals	52,971	52,328	43,794	46,688	-	20,903	19,155	- 65
Fruit and vegetables	148,096	169,468	147,525	149,690	-	145,959	165,761	+ 12.8
Citrus	150,966	174,571	140,718	193,517	-	130,320	124,203	- 17.8
Copra	20,505	24,882	22,910	20,858	11,920	16,394	17,759	- 15
Spices/condiments	16,195	21,126	16,799	12,119	-	9,385	8,935	- 43.6
Cocoa	10,444	10,893	9,193	9,778	-	11,166	10,624	- 0
Coffee	5,001	6,411	7,403	5,500	-	3,538	3,341	- 34
Arrowroot	-	-	-	-	-	955	1,001	- 0
Total crops	1,410,447	1,511,514	1,295,693	1,242,287	-	1,055,523	1,020,816	- 27.6
Sugar (raw)	950,200	1,016,900	957,000	874,300	811,700	820,480	760,000	- 20.0

Source: CARICOM, 1985.

labor use. They typically cultivate only one crop on their most suitable sections, which may result in high yields on actually cultivated acreage, but low output per land area owned or controlled. Land which has become marginal for the main crop is often abandoned. Monoculture is suitable for large-scale weeding, plant protection, etc., but it creates serious inefficiencies of labor use. Paradoxically, in the Caribbean there is simultaneous underemployment and shortage of farm labor. There is a strong stigma attached to plantation work, and a small section of the labor force has very high wage alternatives outside of agriculture. Commercial agriculture, burdened with a high wage structure and unreliable supply of labor, is constantly searching for labor-saving mechanization. The availability of subsidized land clearing and other machine services has also stimulated the substitution of capital for labor. Low (and in some cases zero) rent and taxes on land have encouraged larger farmers to substitute land (not always of good quality) for labor and other inputs, especially due to the high cost of fertilizers and chemicals. Agro-processing equipment tends to be old and inefficient.

The vast majority of the smallholders practice subsistence or semi-subsistence mixed agriculture. Relatively large amounts of family labor is applied to very small land areas in which a variety of crops and animals are raised. Yields are low, quality is poor, losses are high. Nonetheless, small farmers are the mainstay of the Caribbean food supply, and in recent years, smallholders have gradually moved into the production of commercially marketed, even export-oriented crops, like bananas, coffee, spices, and cocoa. A growing share of the domestic fruit and vegetable market is supplied by small farms, especially in the vicinity of, or easy access to, urban centers. Yet, the proportion of what one could call family farmers is still very low. Most of the region's 260,000 farm households farming less than 4 ha are part-time agriculturists whose family income depends in varying proportions on wage labor. Part-time farming means poor agronomic practices, a larger (and unrecognized) reliance on farm women, and a challenge to new technologies in demonstrating earnings competitive with alternative labor opportunities. Sixty percent of the small farms in the CARICOM region are in Jamaica, and 15% are in the small Eastern Caribbean islands. In these countries, the situation is made worse by the fact that an individual's land is frequently fragmented into several parcels by inheritance customs.

The legacy of slavery and of the limited opportunities for individual advancement under post-emancipation plantation agriculture, has generally instilled in most of the Caribbean population strong negative attitudes towards agricultural pursuits. High rates of literacy also contribute to such attitudes, as educational systems are strongly biased in favor of urban values. The average age of farmers is between 40 and 50 years. Few younger people are attracted into agriculture.

To help rationalize intraregional trade, and to reduce rapidly rising regional food imports, the Caribbean Free Trade Association (CARIFTA) countries signed an Agricultural Marketing Protocol (AMP) in the late 1960s covering 22 products. The CARIFTA (later CARICOM) Secretariat was to coordinate intraregional trade by collecting and disseminating data on the anticipated export surpluses and import requirements of each country and by providing for guaranteed prices to farmers. The AMP has not

worked particularly well. Countries have been more willing to declare export surpluses than import requirements, and recent intraregional trade restrictions imposed by economically troubled Jamaica have further hindered Caribbean integration. Price policies have been too rigid, not taking sufficient cognizance of seasonal fluctuations. Because export surpluses cannot be easily marketed, seasonal gluts, alternating with serious shortages during the dry season, continue to plague Caribbean agriculture, thus discouraging increased output of the commodities so affected. The Guaranteed Marketing Scheme, under which the more developed countries (MDCs) in CARICOM agreed to take fixed quantities of a few commodities from specific LDCs at negotiated prices has functioned a little better. On the other hand, the Oils and Fats Agreement (OFA) has been fairly successful in stimulating intraregional trade in products derived from coconuts. The agricultural and agro-industrial activities of the oils and fats sector taken together represents an estimated 5% of the regional GDP, and trade within the region is greater than imports from the outside. The main suppliers of oils and fats products are Dominica, St. Lucia, and St. Vincent. Intraregional trade is almost exclusively in coconut products, while extra-regional imports are mostly in soybean and other vegetable oils, hydrogenated fats, and oils and lard.

Another CARICOM initiative was the Regional Food Plan (RFP), designed to reduce the region's rapidly rising food import bill. Components of the RFP were to be: (1) a regional livestock program for fresh milk, beef, mutton and lamb, eggs, etc.; (2) food production projects through the Caribbean Food Corporation (CFC); and (3) increased supply of agricultural inputs, chemicals, fertilizer, seed. While some specific national projects did get under way, the RFP has remained mainly in the form of a series of studies and proposals. However, there is a considerable information base for setting regional agricultural priorities with ideas about comparative advantage and investment needs at various sites within CARICOM. Most recently, CARICOM has adopted the Regional Food and Nutrition Strategy (RFNS) -- see Annex 1 -- launched in 1983. RFNS is a regional planning model framework, which aims at providing information on the relative costs and benefits accruing to the region if it chooses, for example, to pursue a policy of maximizing foreign exchange savings as an alternative to one that pursues maximization of total employment. It purports to give quantitative notions about the respective trade-offs among the various policy/development objectives and therefore suggest production patterns which satisfy demand and nutritional criteria. The RFNS, if taken seriously, can have a great impact to stimulate a more coherent regional research effort and definitely points to the need to rationalize and coordinate the activities of the various national and international research programs.

## 2.2 Agricultural Technology Issues and Research Areas

It is clear that agricultural development in the CARICOM region faces formidable obstacles. In general, there are poor prospects for the main traditional export commodities; the region has a low competitive position in world markets and the preferentially subsidized markets are a shaky basis for long-term strategies. The region is a high-cost producer of most foodstuffs and, with some exceptions, offers a poor resource base

for achieving a massive increase in output. There are no visible alternatives for sugar and there appear to be no major lines of agriculture which promise across-the-board improvements or break-throughs of the "green revolution" type, even if the political commitment and a large technological push were forthcoming. Thus, the first rather gloomy point that needs to be made is that in the foreseeable future the region will have to contend with a second-best technological strategy.

Nonetheless, recognizing the vast array of external and internal limitations, there are good technical opportunities for agricultural development in some geographic areas and in some commodities. Belize and Guyana have very large unexploited land and water resources for the production of rice, grains, legumes, and pasture grasses on a large scale. Jamaica and Trinidad & Tobago have relatively large populations, but also considerable natural resources. While they have certain limitations of slope, fertility, and rainfall, there is scope for diversified production, especially on areas formerly occupied by sugar. All the countries, but especially the Eastern Caribbean islands, have a large potential for tree crops of various kinds suitable to high-rainfall areas on sloping land. These crops are also suitable to small farming and labor-intensive methods, promising relatively high returns. Some resources and technologies also exist for selected legumes and oilseeds, as well as for root crops. Livestock and dairy potential exist almost everywhere in the region, especially to satisfy local demand. All of this potential could be more rationally and speedily developed if economic integration in the CARICOM region proceeded at a faster pace.

This leads to the third point: technological strategy will have to be increasingly market-led, and therefore must be very selective. Experience has shown that investments in research and development do not pay off unless there is a clearly identified external or domestic demand. Recognition of this means, among other things, that there is: (1) high value in market research, especially for identifying, expanding, or creating effective demand; (2) high priority for research and development where output is seriously lagging behind existing market opportunities, such as presently exists in bananas and coffee in Jamaica and the Eastern Caribbean, coconut in a number of countries, or rice in Guyana. Protectionist policies and subsidies only make sense if the gap between domestic production costs and the costs of imports is not too wide (as can be seen in Belize and Jamaica).

Fourth, research strategy in the Caribbean should be oriented towards profitability and income, rather than yields -- a principle expressed in various forums repeatedly, but very little has followed.

Fifth, there must be a much better identification and definition of the target population for agricultural research and extension. This is especially relevant to the current efforts of CARDI to benefit small- and medium-sized producers. When commodity-based farmer's organizations exist (banana, coffee, rice growers' associations), the commercially or market-oriented cultivators are more easily identified, and indeed reachable. When, however, this is not the case, the research/extension systems tend to work either with a few generally privileged farmers (Barbados) or tend to benefit large heterogeneous masses of small operators, most of whom are subsistence and part-time agriculturists

(Eastern Caribbean islands). What should be done is to identify a group of potential clients whose land resources, labor, and market involvement (not to speak of entrepreneurial motivation) is suitable to the intended technological change. One need go no further than a recent report<sup>1)</sup> in which it was concluded that of the almost 13,000 farm households in Barbados, less than 400 could be considered "current and potential clientele for agricultural research and extension." The report wrote off the several thousand small sugar producers who presently deliver cane to the mills and who are prime targets for any diversification effort.

The sixth point is that in spite of the existence of CARDI and other international research organizations, there are no effective agricultural research networks in the Caribbean, which could achieve a sensible division of labor, minimize the disadvantage of smallness and distance, and systematically diffuse expertise, material, and information. There are exceptions in sugar breeding and bananas (as will be discussed below), but it is rather surprising that technology generation, testing, and diffusion is still operated mainly on a country-by-country and highly fragmented basis in this region.

At the national level, while some visible progress has been made in the past decade, the research systems of the various countries still exhibit fundamental weaknesses of quality, field effectiveness, and stability.

As will be described later, there is considerable variation among countries, but even in the MDCs, where staffs and facilities are larger, the performance of the national research establishments, especially in the public sector, leave much to be desired.<sup>2)</sup> Most countries are heavily supported by outside agencies in staff and funding (curiously, CARDI is generally perceived as an "outside" agency as well) but there is very little systematic institution-building.

The eighth and final point in this review of technology issues is that, with some exceptions, research and extension are operating on separate tracks; often they are divorced from one another. The Caribbean is not unique in this respect, but without an effective and well-integrated extension system, there is little hope that even the best technologies will be diffused, and conversely, that the farmers' real problems will be fed back into the research process.

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- 1) Jacobsen, Eytan. The Organizational Structure & Functions of the Ministry of Agriculture, Food and Consumer Affairs (Barbados). Bridgetown. March 1985.
  - 2) The ISNAR Mission had neither the time nor the mandate to assess the quality of national research systems, except insofar as CARDI was directly involved. However, information conveyed to Mission members from many sources points to their lack of strength. Weakness has been exacerbated by recent drastic curtailment of public-sector budgets (Jamaica) and by accelerated brain-drain (Guyana).

Based on extensive consultation and analysis, the Mission's view of regional research priorities by commodity groups and cross-cutting subject-matter areas are given below. The order in which they are listed indicates a rough measure of emphasis. Possible research priorities for CARDI itself are discussed in a later section of this report.

A. <u>Commodity Groups</u>	<u>Importance for:</u>			Small-Farm Income & Employment
	Exports	Import Substitution	Food & Nutrition	
1. Sugar	x			
a) Sugar byproducts		x		
2. Bananas	x			x
3. Pasture & livestock		x	x	x
a) Special attention on local raw materials for nonruminant feed		x	x	x
4. Selected tree crops				
a) coffee	x			x
b) cocoa	x			x
c) coconut	x			x
d) citrus			x	x
5. Oilseeds, food legumes		x	x	
6. Rice		x	x	
7. Starchy roots, yams, sweet potatoes, aroids			x	x
8. Selected vegetables		x	x	x

B. Cross-cutting Subject-Matter Areas

1. Plant protection.
2. Germ plasm, seeds.
3. Farming systems (including intercropping and rotations).
4. Marketing and demand promotion.
5. Food technology, processing.
6. Soil and water management.

The Mission is aware that details of some key regional research needs were discussed in a recent Workshop on Agricultural Research Policy and Management, organized by the United Nations (ECLAC) and held in Port-of-Spain, Trinidad, in September 1983, and that CARICOM has also identified a number of research areas which should receive attention under the Regional Food and Nutrition Strategy (RFNS) which was adopted by the member governments of CARICOM in 1982.

### 2.3 A Rapid Review of the Agricultural Research System in the Region

The main focus of the Mission's assessments and the bulk of this report deals with the research work of CARDI, which is clearly predominant regionally. It is, however, necessary to place CARDI within the context of other research conducted and sponsored by other organizations throughout the CARICOM countries.

While in recent years the international centers, especially CIAT, CIMMYT, and CIP, have become increasingly active in the Caribbean Basin, the multinational approach and networking in agricultural research is still in its infancy. As will be seen in subsequent portions of the Mission's report, CARDI plays an important role in the Leeward and Windward Islands, and in Belize, specific but lesser roles in the larger MDCs, a very limited role in overall region-wide research servicing, exchanges of materials and information, but relatively little in regional research coordination. Besides CARDI, there are only three institutions which can be said to have a truly regional scope: the West Indian Cane Breeding Station (WICBS) located in Barbados, the Windward Islands Banana Growers' Association (WINBAN) located in St. Lucia, and the University of the West Indies Faculty of Agriculture (UWI) within the education sector at St. Augustine in Trinidad. (See Table 12.)

The Cane Breeding Station, financed by the Sugar Association of the Caribbean, is a small, very high-quality center. Its clientele goes much beyond the anglophone Caribbean. It concentrates on crossing, variety selection, and quarantine, and maintains a large germ plasm collection and regional data to help formulate breeding plans. The staff fluctuates between two to five scientists, an equal number of technical assistants, a field manager, secretary, and 12-16 field-workers. The station has 16 ha of land, a simple laboratory, hybridization house, packing room, and library. WICBS shows what a highly focused and in-depth research network can do on a very modest budget. One of the keys for its success is client financing for services rendered which have economic value.

WINBAN, which has commercial, marketing, and financial functions in the banana industry operates a well-respected research and development program. The program is comprehensive, in that it includes soil and leaf analysis (through a chemistry laboratory which also serves other clients), fertilizer and herbicide testing, leaf spot, nematode, and borer control, and a cropping systems project. WINBAN also engages in fruit quality research and serves as a communication center among its clients, as well as with other regional and international institutions. WINBAN is a founding member of the Association for Collaboration in Banana Research in the Caribbean and Tropical America (ACORBAT). ACORBAT has been interested in affiliating in some way with an existing international organization. WINBAN staff consists of 11 scientists (6 Ph.D. and 5 at the M.Sc. level) and 10 B.Sc. graduates. There is supporting staff of 16, half of whom have diplomas. The annual budget is around EC\$4 million.

The Faculty of Agriculture of the University of the West Indies (UWI) is mainly a teaching institution, but it does engage in research as well. The faculty has over 40 staff members, mostly at the Ph.D. level. Six positions are in agricultural economics, 16 in biological sciences, six

Table 12. Agricultural Research and Development Institutions and Agencies in the CARICOM Region.

	REGIONAL		NATIONAL	
	Public Funds	Private Funds	Public Funds	Private Funds
Multicommodity	UWI-FOA		MINAG-Barbados	
Multidisciplinary	CARDI CARDATS CARICOM CDB IICA CDCC CSTCC		MINAG-Guyana-Nari MINAG-Jamaica-Nari CES-T&T CARIRI-T&T	
Single-commodity	UWI-CORU	UWI-CORU	CSGRS-T&T	SIRI-Jamaica
Multidisciplinary	WINBAN	WINBAN	GRB-Guyana GUYSUCO-Guyana	BBRS-Jamaica CIBRS-Jamaica LDC-Guyana
Monodisciplinary		WICCBS		SPAU-Barbados BBRU-Jamaica

BRS	=	Banana Board Research Station	GRB	=	Guyana Rice Board
BRU	=	Banana Breeding Research Unit	GUYSUCO	=	Guyana Sugar Corporation
CARDATS	=	Caribbean Rural Development & Technical Services	LDC	=	Livestock Development Corporation
CARDI	=	Caribbean Agricultural Research and Development Institute	MINAG	=	Ministry of Agriculture
CARIRI	=	Caribbean Industrial Research Institute	SIRI	=	Sugar Industry Research Institute
CERS	=	Coconut Industry Board Research Station	SPAU	=	Sugar Producers Agronomy Unit
CES	=	Central Experiment Station	UWI-CORU	=	UWI Cocoa Research Unit
CSGRS	=	Caroni Sugarcane Research Station	UWI-FOA	=	UWI Faculty of Agriculture
			WICCBS	=	West Indies Central Cane Breeding Station

Source: Wilson, L.A.

in crop science, four in livestock science, eight in soils, and three in extension. There are nine formal research programs, most of them on a modest scale. The most important one is in grain legumes, which concentrates on pigeon peas. The Faculty has solicited a number of small research grants; the largest recent one is from the government of Trinidad & Tobago for TT\$2 million over a two-year period. Regionally, the most significant research at UWI is centered in the Cocoa Research Unit (CORU) which operates in close relationship with the Trinidad and Tobago Ministry of Agriculture's Cocoa Research Department. The CORU has four professional staff, with one occasionally located in Jamaica. External funding is from the Cocoa, Chocolate and Confectionery Alliance (CCCA) of the United Kingdom and from the European Development Fund (EDF). The EDF project is specifically to consolidate the germ plasm collection into a single site at a new field station. Financial assistance is also received from the government of Trinidad & Tobago and from CCCA. However, resources of CRU for laboratory and field facilities (not to mention outreach) are deemed to be minimal. The Ministry's Cocoa Research Department is headed by an agronomist/breeder and obtains services from the Central Experiment Station. (While cocoa is reputedly grown in Trinidad & Tobago over 54,000 ha, production in recent years has not exceeded 3,000 MT.)

It is important to note that in recent years there has been a heavy influx into CARICOM countries of technical assistance personnel (and some associated funding for equipment) from regional and international agencies, as well as from bilateral donors who provide human resources for research-related activities generally on a short- to medium-term basis. The most valuable portion of such assistance is in the form of resident advisers, with multi-year contracts, but there are many more short-term technical assistance specialists. To the extent that the number of well-trained Caribbeans grows, expatriate help is less needed. CARDI has been particularly successful in employing, retaining, and distributing Caribbean scientists within the region. It is therefore somewhat ironic that CARDI now has to compete with extra-regional organizations for technical assistance funds.

Turning now to the national agricultural research systems (NARS), they are a combination of public governmental bodies, generally parts of ministries of agriculture, some quasi-governmental or parastatal organizations, and privately sponsored, generally commodity-specific institutions.

In the following pages, an attempt is made to list in a summary chart form, country-by-country, the main agricultural commodities, the key problems and potentials, the principal lines of agricultural strategy, and the characteristics of the NARS in order to assist in setting the research background against which CARDI operates. (See Tables 13 to 24.)

Table 13. LEEWARD -- Antigua.

Commodities	Problems/Potential	Strategy	NARS
<ul style="list-style-type: none"> <li>▪ Sugar was historically dominant until 1960s, dropped now from 9,000 ha to about 400 ha</li> </ul>	<ul style="list-style-type: none"> <li>▪ Sugar decline has created an unfilled void. Sugar rehabilitation started in 1979</li> </ul>	<ul style="list-style-type: none"> <li>▪ In sugar aim is to get up to 1,000 ha to satisfy local demand</li> <li>▪ Interested in grazing on old sugar lands</li> </ul>	<ul style="list-style-type: none"> <li>▪ MINAG has recurrent budget of EC\$5.0 million</li> <li>▪ CARDI has major role</li> </ul>
<ul style="list-style-type: none"> <li>▪ Cotton also dropped from 1,000 ha to 20 ha</li> </ul>	<ul style="list-style-type: none"> <li>▪ Constraints include marketing system</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential exists in                             <ul style="list-style-type: none"> <li>- tree crops</li> <li>- out-of-season vegetables</li> <li>- pulses</li> <li>- roots + tubers</li> <li>- pineapple + other fruits</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Extension staff is about 40</li> </ul>
<ul style="list-style-type: none"> <li>▪ Now about 800 ha cash crops (all)                             <ul style="list-style-type: none"> <li>- sweet potatoes</li> <li>- tomatoes</li> <li>- cucumbers</li> <li>- carrots</li> <li>- pineapple has expanded recently to about 40 ha. Now citrus and coconuts have some importance</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Weak extension</li> <li>▪ Crop losses from livestock grazing</li> <li>▪ Land tenure (leases)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Most plans are for domestic consumption or shipment to other eastern Caribbean islands</li> </ul>	
<ul style="list-style-type: none"> <li>▪ Sheep and goat population has grown rapidly</li> </ul>			

Table 14. LEEWARD -- Montserrat.

Commodities	Problems/Potential	Strategy	NARS
<ul style="list-style-type: none"> <li>* Smallest of islands; population is only 12,000</li> <li>* Acreages are very modest</li> <li>* Agriculture is only 7% GDP</li> <li>* Fruits and vegetable tubers</li> <li>* Sea island cotton</li> <li>* Few bananas</li> </ul>	<ul style="list-style-type: none"> <li>* Semiarid very small island</li> <li>* Virtually all farming is for local consumption</li> <li>* Support services for agriculture</li> </ul>	<ul style="list-style-type: none"> <li>* Agricultural rehabilitation</li> <li>* Project aims at establishing 600 ha tree crops, mainly mangoes, guava</li> <li>* 800 ha livestock</li> <li>* Expansion of vegetable production</li> <li>* Irrigation -- CDB</li> <li>* USAID assistance</li> </ul>	<ul style="list-style-type: none"> <li>* CARDI has major role</li> <li>* Very modest facilities</li> <li>* MINAG has 47 staff, 7 in extension</li> <li>* Recurrent budget is EC\$1.6 million</li> </ul>

Table 15. LEEWARD -- St. Kitts/Nevis.

Commodities	Problems/Potential	Strategy	NARS
<ul style="list-style-type: none"> <li>* Second smallest territory; population is 45,000</li> <li>* Sugar is dominant, accounts for 12-15% of GDP and is large employer (3,000)</li> </ul>	<ul style="list-style-type: none"> <li>* Land titles are insecure</li> <li>* Government purchased sugar estates</li> <li>* Very high-cost producer</li> <li>* Soil erosion is severe on both islands</li> <li>* Overgrazing is an issue</li> <li>* Sugar could release 800-1,200 ha for other crops</li> </ul>	<ul style="list-style-type: none"> <li>* According to a recent land use study, potential exists in:               <ul style="list-style-type: none"> <li>- tomatoes</li> <li>- carrots</li> <li>- cabbages</li> <li>- eggplants</li> <li>- citrus</li> </ul> </li> <li>* Experience exists in:               <ul style="list-style-type: none"> <li>- peanuts</li> <li>- cotton</li> </ul> </li> <li>* Livestock could be larger and more rational</li> <li>* Sugar residues not used</li> </ul>	<ul style="list-style-type: none"> <li>* CARDI has major role</li> <li>* MINAG recurrent budget EC\$2.6 million</li> <li>* Extension staff is about 14</li> </ul>

Table 16. WINDWARD -- Dominica.

Main Commodities	Problems/Potential	Agricultural Strategy	NARS
<ul style="list-style-type: none"> <li>* Bananas -- largest crop 25-30% of all agricultural land under cultivation. Employs 2 farm labor</li> <li>* Citrus - 7% production</li> <li>* Coconuts - 1,600 ha - 2,000 growers</li> </ul>	<ul style="list-style-type: none"> <li>* Insecure land tenure</li> <li>* Marketing constraints</li> <li>* Bananas suffer from leaf spot</li> <li>* Hurricanes frequent</li> </ul>	<ul style="list-style-type: none"> <li>* Rehabilitate banana, coconut, citrus after recent hurricane</li> <li>* Develop new exports with UK financing, probably: coffee, cocoa, mangoes, passion fruit, avocados</li> <li>* Cut food imports, (now running to 30% foreign exchange earnings)</li> </ul>	<ul style="list-style-type: none"> <li>* CARDI has major role</li> <li>* Extension upgrading underway with assistance from various sources: FAO, France, USAID</li> </ul>

Table 17. WINDWARD -- Grenada.

Main Commodities	Problems/Potential	Agricultural Strategy	NARS
<ul style="list-style-type: none"> <li>* Traditional export crops have declined:               <ol style="list-style-type: none"> <li>1. cocoa</li> <li>2. bananas</li> <li>3. nutmeg &amp; mace</li> </ol>               Mostly grown together in mixed stand. Account for about <math>\frac{1}{2}</math> agricultural land, approximately 3,600 ha             </li> <li>* Fresh fruits now more important: citrus, avocados, mangoes, breadfruit, plantains</li> </ul>	<ul style="list-style-type: none"> <li>* Nutmeg demand weak, high fat content is problem. Prices have dropped by 40%</li> <li>* Mace prices are OK</li> <li>* Trees are average</li> <li>* Not much level land for food crops</li> <li>* Food imports are <math>\frac{1}{2}</math> of all imports -- US\$14-15 million</li> </ul>	<ul style="list-style-type: none"> <li>* Diversification is major goal, higher priority for agriculture in general</li> <li>* CIDA-financed cocoa rehabilitation project, target is 4,000 ha</li> <li>* Reduction of food imports is also important, but difficult. World Bank will finance Agricultural Rehabilitation and Crop Diversification Project at US\$5 million. CDB will provide farm credit</li> </ul>	<ul style="list-style-type: none"> <li>* CARDI has major role</li> <li>* World Bank project includes institutional strengthening</li> <li>* MINAG reassessment agricultural budget EC\$3 million</li> </ul>

Table 18. WINDWARD -- St. Lucia.

Commodities	Problems/Potential	Strategy	NARS
<ul style="list-style-type: none"> <li>▪ Bananas are first, about 7,000 growers, large &amp; small</li> <li>▪ Coconuts</li> <li>▪ Some fruits + root crops exported</li> <li>▪ Some acreage of cocoa</li> </ul>	<ul style="list-style-type: none"> <li>▪ Land title insecurity is a major problem</li> <li>▪ Hurricane damage serious</li> <li>▪ Marketing</li> <li>▪ Feeder roads needed</li> </ul>	<ul style="list-style-type: none"> <li>▪ Rehabilitation of tree crop exports</li> <li>▪ CDB loan for bananas</li> <li>▪ Limited expansion of non-trad.</li> <li>▪ Limited import-substitution, especially for tourist trade</li> <li>▪ Strengthening nutrition</li> </ul>	<ul style="list-style-type: none"> <li>▪ CARDI has major role</li> <li>▪ Site of WINBAN</li> <li>▪ Also St. Lucia Banana Growers' Association</li> <li>▪ Rel. large extension staff (55)</li> <li>▪ MINAG recurrent budget EC\$6.7 million</li> </ul>

Table 19. WINDWARD -- St. Vincent

Commodities	Problems/Potential	Strategy	NARS
<ul style="list-style-type: none"> <li>▪ Crops are geared to export</li> <li>▪ Bananas -- around 30,000 MT UK market</li> <li>▪ Arrowroot is now suffering from price, marketing problems</li> <li>▪ Sweet potatoes</li> <li>▪ Spices</li> <li>▪ Vegetables (carrots)</li> <li>▪ Yams, aroids</li> <li>▪ Coconuts</li> <li>▪ Livestock</li> </ul>	<ul style="list-style-type: none"> <li>▪ Banana production has a greater potential</li> <li>▪ Arrowroot faces competition, price declines</li> <li>▪ Roots, tubers have Trinidad market access</li> <li>▪ Sugar reintroduced in 1980</li> </ul>	<ul style="list-style-type: none"> <li>▪ Banana upgrading</li> <li>▪ Cut food imports (now running about US\$20 million, about 35% of all imports)</li> <li>▪ Livestock potential is deemed considerable</li> </ul>	<ul style="list-style-type: none"> <li>▪ St. Vincent Banana Growers Association</li> <li>▪ Arrowroot Industry Association</li> <li>▪ Very small Ministry staff</li> </ul>

Table 20. Belize.

Main Commodities	Problems/Potential	Agricultural Strategy	NARS
<ul style="list-style-type: none"> <li>* Sugar dominant with 25,000 ha followed by               <ul style="list-style-type: none"> <li>- corn</li> <li>- rice</li> <li>- citrus</li> <li>- pulses/beans</li> </ul> </li> <li>* Cocoa expanding rapidly</li> <li>* Highest ratio of arable land per capita</li> <li>* Many small/medium-sized farmers</li> <li>* Agricultural sector employs 43% work force, generates 4 GDP</li> <li>* Agricultural exports are 50% agricultural, 70% of all agricultural production is exported</li> </ul>	<ul style="list-style-type: none"> <li>* Excellent man/land ratio -- expansion potential is great</li> <li>* 0.9 m ha available for crop + pasture, only 15% directly used</li> <li>* Import bill high for:               <ul style="list-style-type: none"> <li>- vegetables</li> <li>- processed meats and dairy products</li> <li>- oils &amp; fats</li> <li>- animal feed</li> </ul> </li> <li>* Few exports to pay for food imports</li> <li>* In a number of areas traditional <u>Milpa</u> farming</li> <li>* Rural infrastructure needed</li> <li>* Few imports used -- market constraints for livestock</li> </ul>	<ul style="list-style-type: none"> <li>* Strong growth projects for for agricultural livestock</li> <li>* Country now nearly self-sufficient in rice, corn, beans, poultry, pork, beef</li> <li>* Needs to develop domestic feed supply</li> <li>* Cocoa rehabilitation sponsored by Hershey's expected to reach 2 million lbs. by late 1980s</li> <li>* Citrus rehabilitation to fill US preferential market</li> <li>* AID starting large project for winter vegetables</li> <li>* AID has resident livestock adviser</li> </ul>	<ul style="list-style-type: none"> <li>* CARDI has major role</li> <li>* Ministry has no research unit now, relies on Central Farm and various special programs</li> <li>* UK ODA has research station in Toledo District Alternatives for Milpa Agric. -- farming systems approach, hillside rice</li> <li>* Belize sugar industry has strong team at research farm in St. Cruz</li> <li>* Banana Control Board has some research facilities at Cowpen</li> <li>* Central Farm research is weak, overshadowed by teaching demands at the School of Agriculture: mostly cattle/pasture, some entomology</li> <li>* Total national research staff about 5-6</li> <li>* CARDI has its own station nr. Belmopan, now also has use of CARICOM farm</li> </ul>

Table 21. Barbados.

Main Commodities	Problems/Potential	Agricultural Strategy	NARS
<ul style="list-style-type: none"> <li>* Sugar dominant, but declining in importance -- in 1984, only represented 40% agricultural output from 20,000 to 10,000 ha</li> <li>* Bananas are second export crop</li> <li>* Root crops -- yams, sweet potatoes</li> <li>* Livestock -- poultry and milk</li> <li>* About 1,000 ha vegetables               <ul style="list-style-type: none"> <li>- carrots</li> <li>- onions</li> <li>- cabbage</li> <li>- tomatoes</li> <li>- cucumbers</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>* Ecological limitations for Sugar substitution               <ul style="list-style-type: none"> <li>* thin, light soils</li> <li>* undependable rainfall</li> <li>* erosion prone</li> </ul> </li> <li>* Permanent grass cover important</li> <li>* Land concentration</li> <li>* Few small commercial farms</li> <li>* Marketing is crucial</li> <li>* Scarce agricultural labor, farming incentives are low</li> </ul>	<ul style="list-style-type: none"> <li>* Rationalization of sugar industry</li> <li>* Diversification (Large World Bank agric. diversification mission, staffed by Israeli specialists)</li> <li>* Recurrent expenditures in irrigation (China)</li> <li>* Seek outlets for high value exports, eggplant, peppers, etc.</li> <li>* Stress-processed foods, which include sugar</li> <li>* Key importance of pasture and legumes for soil conservation</li> <li>* 17% of all externally financed investment are in agriculture</li> </ul>	<ul style="list-style-type: none"> <li>* MAGFA: Crop &amp; livestock development has 89 permanent staff, probably 30-40 research related, including support staff at level 2 Ph.Ds 6 M.ScS</li> <li>1983-84 were: 14.5 m (11% of Ag. GDP) of which research = ± 2 m for crops ± 2 m livestock capital budget = 17-25 m</li> <li>* Stress on pest control research, irrigation, black-belly sheep, milk production</li> <li>* Sugar producers association has agronomy research unit</li> <li>* Strong international TA support -- according to Jacobsen, had equivalent of 21 m/yr in 1983</li> </ul>

Table 22. Jamaica.

Main Commodities	Problems/Potential	Agricultural Strategy	NARS																								
<ul style="list-style-type: none"> <li>▪ Sugar dominant</li> <li>Bananas</li> <li>Citrus</li> <li>Coconuts</li> <li>Coffee</li> <li>Cocoa</li> <li>Spices, pigments</li> <li>Root crops/yams</li> <li>Vegetables</li> <li>Pulses</li> <li>Corn</li> <li>Rice</li> <li>Livestock</li> <li>▪ Domestic agriculture grew at average rate of 4% per year during 1970-80. Export contracted by similar percentage</li> </ul>	<ul style="list-style-type: none"> <li>▪ Largest population in region: 37% rural. High density on arable land</li> <li>▪ Largest number of small farmers. Out of total of 175,000, 163,000 are under 10 ha, 142,000 are under 5 ha</li> <li>▪ Former slaves, settled hills after 1838, subsistence farming mostly under 5 ha. UK banana quota unfilled since early 1970s. Retaining young people is a major problem</li> <li>▪ Although good land is limited, resources permit diversified farming</li> <li>▪ Steep slopes are a serious limitation for small-farm agriculture</li> <li>▪ Salinity is a threat on level irrigated lands</li> </ul>	<ul style="list-style-type: none"> <li>▪ Government is stressing privatization and market incentives, limiting the role of public sector</li> <li>▪ "AGRO-21" a USAID-supported agri-business program is a major driving force</li> <li>▪ In the past decade many area-specific rural development projects were initiated, with mixed results</li> <li>▪ Strategy calls for reducing sugar to satisfy EEC and domestic markets. Big push in revitalizing banana exports, increase quality coffee, cocoa production, seasonal vegetables for exports. Aim is to increase degree of self-sufficiency in: <ul style="list-style-type: none"> <li>- beef &amp; other livestock 100%</li> <li>- rice 75%</li> <li>- soya 54%</li> <li>- corn/cassava 53%</li> <li>- dairy 25%</li> </ul> </li> <li>▪ Biggest sugar diversification project is on 8,000 ha from 4 estates to produce vegetables, soya, corn. Employment for 46,000 farmers</li> </ul>	<ul style="list-style-type: none"> <li>▪ Government expenditures on agriculture: J\$22 million in 1970/71 and J\$120 million in 1980/81</li> <li>▪ For crop research: <table style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: right;">1970/71</th> <th style="text-align: right;">1980/81</th> </tr> </thead> <tbody> <tr> <td>recurrent exp.</td> <td style="text-align: right;">541</td> <td style="text-align: right;">971</td> </tr> <tr> <td>capital exp.</td> <td style="text-align: right;">165</td> <td style="text-align: right;">330</td> </tr> <tr> <td>total</td> <td style="text-align: right;">706</td> <td style="text-align: right;">1,301</td> </tr> </tbody> </table> </li> <li>▪ For livestock research: <table style="margin-left: 20px; border-collapse: collapse;"> <tbody> <tr> <td>recurrent exp.</td> <td style="text-align: right;">474</td> <td style="text-align: right;">1,747</td> </tr> <tr> <td>capital exp.</td> <td style="text-align: right;">165</td> <td style="text-align: right;">--</td> </tr> <tr> <td>total</td> <td style="text-align: right;">639</td> <td style="text-align: right;">1,747</td> </tr> <tr> <td>Grand Total</td> <td style="text-align: right;">1,300</td> <td style="text-align: right;">3,000</td> </tr> </tbody> </table> </li> <li>Has remained virtually the same in recent years</li> <li>▪ MINAG has a research-related staff of 84, including 74 graduates, 7 post-graduate level research training</li> <li>▪ Strong commodity groups in sugar, coffee, citrus, coconut, and bananas, mostly with good quality work, but often limited in scope</li> <li>▪ A National Agricultural Research strategy is in formulation</li> </ul>		1970/71	1980/81	recurrent exp.	541	971	capital exp.	165	330	total	706	1,301	recurrent exp.	474	1,747	capital exp.	165	--	total	639	1,747	Grand Total	1,300	3,000
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Table 23. Guyana.

Main Commodities	Problems/Potential	Agricultural Strategy	NARS																					
<ul style="list-style-type: none"> <li>▪ Sugar dominant, accounts for 60% of agricultural exports</li> <li>▪ Rice is second, accounts for 20% exports</li> <li>▪ Small farmer crop involves 30,000 families</li> <li>▪ Coconut</li> <li>▪ Root crops &amp; cassava</li> <li>▪ Plantain</li> <li>▪ Citrus</li> <li>▪ Grain legumes</li> <li>▪ Corn</li> <li>▪ Beef</li> <li>▪ Fisheries important export earner, potential user of feed</li> </ul>	<ul style="list-style-type: none"> <li>▪ Highly concentrated agriculture with irrigation/drainage along coast. Depends on high cost hydraulic works and sea defences</li> <li>▪ Vast interior, poorly developed, inaccessible, isolated -- largely has poor soils, serious ecological problems</li> <li>▪ Rice acreage + production fell drastically since 1977:               <ul style="list-style-type: none"> <li>- lack of incentives</li> <li>- low investment</li> <li>- export market negatively affected by poor quality</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Stress is on self-sufficiency nutritional needs</li> <li>▪ Diversification for both export and domestic use</li> <li>▪ Rice and sugar rehabilitation</li> <li>▪ Double rice exports</li> <li>▪ Increase for non-traditional exports targeted at 400%</li> <li>▪ Agricultural plan calls for increase in:               <table style="margin-left: 20px; border: none;"> <tr> <td style="padding-right: 10px;">root crops</td> <td style="padding-right: 10px;">by</td> <td>50%</td> </tr> <tr> <td>legumes</td> <td></td> <td>50%</td> </tr> <tr> <td>pineapples</td> <td></td> <td>100%</td> </tr> <tr> <td>citrus</td> <td></td> <td>100%</td> </tr> <tr> <td>milk, beef</td> <td></td> <td>300%</td> </tr> </table> </li> <li>▪ IBD major agricultural donor:               <table style="margin-left: 20px; border: none;"> <tr> <td style="padding-right: 10px;">ag. sector loan</td> <td style="padding-right: 10px;">20 million</td> </tr> <tr> <td>irrigation</td> <td>43 million</td> </tr> <tr> <td>food crops</td> <td>7.7 million</td> </tr> </table> </li> </ul>	root crops	by	50%	legumes		50%	pineapples		100%	citrus		100%	milk, beef		300%	ag. sector loan	20 million	irrigation	43 million	food crops	7.7 million	<ul style="list-style-type: none"> <li>▪ Based on recent ISNAR reviews, government created: NARI in 1984, at Mon Repos headquarters. Has taken over Rice Board research staff. NARI has about 60 technical positions (not all filled):               <ul style="list-style-type: none"> <li>- 25 graduates</li> <li>- 35 subprofessionals</li> </ul> </li> <li>▪ Extension is now completely separate</li> <li>▪ Sugar research continues at GUYSUCCO</li> <li>▪ LIDCO does limited research in livestock development</li> <li>▪ Budget: 1981-82 GY\$1 million for research, seed &amp; extension. ISNAR estimated in 1982 only GY\$200,000 for research (value of crop is GY\$300 million)</li> <li>▪ In Ministry, about 70 professionals. About 50 in other seven agencies. Few Ph.Ds &amp; M.Sc.s, lack of practicing middle-level scientists. Brain drain is serious. AID has pulled out, FAO active, Eastern European missions in agricultural technology</li> </ul>
root crops	by	50%																						
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ag. sector loan	20 million																							
irrigation	43 million																							
food crops	7.7 million																							

Table 24. Trinidad & Tobago.

Main Commodities	Problems/Potential	Agricultural Strategy	NARS
<ul style="list-style-type: none"> <li>▪ Sugar still predominant although declining</li> <li>▪ Cocoa is second in agricultural exports, declined in 1970s</li> <li>▪ Coffee, slight increase</li> <li>▪ Citrus (decreasing)</li> <li>▪ Bananas</li> <li>▪ Coconuts (declined)</li> <li>▪ Rice</li> <li>▪ Livestock</li> <li>▪ Milk (no change in decade)</li> <li>▪ Trinidad is largest food importer: accounts for 55% of all CARICOM food imports: 1982: TT\$105 million 1983: TT\$126 million</li> </ul>	<ul style="list-style-type: none"> <li>▪ Rapid decline of Trinidad agriculture, especially in oil boom period</li> <li>▪ Sugar industry deemed unviable, highest costs in the region: 1982 per ton costs TT\$4,400. Revenue is TT\$900 for export; TT\$450 internally. Industry requires huge subsidies</li> <li>▪ Tree crop exports down from TT\$13 million in 1970 to TT\$8 million in 1980</li> <li>▪ Sugar down from TT\$51 million to TT\$30 million</li> <li>▪ Domestic agriculture up from TT\$35 million to TT\$42 million</li> <li>▪ Livestock industry subsidy in 1981 TT\$100 million</li> <li>▪ Trinidad agriculture across the board is high-cost producer, and labor reluctant to work on land</li> <li>▪ Diseases and pests affect traditional export crops</li> <li>▪ Tree plantations are old</li> </ul>	<ul style="list-style-type: none"> <li>▪ White paper on agriculture, issued in 1978, but not implemented</li> <li>▪ With end of oil boom, somewhat greater interest in agric. development, but technology and economics favor imports</li> <li>▪ Strategy is to expand food crop production to keep pace with growth in local demand</li> <li>▪ Mostly self-sufficient in poultry and eggs, but based on feed imports -- could increase</li> <li>▪ Tropical starchy foods &amp; root crops could be expanded under mechanization</li> <li>▪ Vegetable production is only practiced on very small scale in absence of marketing system, consumed locally</li> <li>▪ Plans exist to rehabilitate cocoa, increase rice, citrus, coffee, pigeon peas, maize and pineapples</li> </ul>	<ul style="list-style-type: none"> <li>▪ Research budget in 1983 for crop and red ring disease TT\$14.8 million, with TT\$10.0 million wages TT\$ 1.2 million capital costs TT\$ 0.9 million materials about 3% of agricultural GDP</li> <li>▪ Total research-related staff is between 70-80, including 6 Ph.Ds. and 19 M.ScS. <ul style="list-style-type: none"> <li>- Ministry 50</li> <li>- CARONI 10</li> <li>- Sugar Cane Center 10</li> <li>- Chaguaramas Agricultural Project 8</li> </ul> </li> <li>Supplemented by UWI, CARDI, FAO, IICA personnel</li> <li>▪ CARONI is the strongest applied research group, has a growing diversification program</li> </ul>

Chapter 3

3. CHARACTERISTICS AND FUNCTIONING OF THE CARIBBEAN AGRICULTURAL RESEARCH AND DEVELOPMENT INSTITUTE (CARDI)

3.1 Background and Mandate

Toward the end of the British colonial period in the Caribbean, a Regional Research Center (RRC) was established in 1955, on the campus of the then Imperial College of Tropical Agriculture (ICTA) to undertake research on problems of interest to the Caribbean Region and to provide a nucleus of specialists on call to teach or advise in their specialist subjects, in addition to conducting their research programs. Following independence and the establishment of the West Indies Federation, in 1960, the former ICTA was merged with the University College of the West Indies (UCWI) and became the Faculty of Agriculture of the University of the West Indies (UWI). In the late 1960s, with withdrawal of British funding in view, RRC assets were vested in the University, staff were transferred to the Faculty and, to all intents and purpose, RRC was integrated into UWI. The Pro-Vice-Chancellor of the University became the Director of RRC. The union was complete. Following the announcement that the United Kingdom government funding would be phased out during 1971-75, the by then independent states of the anglophone Caribbean (CARICOM) met and decided, on the basis of the Campbell commission report, to develop and maintain a regional research body in agriculture, and CARDI was established in late 1975.

CARDI is an autonomous institute established by the governments of the Caribbean Community (CARICOM). It was created in 1974, as a regional organization for agricultural research and development within the framework of Caribbean regional economic integration. The countries involved in CARDI are Antigua, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts-Nevis-Anguilla, St. Lucia, St. Vincent, and Trinidad & Tobago.

Nevertheless, the membership is open to any other state of the Caribbean region which becomes a member or associate member of CARICOM.

CARDI was established with a broad mandate which is still current. Its formal objectives as expressed in the original agreement are to:

- \* provide for the research and development needs of the agriculture of the region as identified in national plans and policies;
- \* provide an appropriate research and development service to the agricultural sector of member states;
- \* provide and extend the application of new technologies in production, processing, storage, and distribution of agricultural products of member states;
- \* pursue for specified periods long-term research in pertinent areas;

- \* provide for the coordination and integration of the research and development efforts of member states where this is possible and desirable;
- \* undertake teaching functions, normally at the post-graduate level, limited to the development of the relevant research by any member state;
- \* seek to achieve the optimum decentralization of facilities.

Basically, these objectives can be summarized into three major tasks originally given to CARDI:

1. supplement national research efforts, stressing technology application;
2. provide region-wide research services, including some teaching;
3. coordinate and integrate regional research.

As will be seen in other portions of this report, during the decade of its existence CARDI has made considerable contributions to the first objective of supplementing national research, especially in the LDCs, has made little progress in region-wide services, and little in regional coordination.

It is interesting to note that sympathetic extra-regional observers and organizations seemed to have been more interested in CARDI's potential role than some of the founding governments themselves. For example, a major study on Caribbean integration by the World Bank concluded in 1978: "Agricultural research at the regional level, and in individual CARICOM Member Countries falls far short of even the most urgent needs. The applied research necessary to make better use of technology familiar to the developed regions of the world has not been done. The findings of research in other developing areas are not transmitted. The countries of the region have no research programs adequate to deal with national agricultural problems, and they have failed to utilize such useful research information as has emanated from the RRC. In the light of these fundamental shortcomings, the recent establishment of CARDI is a welcome development, which promises to revitalize applied agricultural research in the region ..."\*

In interpreting its mandate, CARDI sees its mission to be "to contribute to agricultural development through the generation and dissemination of appropriate technology for the benefit of the Caribbean people." It seeks "to execute its mission principally by developing and demonstrating appropriate technology for increasing production, productivity, and utilization of food commodities for domestic and export markets," in support of the Regional Food and Nutrition Strategy (RFNS).

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\* World Bank. The Commonwealth Caribbean - The Integration Experience. The Johns Hopkins University Press. Baltimore, 1978. p. 132.

This very broad statement of intent is reflected in the Institute's far-ranging programs which encompass food legumes and cereals, root crops, vegetables, tree crops, cotton and animal production, and additional programs in soil and water management, integrated pest management, and engineering. It does nothing to sharpen up CARDI's role as a regional center of excellence, and with its continuing emphasis on food production, it could impose a constraint on CARDI should it be deemed appropriate to undertake work on problems of regional importance affecting nonfood crops.

The pivot of CARDI's strategy must be in the second clause of its mandate, which calls on CARDI to "provide an appropriate research and development service to the agricultural sector of Member States." The question of what is appropriate at any given moment in the agricultural development of the region, and more particularly of the member states of that region, leads the Mission to propose a sharpening of CARDI's focus by periodic definition of appropriate roles for the Institute.

### Recommendation

- \* That the existing mandate of the Institute as embodied in the enabling legislation be maintained, but that from time to time the governing body authorize the issuance of a "strategy statement" aimed at clarifying, for the accepted period of validity of that statement, what is regarded as "... an appropriate research and development service ..."

### J.2 Structure

Basically, CARDI's organizational structure consists of a central headquarters and decentralized units established in the member countries.

The governing body of the Institute is constituted by the Standing Committee of Ministers Responsible for Agriculture whose responsibilities lie mainly in giving general or specific policy directions, budget and program approval.

CARDI operations are directed by a Board of Directors whose members are nominated by, and represent the governments of Barbados, Guyana, Jamaica, Trinidad & Tobago; one member representing Dominica, Grenada, St. Lucia, and St. Vincent; one member representing Antigua, St. Kitts-Nevis-Anguilla, and Montserrat; one member each representing Belize, the University of Guyana, the CARICOM Secretariat; the Caribbean Development Bank; and the University of the West Indies (UWI); as individual members, the Executive Director (ex-officio), and the Chairman, appointed by the Standing Committee on recommendation of the Board.

The Executive Director is also appointed by the Standing Committee on the recommendation of the Board of Directors; his main responsibility is to execute CARDI's program activities and the day-to-day management and control of the Institute. To accomplish his functions, he is assisted by a Deputy Executive Director (currently stationed in St. Lucia) and two directors each constituting organizational offices: the Director of Research and Development; and the Director of Finance and Administration.

The headquarters of the Institute is in Trinidad & Tobago on the St. Augustine Campus of the University of the West Indies.

Headquarters staff, additional to the directors, consist of a mobile team (when travel funds permit) of specialists, on call to any member country, comprising a virologist, a nematologist, a biometrician, an animal scientist, and a statistician. In addition, library and documentation services and a central analytical laboratory are staffed by three professionals.

To carry out its field activities, CARDI has research and development units in the different member countries of CARICOM, where the national and regional commodity projects, and the farming systems projects are conducted.

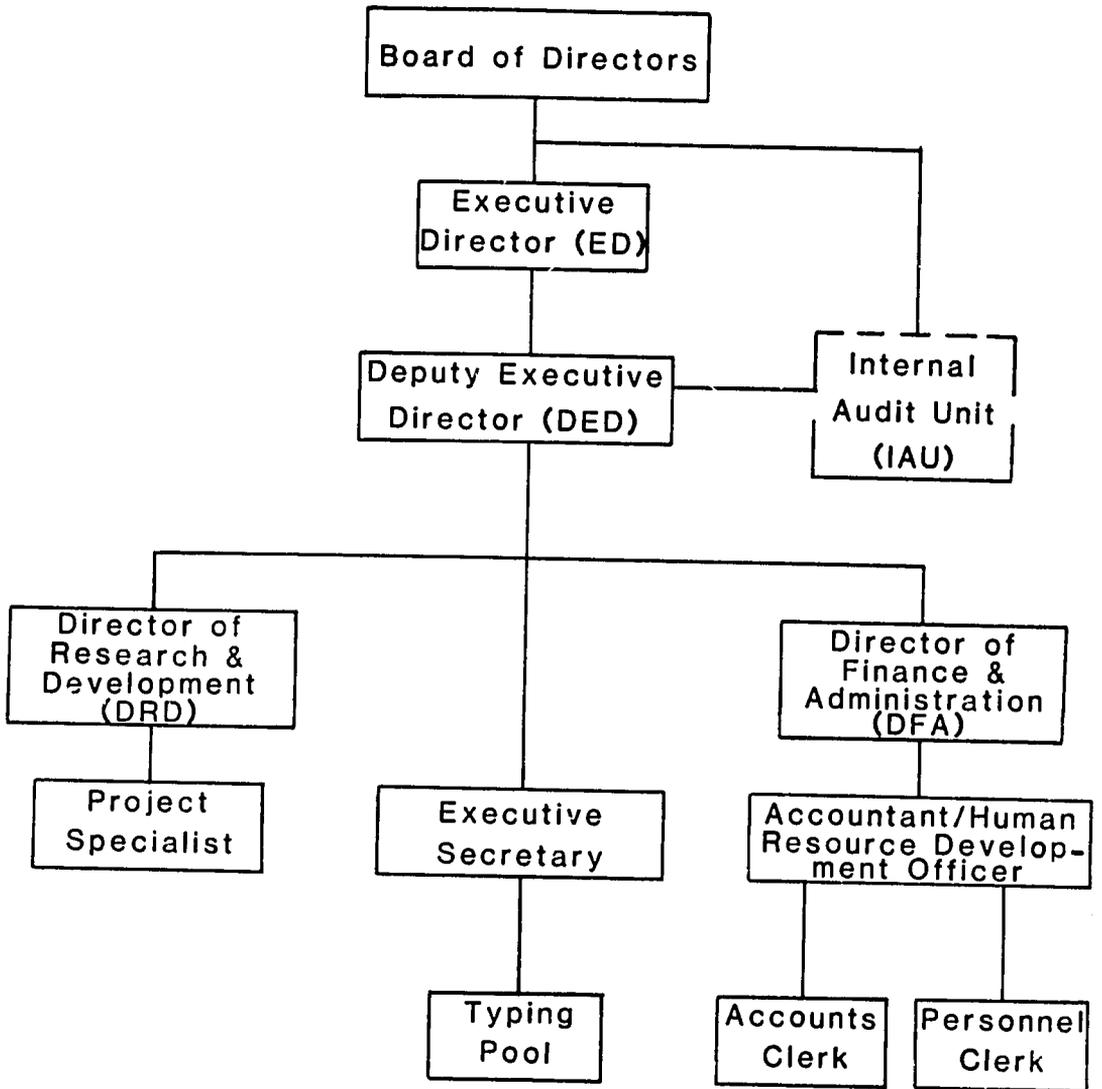
Country unit structure consists of a country team leader who has a direct line of responsibility to the Director of Research and Development, and project leaders who are responsible for the execution of specific projects and are answerable to the Executive Director. In each of the countries, such projects can be either national or regional in scope. The numbers of specialist and support staff vary according to the size of the country program.

While this decentralized structure did much to improve CARDI's image in the region, and certainly its visibility, it exhausted its core resources.

CARDI has not yet completely developed a clear organizational and structural functioning even though the decision had been taken to decentralize CARDI's operations with the establishment of country teams backstopped by the research of the subject-matter specialists attached to the headquarters in Trinidad & Tobago, as long ago as 1976. The Mission found at least two different structural organigrams which are still in the process of analysis and discussion, and a decision has not been taken yet (Charts 1 and 2).

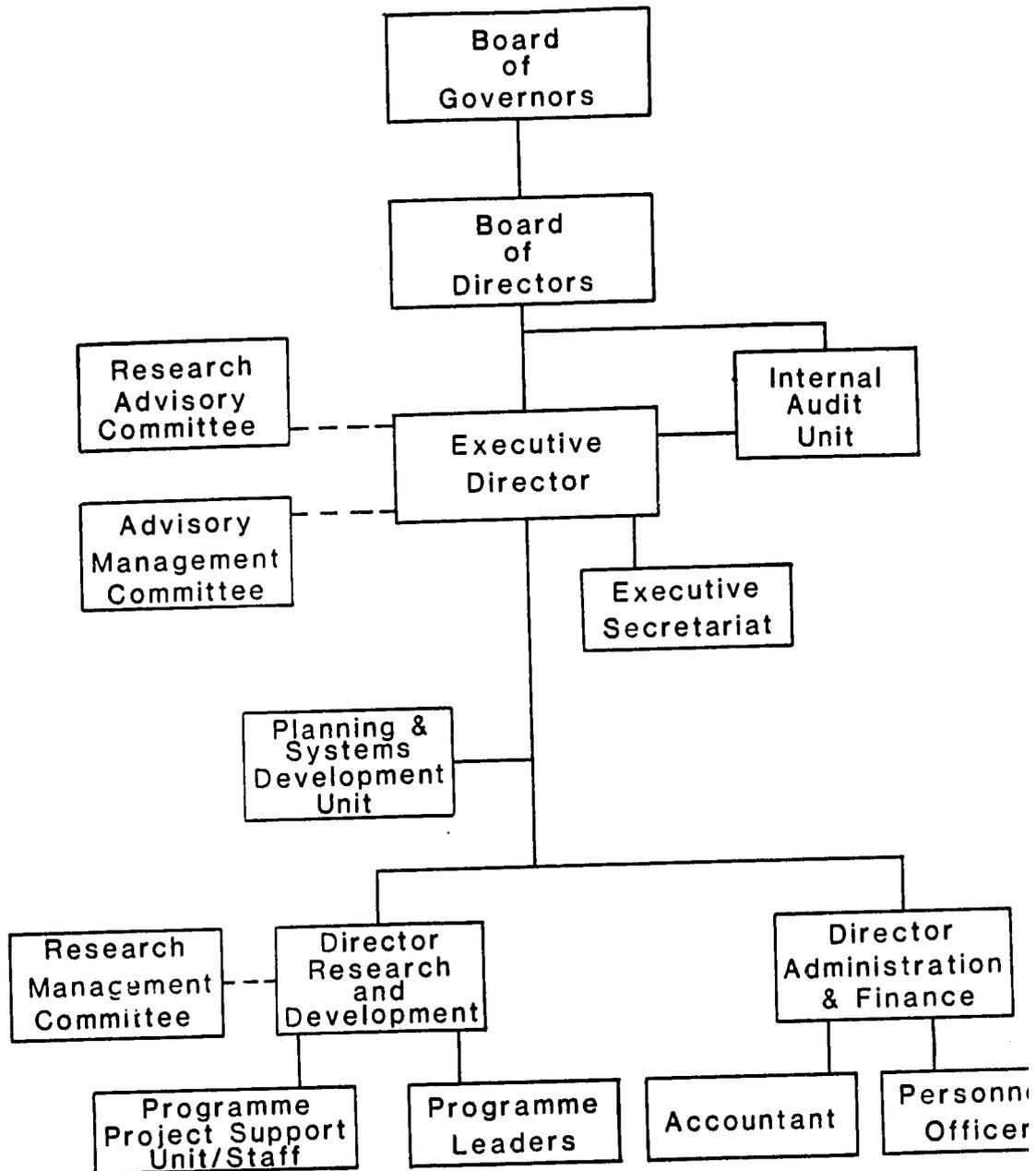
CARDI has recently undergone a systematic review of its program, personnel, and project management systems by SCL, whose reports were made available to the Mission. It also has a part-time research management specialist, appointed under a USAID-FSRD project, to assist in the implementation of management and structural recommendations. In view of the options for reorientation (and therefore possible consequent reorganization) of CARDI made later in this report (Chapter 5), the Mission does not propose to analyze CARDI's present structure in detail, but simply to present what it believes to be essential structural components of CARDI, whatever form the Institute should ultimately take. It assumes that the Board and upper echelon of management will retain more or less the same relationship. Absent from the present structure are any provisions for executive support from the Board to the Executive Director in the interim period between board meetings; essential technical advice to the Board on research programming, and last, but by no means least, internal units responsible for planning, programming, monitoring, and evaluation. The Board's proposed Executive Committee would have line communication to the Board and the Executive Director and should consist of four Board members, one of whom should be chairman. The Research Advisory Committee to the Board, for which a Steering Group was established recently, is still awaiting Board sanction on the basis of the Steering Group's recommendations.

Chart 1. ORGANISATION CHART - HEADQUARTERS



New Positions to CARDI's  
 Existing Structure

Chart 2. PROPOSED CARDI ORGANIZATION CHART(SECID)



To avoid a proliferation of units, the Mission suggests amalgamation of the so-called "audit unit" and "planning and systems development unit" already proposed to CARDI by SCL and SECID into a single Planning, Project Development and Evaluation Unit, attached to the office of the Deputy Executive Director and with the functions detailed below:

- \* to establish CARDI policy guidelines on the basis of broad directions from the Board;
- \* to formulate work plans and programs in close liaison with CARDI's decentralized units;
- \* to assist the Director of Finance and Administration in budget preparation;
- \* to promote and develop specific projects, both core and special programs, to implement regional programs; and
- \* to formulate a methodology for, and carry out, program and project monitoring and evaluation.

Specific recommendations for the establishment of the proposed units are found in appropriate chapters and a graphic relationship of the units is indicated in Annex 2. The Mission strongly advises against the creation of any further new structural units at this juncture, given the current state of CARDI's finances and the possibility of further changes becoming necessary.

### 3.3 Organization, Management, and Finance

The Constitution of CARDI provides that the Board of Governors shall be "the Standing Committee of Ministers responsible for Agriculture in CARICOM" and shall be responsible for appointment of the Chairman of the Board of Directors, the Executive Director (N.B., "after consultation with UWI"), and shall approve annually the rolling three-year work program and budget.

The ministers concerned must include CARDI matters in a busy two- or three-day agenda comprising consideration of the activities of several regional entities. The Mission suggests that CARDI could, with advantage, capture or stimulate high-level interest by the imaginative presentation of a separate important element of its program annually, and thus attempt to avoid routine consideration of its program. It should also ensure much earlier submission of documentation, to permit adequate consideration by the ministers' advisers.

The Board of Directors is composed of representatives of the CARICOM member countries, regional secretariats, and the Universities of Guyana and the West Indies. Although it was formerly dominated by three representatives of UWI, this representation has now been reduced to one. The Board, although constitutionally supposed to meet twice a year, has not maintained a proper schedule of meetings, there being on one occasion 16 months between meetings. Furthermore, frequent changes in senior ministry officials and frequent attendance by alternates without full powers and often without agricultural research-related experience has

mitigated against desirable continuity in Board membership and strong guidance of CARDI's affairs by the Board. It has also pointed out the need for a technical advisory body to the Board. The observed facts of frequent and numerous irregularities in management, the most serious of which has been the failure, on more than one occasion, to present audited accounts to the Board of Governors, suggest the need also for an executive body of the Board to monitor management between board meetings, ensure proper accounting and timely presentation of Board documentation.

Many of the difficulties with which CARDI is now faced could have been averted by stronger Board and staff participation in management. The firm impression was gained that many of CARDI's difficulties stem from the failure of management in the past to appreciate the feelings and views of the scientific staff, and as a consequence, the management did not enjoy the support of most of the staff or some of the technical members of the governing bodies that it should expect. The handling of dealings with the University, some inattention to financial controls, and an inappropriate style of personnel management, contributed to lower staff morale and has led to the recent crises. Notably, although core resources have remained virtually static in real terms since 1975, the core staff was allowed to increase from 28 posts to about 46 posts between 1978-80. This completely absorbed a healthy contingency saving of some TT\$1 million and has left CARDI consistently overstretched and has jeopardized its survival.

CARDI's major special project is the CARDI/USAID Small-Farm, Multiple-Cropping Systems Research Project which forms the backbone of CARDI's Farming Systems Research and Development (FSRD) Program in the LDCs of the CARICOM. The first phase of this project was reviewed by a USAID team in March/April 1982. One of the recommendations was to institute a management review and evaluation of CARDI; this was undertaken and led to the contracting of SCL (with USAID funding) to prepare proposals for systematizing CARDI's internal management.

The Mission's observations suggest that the outcome of this review may well be the presentation of an optimal "blueprint" or textbook design that will impose on CARDI (if accepted) either a greater workload or the need to establish additional staff posts in the face of already stringent economies. Fortunately, CARDI's internal Task Force on Organization and Management (O & M) is very pragmatic and aided by SECID, which is providing ongoing management support over a two-year period; it is effectively tempering and rationalizing the complex proposals contained in SCL's report.

The need for such assistance in all four "systems" concerned (Project Management, Personnel Management, Communications, and Internal Audit [= continuing Monitoring/Evaluation]) is abundantly clear. Hitherto, the Institute has responded in a rather ad hoc manner to project requests, with consequent arbitrary movements of staff and funds. Although commodity and farming systems programs were, to the extent possible, regionalized by lumping together country requests, much of the commodity work remained a response to individual countries' needs. The results of this policy have further weakened the impact of CARDI's activities already attenuated through the earlier (1976) decentralization.

CARDI core funding is derived from the member governments according to the following formula; Jamaica and Trinidad & Tobago -- one-third each; Barbados and Guyana -- one-ninth each; Windward and Leeward Islands, and Belize -- one-ninth.

This core contribution has grown over the 10 years of CARDI's existence in accordance with the following table (Table 25) which reflects, mainly, the results of inflation, growth in real terms being negligible.

Table 25: Core funding 1975-1985.

Fiscal Year	Government's Contributions (in TT\$)
1975-76	2,713,307
1976-77	2,713,307
1977-78	2,713,307
1978-79*	5,436,386
1980	4,575,174
1981	5,558,208
1982**	3,785,605
1982-83	7,000,000
1983-84	7,000,000
1984-85	<u>7,224,268</u>
	43,719,562

\* for 17 months

\*\* for 8 months

Over the same period, CARDI received over TT\$54,300,000 in Special Project funding.

The contributions for 1984, and projected allocations for 1984-85, are shown in the following table (Table 26). Noteworthy are the high allocations to Trinidad & Tobago for the country unit and CARDI headquarters in comparison to the contribution.

Table 26. CARDI's core income and expenditure.

Country	1984 Contribution	Projected Estimates Sept. 1984- Aug. 1985	Projected Estimates Sept. 1984-Aug. 1985	
			Personnel	Other Costs
Antigua	105,683	153,538	114,698	38,842
Barbados	777,666	498,248	441,728	56,520
Belize	105,683	234,000	154,080	79,920
Dominica	105,683	97,021	46,221	50,800
Grenada	105,683	134,806	83,826	50,980
Guyana	777,666	300,152	183,507	116,645
Jamaica	2,333,000	1,018,061	709,929	308,132
Montserrat	38,887	41,509	29,813	11,696
St. Lucia	105,683	363,894	213,894	150,000
St. Kitts/Nevis	105,683	133,112	73,830	59,282
St. Vincent	105,683	72,402	31,777	40,625
Trinidad & Tobago	2,333,000	2,392,478	2,062,478	330,000
Headquarters	---	2,062,741	1,446,741	616,000
	7,000,000	7,501,962	5,592,522	1,909,440

Examination of CARDI's budget indicates that with relatively little adjustment, an acceptable balance between personnel costs and operational (other) costs could be achieved, provided that pledged contributions were received regularly and on time. Unfortunately, CARDI's core contributions have maintained the Institute in a condition of constant deficit, with attendant problems of increasing overdraft, accruing interest payments, and an acute cash-flow problem. Not only is there consistent delay in the payment of current annual contributions, there is also an accruing deficit in previous years' contributions, now amounting to TT\$2.3 million. The deficit situation over the last five years is indicated in Table 27.

Table 27. CARDI, March 1985. Outstanding contributions 1981-1985.

1981	1982	1983	1984	1985
2,749,509	1,265,449	3,668,441	3,028,191	6,140,222*

\* Comprising: Accrued deficit TT\$2,288,816  
Contribution due 1985, TT\$3,851,406

It is no exaggeration to suggest that CARDI is approaching bankruptcy. Funds for the proper operation of research, particularly at headquarters, which has little access to special project funding, are negligible; salary payments were delayed at the time of the Mission's visit, and only those units of CARDI which depend on special project funding could be said to be functioning normally. Recourse to special project funding, to make good shortcomings in the core, is a very undesirable practice which should be avoided. Repeated urging by the Board of Governors to their governments to meet their obligations to CARDI have not, so far, had much effect. The Mission would be failing in its task if it did not point out the very real need for immediate financial support of CARDI, if it is to survive as a viable institution of the governments' own creation.

#### Recommendations

- \* That the member governments nominating Board of Directors members give attention to the desirability of continuity on the Board, possibly achievable by personal rather than ex-officio appointments.
- \* That the Board of Governors appoint a small (3-4 members) Executive Committee to support and guide the Executive Director between sessions of the Board.
- \* That the appointment of a Research Advisory Committee be speedily effected, along the lines recommended by the Steering Committee.
- \* That the recommendations for management systems proposed by SCL and modified by SECID and the CARDI Task Force be adopted.
- \* That management training courses be arranged for those members of CARDI senior staff likely to remain in or aspire to management.
- \* That member governments take urgent steps to make good the arrears of annual subventions to CARDI and bring currently due payments up to date, in order to ensure the maintenance of CARDI as a viable institution of their own creation.

#### 3.4 Program and Budget Presentation

The presentation of the program of work has traditionally been in three volumes -- by country, by objective, and by program. Presentation by country (Volume I) was subdivided into program thrusts and program elements under each country head; that by objective (Volume II) was subdivided by country and program elements under each objective head, the objectives being as expressed in CARDI's mandate; and that by program (Volume III) was again subdivided by country and program elements under each major program. Nowhere have associated budget elements been indicated. This was a major weakness which imposed considerable difficulties in the understanding of CARDI's operations.

It is difficult to elucidate how and why this repetitive system has developed, unless it was felt that justification of CARDI's programs could best be achieved, at the country level, by saying the same thing in different ways to different audiences. Volumes I and III, for example, presented virtually the same information in two different sequences.

Some improvement, and certainly a simplification, has been effected in the latest Work Program 1985-88, which is presented in one volume only. The subdivisions remain the same as before, however, although there is an introduction which attempts to formulate a rationale for the program and a useful addition in the form of a tabular indication of funding sources against the program areas and major activities. The usefulness of this latter is reduced, nevertheless, as amounts are not shown and respective proportions are not indicated in those cases of multiple-source funding.

The budget of CARDI is presented in two parts: the core budget by countries, under expenditure heads in each country; and the special project budgets, which are presented in two different ways (presumably reflecting donors' wishes). That of the FSRD Project is by country and expenditure heads, and that of the EDF project and subprojects by expenditure heads but with notations to indicate specific locations for the anticipated expenditure. A tabulation of CARDI's overall estimated expenditure on a country basis, by source of funds, provides an overall picture. As indicated above, however, program-related expenditure is nowhere indicated for the core budget. The much more detailed EDF Special Projects budgets could lend themselves to an indication of program allocation, although it would then prove difficult to express this total picture on a country basis. It is noted that this problem was not addressed by the SCL consultants, and it is strongly felt that CARDI would be well advised to modify its program and budgeting processes in order to achieve a satisfactory degree of integration.

#### Recommendation

- \* That CARDI adopt as a matter of urgency the already recommended computerized system of program budgeting to facilitate presentation, monitoring, and control of program-related allocations and expenditures.

### 3.5 Policies, Priorities, and the Planning Process

CARDI's program planning is characterized by informality and subjective response to the stated needs of the RFNS (see Annex 1) and of its client countries, as expressed in national policies and plans, which themselves often lack clear statements of agricultural research policy. To the extent possible, CARDI staff endeavor to participate in the identification and planning processes which give rise to national proposals, as they are the body responsible for implementation, monitoring, and evaluation of the projects' progress. However, it is not clear that any specific criteria have been established for priority selection of projects within the general policy which is defined in the preamble to the Work Program in terms of CARDI's mandate and the RFNS.

CARDI's Board appears not to have adequately addressed the setting of either long-term research policy or the relative priorities of work among the many alternatives.

Not surprisingly, the program objectives of CARDI's eight principal program elements are expressed equally broadly, amounting to more and better of everything. Within these eight program elements (legumes and cereals; root crops; vegetables; farming systems; animal production and feeds; engineering; tree crops; soil and water;) individual projects, identified by national and regional bodies, are examined by CARDI's headquarters staff and management. Assuming that national and regional priority needs have been considered in formulating the request, CARDI's main criteria for acceptance are consideration of the availability of resources and the strength of national political pressures.

The major goals of the Work Program are therefore reflections of the national goals of the member countries. The diversity of the resulting program, spread over 12 countries, numerous commodities, a wide ecological range, differing farm sizes, soil types and climates, makes it imperative that CARDI should consider some program consolidation and reduction. CARDI attempts too many activities, achieves too little, and will suffer the subsequent dissatisfaction and criticism.

Priorities appear to have now been more systematically selected within the FSRD Project for the LDCs.\* The goal there is a combination of import substitution and small-farm income generation. But even in the FSRD Project, the number of separate lines of work is very large. (The stated aim by 1988 is to improve over 300 technologies). CARDI-wide, there is no long-term planning and no consensus among the staff on ends and means. The tendency for dispersion and lack of focus has been exacerbated in recent years by CARDI's financial crisis, in which the search for outside project funding has effectively taken the place of Institute planning.

There does not seem to be a regional research program as such, or even an articulation of regional research priorities and research objectives for the Institute as a whole. It is recognized that priority setting and the establishment of a research strategy is a very complex and difficult task, even under the best of circumstances, such as prevail in some of the international centers under the CGIAR system. There are no acceptable criteria and there is always room for disagreement. The Mission has been unable to find any CARDI strategy except, perhaps implicit in the program, a stress on food crops for import substitution and avoidance, with some exceptions, of the traditional export sector. The following set of questions need to be considered:

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\* See "Benefits from USAID Farming Systems Research and Development Project" by Calixte George, in which six production systems are identified for the LDCs, and specific lines of technological development are proposed within each system.

1. What lines of agricultural production (crop/animal systems) should be the focus of the long-term research effort?
2. What components of each line to stress (and what combinations), i.e., crop or animal improvement; plant protection, diseases, pests; agricultural practices; processing/marketing?
3. Where to work and on what? Would it not be wiser to concentrate on a few lines of work in many places, rather than on many lines in a few places?
4. What balance to achieve in the R & D continuum?

The Mission notes that in individual countries, CARDI staff has made informed judgments on what to do and where to do it. In the Eastern Caribbean islands, constraints to food crop production by small farmers have been identified. In Belize, specific short-term import-substitution problems in oilseeds/legumes are addressed. In Barbados, forage/cattle possibilities are well-identified for sugar substitution. In Jamaica, coffee borer control promises high returns. However, there is no regional strategy, and in practice CARDI, as a regional institution, provides a framework for a set of miscellaneous projects and researchers, rather than a coherent regional research network in which the various parts mutually reinforce each other.

The dispersion and opportunism in CARDI's choice of projects and the lack of a clearly articulated and concentrated research strategy may well be a contributory cause of the delayed financial support from many governments. It is the Mission's view that it would be better to excel and be known for competence in a few lines of work.

The recent CARDI/SECID-sponsored Strategic Planning Workshop, held in February 1985, illustrates these problems:

- \* The workshop participants could not agree on an interpretation of CARDI's mandate.
- \* There was no consensus on strategy.
- \* R & D appears not to be properly understood and no basis was found for resource allocation.
- \* Participants recommended maintenance of 16 fields (crop/animal lines of work), increase in 23 and proposed adding 11 for a total of 50. (Decrease was recommended in only one).
- \* No priorities were recommended among food security objectives, import substitution and export promotion, but by implication the first two were stressed (probably based on CARDI's present strength and Regional Food and Nutrition Strategy).
- \* There was little attempt to sort out relative weights to be assigned to the sequential components of R & D, such as, research support, testing and demonstration, training, information, etc.

The Mission notes that one should not expect a staff workshop to set strategy, but it was clear that the participants were unable to communicate a coherent strategy. Participants did, however, suggest the establishment of seven Institute programs with project priorities to be evaluated and ranked within each program. They also suggested that CARDI should clearly communicate to governments the programs in which it is most competent and can fulfill requests.

There is very little summary information of the current deployment of CARDI's resources by major lines and components. The following data are derived from the strategic planning workshop and from Board presentations:

<u>R &amp; D</u>	<u>% by staff time</u>
Technology Generation	15
Technology Adaptation	70
Technology Application	15

<u>Fields</u>	<u>% of 1985 project budget</u>
Food legumes & cereals	8.6
Root crops	16.2
Vegetables	8.5
Animal production	17.3
Farming systems	32.3
Agricultural engineering	0.9
Tree crops	0.6
Soil & water conservation	12.4
Integrated pest management	1.7

It appears to the Mission that the staff time percentages are a good indication of actual resource allocation throughout CARDI. The Mission strongly approves of the current emphasis on adaptive research, but will express some concerns later in the text about the quality and coverage of technology testing.

The FSRD component of the budget allocation is not disaggregated, and the Mission has not received a breakdown of staff costs by subject matter fields. It is likely that the share of root crops and of vegetables would go up if the FSRD funds were allocated. Notable are the very low amounts allocated to tree crop work and the relatively high share of soil and water conservation.

CARDI's mandate is very broad and general. For meaningful planning and strategy, the mandate must be interpreted and focused. However, CARDI has tended to leave the interpretation vague and flexible. It insists that its program must be "client-driven." This has resulted in a wide dispersion of activities in terms of commodities, sites, and approaches. There does not seem to be a conscious process of goal selection, regional priority setting, and strategy determination, but rather an opportunistic response to government "wants and needs" as well as to specific donor interests, whether in support of these wants and needs or otherwise.

The Mission notes that there is often too little continuity of programs (dependent on individual staff who may leave or on special funding which expires). On the other hand, some programs linger on year after year, regardless of impact or relative priority; this situation demonstrates that monitoring and evaluation of the projects are absent or not properly managed.

Priority setting and strategy seems better in LDCs, where CARDI is better integrated with the governments (and where the FSRD Project has done more systematic groundwork.) It is poorest in the MDCs, where CARDI's role seems more diffuse and often of marginal relevance. It is also poorly practiced at headquarters where, with some exceptions, the service function at the regional level becomes more "fire-fighting" and less useful to the component country programs.

The Mission finds that virtually no Institute resources are currently devoted to research coordination on a regional basis, although occasional workshops are helpful as an information forum. Likewise, CARDI does very little in the way of national research planning and institutional strengthening except through the USAID project. In the Leeward and Windward Islands, CARDI's role in the national systems is large and there is bound to be a positive effect on the NARS; for example, under the FSRD Project, 50 MINAG staff are to be trained in short courses. However, CARDI's training program as a whole is subminimal.

In view of the foregoing, the Mission feels that while it would be undesirable to change CARDI's mandate, given the need to maintain maximum flexibility, every attempt must be made to achieve consolidation and in-depth development of a more narrowly focused program, rather than continue the current horizontal, amorphous expansion.

The Mission therefore reiterates its view that CARDI should define a strategy based on a new concept of what constitutes an appropriate research and development service. This should result in CARDI acquiring greater competence in fewer key fields, rather than attempting to cover everything. Such slimming down is also a financial necessity. CARDI should set medium- to long-term planning objectives for itself and establish the means to reach them, in both financial and human resource terms. Some activities should be phased out and others built up. A more purposeful CARDI, more competent in key fields, would also be more attractive to new donors. While the Mission approves of the present stress on "adaptive research", it feels that there is an urgent need to better define the "D" in the R & D continuum. It could be of value to CARDI to establish a committee or a consultancy to work out a proper development approach.

The Mission feels strongly that CARDI should concentrate its work more on regional priorities, which are of importance to a number of countries, rather than attempt to respond indiscriminately to country requests. Priority fields can be agreed by the CARDI Board and then become focal elements for negotiating programs with countries and donors. In such negotiations, CARDI should stress teamwork on common problems, rather than disperse its technical work in isolated specialized directions. CARDI teams would then create foci of excellence in the region, rather than CARDI being known as a universal technical assistance (TA) and service agency, competing with everybody for external resources.

CARDI urgently needs a permanent, substantive, planning mechanism, which need not be complicated or formal. The functions of this mechanism should be carried out by the Planning Unit recommended by SCL and SECID, which the Mission believes should be attached to the office of the Deputy Executive Director and titled Planning and Project Development Unit (see Section 3.2). Internally, two people should be assigned this task, a senior scientist assisted by an economist. Externally, a small external research advisory group which meets at least once a year (e.g., the proposed Research Advisory Committee) should ensure the appropriateness of the programs and program elements proposed.

#### Recommendations

- \* That for the next decade (1985-95), the following strategy be adopted. That CARDI recognize a clear distinction between needs of the LDCs and MDCs in view of the development of strong research cadres in the latter. Thus, it should reduce work in the MDCs to those problems of regional significance which can be conducted with advantage in MDCs (especially in Trinidad & Tobago alongside UWI), and to specialist consultation.
- \* That CARDI establish and work on those regional priorities which are of importance to a number of countries rather than attempt to respond indiscriminately to country requests.
- \* That CARDI, as a matter of urgency, set medium- to long-term planning objectives for itself and establish means to reach them.
- \* That CARDI set up an internal planning unit with appropriate external assistance on a periodic basis.

#### 3.6 Monitoring and Evaluation

CARDI's Work Program contains an element under Central Services for Project Development, Monitoring, and Evaluation. In practice, just as program development had been of an ad hoc nature, so monitoring and evaluation tended to be carried out in a piecemeal fashion, especially with respect to core program activities for which no evaluation norms had been developed. Both project development and subsequent review/evaluation are carried out by the team of headquarters specialists comprising a loose and informal project management group. A new project and program management system has now been produced by the SCL consultants, and initial staff responses were favorable, although it was found by the Mission that the system proposed was considered both somewhat stereotyped and overcomplicated. It will, however, form a basis on which a flexible agricultural research project management system, suitable to CARDI's needs, may be built.

The Mission found that CARDI researchers, particularly in the LDCs, are already expending up to 40% of their time in writing internal reports. This situation needs to be corrected. An important consideration in the elaboration of the final project management system to be adopted will be the acceptability of the outputs of the system (particularly annual and

terminal reporting) to the various donors supporting CARDI's projects. To this end, it is important that draft proposals be discussed with donors' representatives to ensure the acceptability of the standardized monitoring and reporting procedures, notwithstanding that the final ex-post evaluations will, in all probability, need to conform to individual donors' requirements.

#### Recommendation

- \* That in order to avoid duplication, the project-monitoring and reporting system adopted be compatible with donors' requirements.

### 3.7 Human Resources and Personnel Policies

CARDI has 58 scientific and managerial staff (including special project staff), made up of an Executive Director, a Director of Research, 19 specialist posts, and 37 in generalist posts in country teams, backed up by some 90 technical support staff. The core senior staff (see Annex 2) are of three distinct categories: those former members of the RRC who chose to join CARDI; those recruited by CARDI subsequently into core posts; and those recruited to fill fixed-term posts on special project funding. The first have certain continuing acquired privileges, and this accounts for some observed friction.

On its establishment, CARDI inherited the staff rules of the RRC, effectively those of the UWI. The foundation staff also remained on their UWI-type contracts, an oversight which has led to subsequent staffing problems outside Trinidad & Tobago, as those contracts quite clearly specified the St. Augustine UWI campus as duty station. Although draft staff rules for CARDI have been subsequently drawn up, they remain in draft form (dated February 1981) and have been as much honored in the breach as in observance. Supervision in general, and monitoring of performance standards in particular, are poor or nonexistent. Few, if any, annual staff assessments have been carried out, even before the grant of increments, even though the Institute has an Assessment and Promotion Committee which advises the Executive Director on promotions and new recruitments, and little rationale was found to support certain promotions and incremental awards. Prior to the initiation of the current FSRD Project and the management survey by SECID, job descriptions were either nonexistent or limited to a brief inclusion of duties in letters of appointment. The preparation of full job descriptions for all FSRD posts has been undertaken; those for core staff, and the ratification of the existing draft staff rules, should be undertaken as a task of some urgency. Proposals for personnel management norms have been made recently by SCL and should be adopted with appropriate modifications.

There are two unusual aspects of personnel emoluments and benefits, relating first to privileges and immunities conferred by the member states. The acceptance of international privileges for CARDI and its staff by some member states, but not others, confers considerable advantages (income-tax-free, duty-free, etc.) on staff posted to these territories. No arrangements for rotational appointment to these territories, or compensatory privileges, exist for the staff, and

personal relationships have been affected by discrepancies in compensation, particularly when nationals of the territories concerned have been posted in their own countries.

Second, a relic of the colonial period, study leave (based on the former home leave) applies to all staff with three years of service or more, and permits senior staff and their families up to five full passages to travel once every three years, for up to three months (or whatever period is accrued at up to one month per year) to any country of their choice as a right rather than as an earned privilege. The only limitation being that round-trip economy fares should not exceed those from duty station to the United Kingdom. This right imposes a major financial burden on the Institute. While sabbatical or study leave is an excellent principle, a three-year cycle appears excessively frequent, considering staff (and family) numbers and available resources. This and other existing norms relating to travel, in particular, should be carefully reviewed.

CARDI salary levels are good but attention needs to be given to fair rates of exchange outside Trinidad & Tobago, especially the index linking of salaries in those countries with high inflation rates.

There is at present considerable and understandable concern among both senior and support staff over the late payment of salaries; at the end of June 1985, salaries were over one month in arrears in Trinidad. Furthermore, accrued back pay is still owing following an incremental award in Trinidad, and a new collective contract is now over two years in negotiation. Management and staff were only recently called together to discuss the reasons underlying this crisis. Such staff meetings have been notably absent in CARDI management and must be instituted as a matter of urgency. Field staff in particular need more and better interfaces with management.

All of the above contributes to a low state of staff morale and creates a climate in which constructive work is virtually impossible, even if funds were available. The morale of support staff is equally low, and they feel that they have insufficient opportunity to air their concerns to management which, in turn, is preoccupied with constant financial crises.

#### Recommendations

- \* That early attention be given to correcting the anomalies created by the existence of at least two different forms of senior staff contract.
- \* That regular management/staff meetings be instituted at an early date to facilitate a better two-way flow of information.
- \* That the personnel structure and policies of the institute be revised in accordance with modified SCL recommendations.
- \* That the rules governing "study leaves" be revised to make the granting of such leave conditional on performance assessment, and at wider intervals.

### 3.8 Facilities

The need for a physical infrastructure to carry out CARDI's research activities has resulted in the establishment of a regional decentralized network of experimental sites and offices located in each CARICOM country.

Experiment stations are sited on land allocated to CARDI by national governments. In almost all cases, facilities and equipment have been provided by external funding aid, especially from EDF. CARDI's field facilities are summarized in Table 28.

CARDI's physical facilities are modest and utilitarian. At the country level, offices are located at small field stations in St. Kitts, Belize, Montserrat, and Antigua; in accommodation provided by the ministries of agriculture in the other Eastern Caribbean countries, and on the campus of UWI in Jamaica, Barbados, and Trinidad (CARDI headquarters). In Jamaica, CARDI occupies a former RRC building, not all of which has been handed over by UWI, thus creating some accommodation problems. This unit badly needs additional equipment, notably a desk-top computer.

In Barbados, the CARDI unit is housed in a new single-story building, but continuing dependence on UWI for utility services -- especially international telephone links and a continued reliable supply of electricity -- has raised problems. The Entomology Laboratory in Barbados is provided by the Sugar Growers' Association and, though small, has the necessary facilities and equipment for its work. A similar arrangement with NACO in St. Kitts provides a small pest control laboratory facility which works closely with the unit in Barbados. The tissue culture laboratory in Diamond Valley in Barbados is adequate and is fairly well equipped, although its greenhouse facilities need to be better protected to avoid outside contamination.

Historically, and as a result of its only partial separation from the University, CARDI headquarters in Trinidad has no buildings or land of its own. The building it occupies (offices, laboratories, library, etc.) is now rented from the UWI Faculty of Agriculture. It is relatively new, and the laboratories are moderately well equipped. However, offices and laboratories present a neglected appearance. The general environment was that associated normally with a situation of low staff morale. In contrast, buildings on the UWI campus in Jamaica and Barbados, though modest, were well maintained and in keeping with the enthusiasm and morale of the local personnel.

The present network of facilities covers a good sample of the different environments in which CARDI operates. During its 10 years of operation, CARDI has thus built up an infrastructure of facilities which represents one of its most valuable assets.

Generally, field and laboratory facilities and equipment are about adequate for present needs. There are some shortcomings which need to be made good and, in particular, a number of country units need access to more land for on-station trials. Such deficits as exist reflect the ad hoc planning process and sporadic financing. Physical plant and equipment have not been built up according to a coherent plan, and

Table 28. CARDI field and laboratory facilities.

Country	Facilities	Experimental Areas/ha	External Funding Agency
Trinidad	* Central Analytical Laboratory (CAL)	-	TT-MOA EDF
	* Field station building (El Carmen)	20.0	
Barbados	* Tissue culture laboratory (Diamond Valley)	-	EDF EDF Barbados Sugar Producers and Barclays Bank International
	* Field station building (Graeme Hall)	10.0	
	* Entomology laboratory	-	
Guyana	* Field station building (Ebini)	-	EDF LIDCO/IDRC
	* Field station -- pastures (Moblissa)	600.0	
Grenada	* Field station building (Calivingy)	-	EDF
St. Lucia	* Field station building (Dennerly)	13.0	EDF & USAID
Dominica	* Field station & pathology laboratory (Botanical gardens)	2.5	EDF
Antigua	* Field station building and station (Betty's Hope)	25.0	EDF & USAID
St. Kitts	* Field station building and station (Taylors Range)	2.0	USAID & EDF NACO
	* Entomology laboratory (NACO)	-	
Jamaica	* Field station building (Lawrence Field)	14.0	EDF
Belize	* Field station building and station (Belmopan)	10.0	EDF
St. Vincent	* Entomology laboratory	-	Sugar Assoc. & Arrowroot Assoc.

Source: ISNAR, CARDI Mission.

capital items and their maintenance have been underfunded. The Mission recommends, therefore, that CARDI should prepare a specific project focused on improving existing facilities. This reassessment of facilities should be based on the proposed reorientation and consolidation of the Institute's program in a 10-year perspective, as outlined in this report.

The project should present the short-, medium-, and long-term needs of CARDI for field, laboratory, and office facilities, respectively, and should take account of the needs of shared facilities with the national research systems of the CARICOM countries and other national and regional entities.

A major responsibility of CARDI is the maintenance of old soils and pesticides laboratories, the Central Analytical and Pesticides Laboratories (CAL), now threatened with closure. This closure, although justified on cost-effectiveness, could cost CARDI, through no fault of its own, the expenditure of over TT\$3 million in redundancy and severance payments, owing to the liberal nature of local labor legislation.

The laboratory is in a poor state of maintenance, and most of the instruments need to be either replaced or repaired. The technical staff are experienced and are knowledgeable of modern methods of analysis and have proven they can perform satisfactorily.

The main problem of CAL lies in the marked decrease in the number of samples submitted and the low output of results in terms of numbers of samples per year which go to the farmers. In 1980, an internal review committee on the operations of CAL recommended that the laboratory be upgraded and retained; at that time, the projected demand was 25,000 samples or approximately 130,000 analyses per year. The actual number of samples analyzed, at present, is less than 10% of the projected demand. (See Section 4.4.3)

The observations and comments of the clients of CAL indicated that lack of prompt return of results to the users (researchers, other institutions, and growers) has been one of the causes for the continuous decrease in the number of samples submitted. The cause is clear. CAL's performance is reduced to a minimum by the scarcity of operational funds. No laboratory can perform adequately without reagents and other chemicals, adequate equipment, and proper maintenance. The laboratory staff are now underutilized. The Mission believes that CAL finds itself in a vicious circle which needs to be technically addressed.

The Mission agrees that the laboratory is one of CARDI's major assets in which there is considerable financial investment and that analysis facilities are needed to support CARDI's activities. However, based upon the economic constraints under which CARDI is operating, the very low output which makes the whole operation of CAL uneconomical to maintain, and that CARDI's program will be reoriented, the Mission reluctantly suggests that CAL be closed down. An internal committee or task force should be appointed to define CARDI's requirements for laboratory services, and how they can best be met either by a smaller well-equipped laboratory or by contracting out the work to other laboratories in the region.

The task force should examine to what extent samples could be analyzed in other laboratories in the region, such as the WINBAN facilities, Caroni Limited, Guyana, Jamaica, and others.

### Recommendations

- \* That CAL be closed down. An internal task force should reassess CARDI's needs for analytical services and whether these are better met by a much smaller but up-to-date laboratory, equipped for rapid analyses or by contracting out the work to another laboratory. Other users of CAL should be consulted and may wish to support a joint facility.
- \* That CARDI prepare a specific project aimed at correcting the deficiencies in its physical plant and equipment.

### 3.9 Relationship with Member Countries and National Agricultural Research Systems (NARS)

The CARICOM countries provide the core funding of CARDI. Additional funds for specific projects come from bilateral and multilateral agencies such as USAID, CIDA, EDF, UNDP, IDRC, and others (see Section 3.11).

CARDI is highly regarded by the governments of the Eastern Caribbean countries, where it is seen as performing a complementary role to the National Agricultural Research System (NARS), often in response to emergency needs of the agricultural sector. All of the Eastern Caribbean countries are small-island States, and the ministries of agriculture in most of the countries have limited resources for mounting and maintaining a national research system. Typically, countries have one or two professionals to serve as research officers in their ministries of agriculture.

The relationships between CARDI and its member countries are markedly different between the LDCs and the MDCs; although one major effort in all 12 territories is the participation of CARDI staff in various committees of government and para-government bodies.

In all the LDC member states, including Belize, CARDI personnel participate actively in the country's agricultural activities, often at ministerial level, and are considered an integral part of their planning mechanism, as in St. Kitts/Nevis, Montserrat, and Dominica. In St. Vincent, the agricultural research planning committee of the Ministry of Agriculture is chaired by the CARDI Head of Unit, and in Nevis, the CARDI Head of Unit functions on-call as an adviser to the Minister of Agriculture, Lands, Housing, Labor and Tourism; similar situations prevail in St. Lucia and Belize.

CARDI's current relations with the LDCs are less satisfactory. This is a complex problem which needs to be carefully addressed. The MDCs have their own research systems, built up largely during the past decade. They are less dependent on CARDI's support.

CARDI's lack of concentration and depth in any one field has resulted in a lack of definition and understanding of what CARDI can do best and where its long-term contribution to the MDC agriculture lies. CARDI is sometimes perceived as another technical assistance agency rather than as an integral part of the NARS in these countries. While CARDI has often contributed to stability and retention of key personnel, it is frequently criticized for duplication of effort and lack of cooperation with the national researchers.

CARDI's relations with government officers in Barbados have improved considerably in recent years, after some initial misunderstandings. What joint work is being undertaken depends for its success on the untiring efforts of CARDI's young and energetic team who are working mainly with the private sector, with the sugar industry's crop diversification program, and with the Agricultural Development Corporation. Room for misunderstanding still remains, as CARDI's expertise tends to duplicate that of the NARS, especially in the entomology and livestock fields. Only in the fields of yam virus and biological control work on cane moth was CARDI able to effect institutional programs which drew on its core specialists and had a worthwhile economic impact. Current livestock program work on pasture establishment and regeneration shows considerable promise and could well prove the success story that CARDI so badly needs.

The Mission was satisfied that much earlier feeling generated in Barbados had now been smoothed out. Advice was given informally by Mission members on ways and means to improve working relationships, particularly by continuous close liaison on what CARDI is doing and should do. The Mission is confident that the results of good work will bring their own reward.

The situation of CARDI in Jamaica is equivocal. In order to satisfy national requirements regarding the utilization of CARDI funds in Jamaica on nationally important projects, CARDI has stationed some of its more experienced staff in the country. Working relationships with the Ministry of Agriculture staff are not, however, as good as they should be. One reason for this is physical separation. CARDI is located on the UWI campus, and is now further separated as a result of the Research Departments' move to new quarters at Bodles. Moreover, the loss to CARDI of two of the senior Ministry personnel, as seen in other countries where CARDI works, led to some official displeasure and personal misunderstandings with former colleagues. It was felt that CARDI had insufficient dialogue with local authorities in the formulation of its program, which was said to be simply presented in a completed state to the Ministry of Agriculture. The Mission urges early dialogue between CARDI and the Ministry of Agriculture towards achieving agreed projects which complement the work of the Ministry. Within such a program, CARDI's regional responsibilities should be preminent.

Relations with the University at Mona are more satisfactory. One of CARDI's more effective programs is the one on Coffee-berry Borer, being conducted with the cooperation of the University Department of Zoology and the Coffee Industry Board. This project is of high national priority, and the level of tripartite cooperation achieved was commended by all authorities interviewed.

In Belize, the CARDI team is very effectively integrated into the overall national activities in both agricultural research and development. Because the CARDI unit is established close to the Ministry of Agriculture, the CARDI Head of Unit is conveniently on call to participate in all high-level discussions in the Ministry. The national agricultural research service is situated at Central Farm at Cayo, some 50 km distant from the capital, and the agricultural officers comprising the staff have teaching (intermediate level) and extension responsibilities as well as research functions. The two CARDI research staff complement the Ministry's activities. Research plans are discussed in detail and, while a fair degree of independence is enjoyed in the operational phase, subsequent evaluation is a joint activity with the Ministry. A vigorous program is being maintained in support of the Ministry's basic policy of import substitution and crop diversification, particularly in vegetables, peanut and oilseeds.

CARDI has undertaken several initiatives in the development field, assisting in the establishment of a pilot industrial peanut plant and currently promoting soya processing, as well as organizing cooperatives and assisting farmers and cooperatives to secure loans from the Development Corporation. Ministry staff have high praise for the local CARDI effort, which has already led to considerable reduction of vegetable imports and the production of exportable quantities of peanuts.

CARDI is being urged to go into food technology/processing and marketing research, should funds permit, in view of the great potential of Belize to produce exportable crops for the Caribbean region. It is also anticipated that CARDI will play a major role in the coming USAID project for crop diversification and mainly directed to the production of crops on cane lands.

In Guyana, the recently reorganized NARI has not been in existence long enough to have established a formal working relationship with CARDI. However, relations with Ministry personnel are good, showing a great improvement since the appointment of the present CARDI Head of Unit. Earlier strained relations resulted from two major causes, the inability of CARDI to fulfill its assigned role in the Intermediate Savanna area, a difficult, pioneering type of environment, assigned to CARDI because government staff could not be persuaded to stay there; and the subsequent duplication of some aspects of the government program in the easier coastal plain environment. The rather difficult economic climate in Guyana made retention of staff difficult, and CARDI programs suffered badly from lack of continuity, except in the dairy development program. Formerly, the local CARDI unit in presenting, rather than jointly planning its program with the Ministry, intensified the image of an external agency, already fostered by the high salary differentials between CARDI and Ministry staff.

Recent agreements on future programming, with clear definitions of responsibility in both separate projects and joint activities, suggest that future relations will be more cordial and harmonious, particularly if CARDI can effectively support NARI in one or two key fields. A closer relationship between CARDI and the Inter-American Development Bank (IDB), the major external financing agency in Guyana, is also desirable. The IDB has a number of new agricultural projects in its pipeline, many of which present well-focused research opportunities.

The relationships of CARDI within Trinidad, its host country, have always been dominated by its relations with the University (see Section 3.11 below). Until the early 1980s, the government's great preoccupation with the oil industry and industrial development in general, resulted in relatively little attention to agriculture, least of all to regional agricultural research, which tended to be regarded as a technical assistance gesture to the LDCs. However, an eventual desire to see some direct return for subventions to CARDI led to the establishment of the CARDI Trinidad & Tobago Unit. This Unit has never disposed of adequate funds to conduct a meaningful program; the percentage of funds expended on salaries alone frequently exceeded 90%. This has led to considerable dissatisfaction and criticism from the NARS, which has a large staff of about 65 professionals who should be able to absorb the work assigned to the CARDI Unit, except insofar as that constitutes part of regional activities. As elsewhere in the MDCs, CARDI's role has never been seriously considered and defined. Furthermore, the staff of the Trinidad & Tobago unit was always seen as a part of CARDI's headquarters, absorbed in regional and teaching tasks. But the Trinidad & Tobago operations, involving the headquarters and Trinidad & Tobago units, suffer most from cash flow, as other governments have not been remitting their payments to headquarters.

Very recently, the Ministry of Agriculture has embarked on a review of agricultural research spending, including that on CARDI. Although the report was not available to the Mission, preliminary indications suggest that ways and means must be found to reduce expenditure and/or improve the effectiveness of the investment. In Trinidad, the Ministry of Agriculture has two committees, a Policy Research Committee and a Liaison Committee, to ensure allocation of research activities with minimal duplication. CARDI is an active member of these committees.

There is a considerable amount of goodwill towards CARDI in Trinidad, and sympathy over its financial problems. Because of CARDI's origin, its ties to UWI, and the fact that most of the original core staff were Trinidadian, there persists a feeling that CARDI is "their" organization. Professionally, the work in general pathology, virology, and biometrics is highly regarded, although general management and the lack of planning, monitoring, and evaluation are heavily criticized. Similarly, CARDI is criticized, perhaps unjustly, for its indecision in handling the problems of CAL. While this is essentially a problem taken over by the Trinidad & Tobago government (owing to governments' and UWI insistence on maintaining it, contrary to CARDI's wishes), the problem of payment of salaries and maintenance devolves on CARDI, which has not yet received any funding for this purpose in 1985.

It is acknowledged by everyone that CARDI faces special problems in Trinidad & Tobago where the local labor laws are extremely liberal towards the employee. Further severe problems may be anticipated should CARDI decide to retrench and create redundancies, as it will need to find heavy additional funding. CARDI is thus in the inevitable situation of having to consider retrenchment to meet a financial shortfall, but requiring additional funding to effect this retrenchment.

One general comment received regarding CARDI's relationships in the MDCs, and to a certain extent in the LDCs, suggested that the Institute lacked assiduity in ensuring that appropriate acknowledgment is made to national participants in joint projects, e.g., in titles and reports, seeming to prefer to maintain a high CARDI profile. On the other hand, the Mission was also told that CARDI is poor in public relations and should do much more in getting itself known and its work appreciated. CARDI needs to establish a policy guideline on this point.

The Mission emphasizes that close interaction and partnership with the NARS is not only essential, but must be carefully sustained by continuous monitoring in order to maintain a proper balance in R & D activities between national and regional commitments at the country level. There is a tendency to spread CARDI unit activities in response to continuously changing short-term national plans and unforeseen circumstances. As a result, continuity in the process of technology generation is lost, the CARDI effort is diluted, and its potential impact, both in the country and the region, is jeopardized.

CARDI should make an effort to establish coordinating mechanisms at local and regional levels to permit the participation of both public and private sector agricultural research institutions in the process of planning their regional activities. In this context, the Mission believes also that country NARS representatives should be members of the proposed Research Advisory Committee (RAC-CARDI).

#### Recommendations

- \* That two or three members of the country NARS be selected to participate in CARDI's proposed Research Advisory Committee and represent the NARS, on a rotational basis, for a period of two or three years.
- \* That a firm effort be made to achieve better working relations between the Ministry of Agriculture and CARDI in Jamaica.

#### 3.10 Relations with the University of the West Indies -- Faculty of Agriculture (UWI)

To understand the current status of relations between CARDI and UWI, it is necessary to reexamine the historical background to the founding of CARDI (see Section 3.1 above). The mandate and terms of reference of CARDI were very different from those of the RRC and the faculty, and many of the staff members found it extremely difficult to accommodate to the change. They were not equipped for a mission-oriented developmental role and were not happy about the loss of much of their former teaching duties. The University, for its part, suffered the loss of some of the more seasoned of its faculty members; a reduction from 75 to 32 senior staff scientists and consequent loss of revenues, while no separate arrangements were made for their administration.

The consequence of this was that CARDI had to negotiate with the University a servicing charge for the handling of CARDI's accounting. A figure of 20% was agreed upon, and this applied to each campus where CARDI was accommodated.

A further complication of relations between the two institutions arose out of a dispute over ownership of permanent buildings. The legal instrument establishing CARDI states that title to all property vested in the University on behalf of RRC should be transferred to CARDI. This has never been effected with respect to buildings, although CARDI believes that it has the right of ownership to several buildings, including some residential quarters, on both St. Augustine and Mona campuses.

Unfortunately, title documents have been mislaid. The University currently charges CARDI rental for the occupancy of a recently completed building, built with a Trinidad & Tobago guaranteed USAID soft loan ostensibly for CARDI, and based on negotiations which began during the life of the RRC. Clarification of these issues is long overdue, and the Mission urges that advantage be taken of the UK/ODA offer to make available RRC documentation, recently removed from archives, for this purpose.

Throughout the whole of CARDI's existence, personal differences have exacerbated relations between CARDI and UWI and have militated against the proper implementation of the Memorandum of Agreement drawn up between CARDI and UWI to facilitate their loose affiliation in work of common concern. This originally anticipated close liaison with the University was reflected in the appointment of no less than three UWI faculty members to the CARDI Board of Directors and making the appointment of CARDI's Executive Director subject to UWI approval. There has been considerable cooperation, but where this has been successful it has nearly always been at the personal, rather than the official level. Nevertheless, most former RRC staff retain their University teaching status and are still giving classes, supervising students, and acting as examiners. For these services, the University makes no payment. Certain new CARDI staff have also been accorded faculty status, but in their case CARDI is able to request payment.

Present relations between CARDI and UWI remain unsatisfactory. There have been accounting problems, and recently the Board of Governors of CARDI decided to reduce the UWI representation on the Board to one seat to bring it into line with other territories and faculties (e.g., the University of Guyana) representation.

Close liaison and collaboration, on a mutually supportive basis, are important for the furtherance of the work of both institutes and to the region they serve, and CARDI needs to seek assistance in the reformulation of a logical and mutually acceptable relationship with UWI. This leads the Mission to recommend, as a matter of some urgency, an unbiased investigation of existing differences over property, outstanding accounts, etc., as between CARDI and UWI and the appointment of an experienced arbitrator to renegotiate a working agreement between the two parties.

#### Recommendation

- \* That, as a matter of urgency, an arbitration mechanism be established to renegotiate an agreement between CARDI and UWI (Faculty of Agriculture) and resolve outstanding differences between them.

### 3.11 Relations with Donors

The donors to CARDI's core financing are the member governments of CARICOM. These governments' attitudes towards CARDI may be partly adjudged from their lack of response to constant urging from the Standing Committee of Ministers of Agriculture to make good arrears of subventions and current dues to CARDI, amounting in total to over TT\$5 million. It must be recognized that, in the face of steadily worsening domestic economies, genuine difficulty is experienced by some countries in meeting their commitments. However, some of the least affluent (i.e., Guyana) do, nevertheless, maintain a regular record of payment. Without exception, the six ministers of agriculture met by the Mission affirmed their continued support for CARDI with varying degrees of enthusiasm, reflecting the ways in which CARDI was utilized within their country. However, the official attitude was frequently at variance with that of senior technical officials of the ministry of agriculture, for reasons referred to in Section 3.9. There is clear need for CARDI to work consciously to improve and sustain good working relationship where friction has occurred.

CARDI has, since 1978, been able to attract considerable external financing, thanks to its position as the only viable regional agricultural research institution serving the needs of the LDCs of the Caribbean. Principal among these donors has been USAID, supporting small-farm systems research in the Eastern Caribbean; the EDF of the EEC, which supports arid improvement, forage seed production, and pasture establishment, soil and water conservation, and a pilot experimental farm; and IDRC of Canada, which supports dairy development in Guyana. Projects have also been supported during the review period by UK/ODA (yam virus), Barclays Bank International, CFTC, CDB/CFC, and CIDA (Canada). (See Annex 4.)

The Mission contacted representatives of all the major external donors, with the exception of IDRC. The reaction was mixed. Some donors find CARDI attractive; others worry about its lack of solvency and weak regional leadership and, with one exception, there is growing concern about CARDI management of their projects. Closer inquiry elucidated two basic reasons. First and foremost was the state of CARDI's management structure with, in the recent past, indecisive leadership, frequent changes in the two top managerial positions, and reluctant or lacking senior staff support. Second, the worsening state of CARDI's own core financing, which prevents CARDI's fulfillment of its capital commitments as a counterpart participant in the projects and worse, leads in some cases to the utilization of project funds to meet core shortfall.

On the basis of current performance, therefore, two major donors felt that future support for CARDI projects would depend on substantial reforms in core financing and management. Both would welcome any constructive proposals for improvement which might be forthcoming from the current evaluation. Other donors, particularly those supporting the Eastern Caribbean, felt committed to CARDI, observing that if CARDI did not currently exist, it would need to be created.

In exculpation of CARDI's shortcomings, one donor drew attention to the general state of agriculture in the Caribbean, particularly the attitude of CARICOM governments towards financing of agriculture, the highest national expenditure in any country being only 6% of the national budget. CARDI's finances clearly suffered as a result of this general indifference and only a change of attitude at the highest level could effect an improvement.

Donors also expressed concern that CARDI was no longer able to compete for the best available staff, not because its salary levels had in any way been changed but simply because its tenuous financial situation may have made career prospects less attractive. As a consequence, donors felt that CARDI was recruiting a number of mediocre staff, whom it would unlikely be able to upgrade in the near future, and consequently was losing any comparative advantage it might once have had vis-à-vis other research institutions at the national level, or the University. The Mission feels that this may be true to some extent, but it should be borne in mind that donors' provisions for technical assistance personnel costs within projects do not always reflect the reality of actual personnel costs in much of the Caribbean, and CARDI must on occasion recruit at levels below its own normal core staff costs and statutory gratifications. Donors also have resisted CARDI's need to charge overhead for central services. In the absence of CARDI's regional strategy referred to earlier, donors have not invested much in what could be CARDI's regional networking function of the provision of regional services. Donors have stressed country-specific and often small short-run projects. Thus, there is reciprocal weakness in CARDI's donor relations. If a well-conceived regional program existed, backed by a minimum mass of high-quality researchers, donors could be found, since donor support is essential to building up just that sort of regional capacity of CARDI.

The general conclusion drawn by the Mission was that donor support is likely to continue but will depend on CARDI adopting a clear, well-defined regional strategy, based on the common problems of its client countries and concentrating its present widely dispersed resources on those problems; on considerable improvements in its program and financial management; and finally on its ability to properly meet its counterpart obligations from a secure financial position resulting from regular receipt of pledged contributions. The Mission feels strongly that in order to avoid duplication and overlap in special project activities, CARDI should ensure regular contacts between its various donors, taking advantage of existing regular forums in the CARICOM region to convene meetings of its donors. The meetings of the CARICOM Group for Coordination and Cooperation in Development suggest themselves as a suitable venue for such meetings, avoiding much additional expense, either for CARDI or donors.

#### Recommendation

- \* That CARDI take advantage of existing forums in the CARICOM region to convene regular meetings of its principal donors to ensure coordination of its special project funding.

### 3.12 Relations with Extension Services

It was the opinion of several authorities interviewed, particularly in the MDCs, that although CARDI had had some success as a research institution, the development part of its activities had been either lacking, or hardly visible.

However, a review by the Mission of the materials produced by CARDI, activities performed in the countries related to the extension projects under way, such as CARDATS and CAEP, and especially discussions with national extension authorities and farmers -- particularly in the LDCs -- indicate that CARDI is far from lacking success, at least in the extension part of its development activities.

In the Caribbean region there are two specific projects of technical assistance to the CARICOM countries which deal with the strengthening of the extension services, and in which CARDI participates quite actively. One of these projects is "Training and Agricultural Development", which places emphasis on aspects of farmer training and agricultural development. The project is presently financed by UNDP (US\$709,000) and a contribution of the European Community Countries (US\$1,658,643). The operating agency is FAO, and the operating unit is the Caribbean Rural Development Advisory and Training Service (CARDATS). CARDATS has its headquarters in Grenada and places its emphasis in all the LDCs. The thrust of the program is the development of the small-farmer sector by assisting them with inputs, management information, credit, marketing systems, and by promoting the organization of farmer groups. CARDI has the role of putting the existing technology recommendations at the disposition of the project as a result of its project on Crop Production Systems, and lately its project on Farming Systems work executed with the financial support of USAID. The second regional activity is the Caribbean Agricultural Extension Project (CAEP). It is a collaborative project funded by USAID with the technical assistance of the Midwestern Universities Consortium for International Activities (MUCIA), and has as executing agencies the UWI and the governments of Belize and the LDCs.

The project was set up with the objective of strengthening the effectiveness of extension services themselves and to increase the capacity of UWI to backstop and support them. Phase I (US\$1.56 million), the analysis phase, has been completed, and Phase II (US\$6.7 million), the program implementation phase, is oriented to strengthening the extension system through training programs, organization, technical assistance, provision of equipment, vehicles, communication tools, and support to the Faculty of Agriculture of UWI. CARDI participates actively with CAEP, producing materials -- handouts, special bulletins, etc., -- for the extensionists and farmers, and serving as a resource institution in the CAEP training program. At the level of management, CARDI participates as a member of the Board of the project (the "Regional Agricultural Coordinating Extension Committee") and on its "Technical Joint Action Committee". The Mission was able to witness the close CAEP-CARDI relationship during the visits to the LDCs and obtained a very favorable impression of CARDI support during a visit to the Program Leader, Leewards, based in Antigua.

The Mission believes that the poor opinions of CARDI's performance in supporting development activities result from three main reasons.

First, CARDI always offers its numerous "technical packages" through local ministries of agriculture or through other national authorities (even though taking credit for them in titles, etc.) and thus it loses, to some extent, its identity in the diffusion and extension process.

Second, the real need for a clarification of the functions CARDI should perform in its development role in view of the fact that such a role should depend on national policies and that all the countries, without exception, have extension services whose main role is the rural development of their respective countries. Third, CARDI does practically no development work in the MDCs (with the exception of Barbados) and relies, for good or bad, on local extension services.

The dilemma of CARDI being expected to take a low profile on the one hand, yet having to fulfill its mandate and confound its critics, on the other hand, is understandable. Obviously, more needs to be done, but it is the Mission's opinion that within the restrictions of its resources, CARDI is correct, at least in the LDCs, to combine experimentation and outreach work in the same teams, and often incorporating extension workers in field trials, leaving the extension part per se in the hands of the national authorities. In a number of countries, however, the separation of research and extension makes such integration difficult. An outstanding example of integration witnessed by the Mission was a most attractive teaching guide prepared jointly by CARDI/Barbados and FAO/Santiago on black-bellied sheep, used in a regional workshop on the same subject.

The Mission was not able to assess the actual development activities on a time and cost basis. Program and budget breakdowns did not facilitate such analysis. The Mission's observations suggest that CARDI's effort to support developmental activities is considerable but that there is a need for it to be quantified and better reported. Therefore, the Mission recommends that CARDI should define appropriate areas of action in its development role, including not only extension but processing, marketing and training, and include them as a program activity within its overall program.

#### Recommendations

- \* That CARDI clearly define its concept of "development" in the context of its regional work.
- \* That work in the LDCs should continue to be adaptive research and development, but development activities should not be increased above the present level while research is slow in generating new technology.
- \* That development work in the LDCs should be confined to those activities where CARDI has a special advantage.

Chapter 4

4. CARDI'S REGIONAL PROGRAM CONTENT AND BALANCE

4.1 Introduction

CARDI's role in the LDCs and MDCs of the CARICOM Caribbean, with their very different needs for support, is not clearly spelled out; nor is there an indication of the balance which is expected to be achieved between R & D and between regional and country-specific work.

Programs are carried out by 58 professional staff in 12 countries, and their content is as diverse within countries as between them. The staff fall into two professional groups. There are 19 specialists engaged in regional activities. Nine are based in Trinidad, nine in the Eastern Caribbean, and one, an engineer, in Jamaica. A horticulturist, stationed in St. Lucia, is attached to CARDI for two years from the Asian Vegetable Research and Development Center (AVRDC), and an advisory engineer and a post-harvest technologist are provided by the Commonwealth Fund for Technical Cooperation (CFTC) for work in the Eastern Caribbean. The European Development Fund (EDF) provides the leader of CARDI's forage seed and improved pasture program.

Thirty-seven professional staff fill generalist posts and serve in country teams of two to six members. Twenty-four are in the LDCs. A number are specialists in their own right.

4.2 Country Unit Research in the Less-Developed Countries (LDCs) of the CARICOM

4.2.1 General

CARDI has a special role in the LDCs, where for all practical purposes the Institute has become the main research arm of national ministries of agriculture. Individual countries are too small to justify the establishment of agricultural research departments, and the smallest countries have only one research officer. Nor can they offer to pay the salaries needed to attract well-qualified professionals. The research done by CARDI country teams is adaptive and appropriate to these circumstances.

The Farming Systems Research and Development Project (FSRDP) supported by USAID currently dominates CARDI activities in the LDCs. The project carries out research in the seven countries of the Windward and Leeward Islands and has a unit in Barbados. The headquarters and most of its specialist staff are located in St. Lucia. At present, there is a total of 24 professional officers, made up of a project manager, who is also Deputy Executive Director of CARDI, six specialist scientists (two of

whom are nominated as Technical Coordinators for the Windward and Leeward Islands respectively) and 17 generalists in country teams (two on study leave). A country team usually consists of a country team leader, a CARDI country team member and a member attached to the team as a counterpart by the host government. In all LDCs, except Belize, where the project does not operate, and Dominica, the FSRD Project country team leader is also CARDI's Country Team Leader, underscoring the project's major role in CARDI activities in these countries. By virtue of the resources at its disposal, the project accounts for a major part of research work carried out by CARDI in the Eastern Caribbean region.

The other major project in the LDCs is an EEC/EDF-supported project. It is concerned with regional research on aroids and with development-oriented work on soil and water management and pasture improvement. (See Sections 4.4.1 and 4.5).

In Belize, there is a team of four professional officers, one of whom is head of unit.

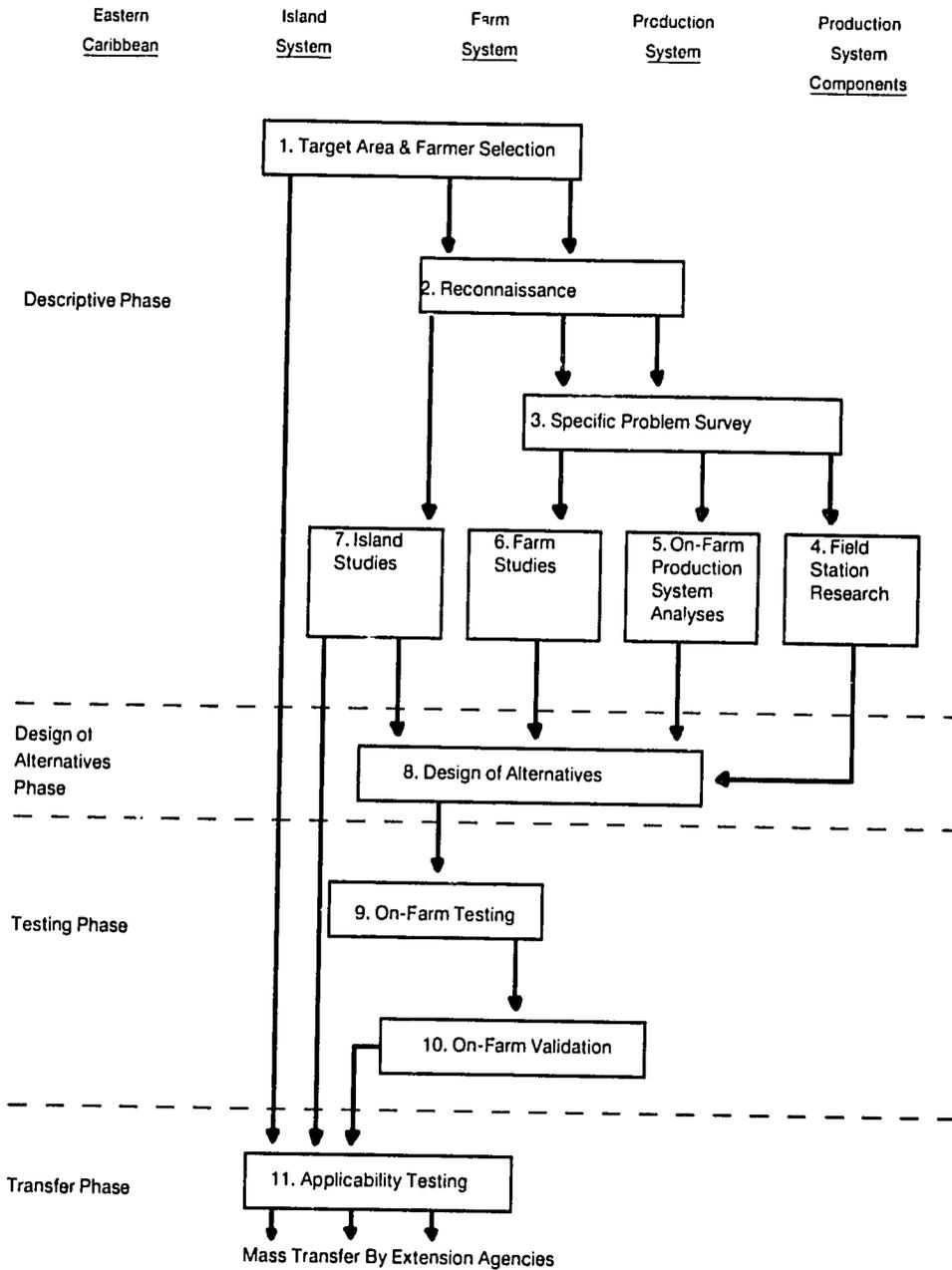
#### 4.2.2 The farming systems research and development project

The purpose of farming systems research is to identify the potential for better farm productivity and the constraints to change in location-specific situations, and to seek solutions that are relevant to these conditions and meet farmers' needs. CARDI's move into farming systems research reflected concern at the limited impact made in the region by earlier and more conventional experiment station research along commodity and discipline lines. The program began with a grant of US\$2.2 million, by USAID in 1978, for the Caribbean Small Farm Multiple Cropping Systems Research Project to enable CARDI to develop on-farm research capability in the LDCs of the Eastern Caribbean. A further grant of US\$7.55 million for a FSRD Project extended USAID support for a second phase, 1983-88.

Phase 1 was largely occupied by baseline surveys of 120 farmers per country, some of which were contracted to UWI, leading to the selection of subsamples of 25 farmers per country, from which more detailed agro-socioeconomic data were collected on a weekly basis for a period of one year. On-farm trials were initiated in the latter part of Phase 1 to test possible improvements to farming systems.

A USAID evaluation mission in early 1982 identified a number of weaknesses in the Phase 1 program. The evaluation mission found that the program of work was too ambitious, and the project had spread itself too thin. The subsamples of farmers represented neither homogeneous groups nor random samples of a country's farmers. CARDI disagrees with this comment and has provided USAID with evidence to contend that the samples were in fact representative. Data collection had been too detailed, and too much emphasis placed on data collection and analysis, together with a lack of implementation flexibility, had led to a cautious, slow approach to field trials. In the second phase, emphasis has moved to the "testing phase" on-farm trials as part of an eleven-step FSRD Project approach (see Chart 3). This moves from a descriptive through a design, to a testing and finally a transfer phase in a four-phase approach.

**Chart 3. CARDI'S FARMING SYSTEMS RESEARCH AND DEVELOPMENT METHODOLOGY**



Source: CARDI - FSRD project

Most of the project staff have come to farming systems research from more traditional upstream research backgrounds and, as yet, there does not appear to be a full understanding by many of the purpose of FSR and how it can be used to best effect. In Phase 1 of the project, it resulted in too-detailed survey work because of a lack of appreciation of what information needed to be collected. A more appropriate approach would have been a series of short multidisciplinary reconnaissance surveys of the kind CARDI recently undertook in Carriacou.

Data collection and analysis in Phase 1 occupied too much time and resources, and these studies seem to have made only a minor contribution to the selection of subsequent activities. The selection of commodities on which the project is now working has been based on their present importance to farmers, government allocation of priorities, perceived potential for import substitution and export, the expertise available to CARDI, and the availability of off-the-shelf technology.

The mechanics of the procedure for establishing work activities is good and takes into account the wishes of national governments. It begins with a meeting in each country of the staff of CARDI, the ministry of agriculture, and other organizations concerned with rural development. A program of activities is agreed upon and presented to one of two CARDI subregional planning workshops for the Windward and Leeward Islands, together with a report on the preceding season's activities. Draft programs are agreed upon, and each country team leader presents draft activity sheets, including an estimate of costs, to an annual regional workshop when programs are finalized to conform with the budget allocation to each country.

As is appropriate, the work is adaptive research. Varietal screening, simple agronomic practices, including intercropping, forage improvement and control of pests, diseases and nematodes are the major lines of approach. However, despite the procedure adopted to decide work programs, resources continue to be spread too thinly for staff spread over eight countries (including Barbados). In 1984-85, five country teams each had 11-15 activities in progress. One country had 21 activities. Work is done on a range of vegetable crops (broccoli, cabbage, carrot, cucumber, okra, onion, hot pepper, snap bean, tomato), cowpea, peanut, pigeon pea, soybean, miscellaneous legumes, corn, cassava, white potato, sweet potato, yam, cotton, and pasture forage banks. There is a range of miscellaneous activities from studies to improve backyard and garden production to the evaluation of small tools and machinery and a variety of survey work. Involvement in so many activities, many of minor importance, reduces the opportunity for bringing any to a meaningful conclusion. One reason for CARDI doing so is its too-ready response to requests for support by national governments. In the short-term, this may make for good public relations, but in longer term, as experimental work continues inconclusively, it does not. It would be more realistic for each team to concentrate on a limited number, say four or five, well-defined projects. Emphasis on on-farm research trials, which tend to be at numerous, separated locations, is a major constraint to the number of activities that can be pursued efficiently.

The above implies a further analysis of priorities. (For details, see Section 3.5). It was attempted for the whole region in CARDI's recent Strategic Planning Workshop (February 1985) but resulted in recommendations to maintain or increase existing activities in food security, add others, and end only one. Understandably, in the LDCs, CARDI has chosen activities where it can expect to obtain quick results. In the FSRD Project, this has resulted in concentration of work on vegetables and the annual food crops. Forage crop development, in which there is significant in-house expertise and knowledge, is covered by the EDF project. A notable omission is any significant input into tree crops which are important throughout the Caribbean. These are obvious candidates for work by a regional institution, but cannot be taken on board by CARDI without streamlining the present program.

There is a need for a greater degree of coordination of the project's activities than is evident at present. It was evident to the Mission that duplication does occur, for example, in work on onion, cowpea, and white potato. Networking is one means by which resources can be used more efficiently. Rather than for several countries to repeat similar on-station research, it would be more effective to assign the major responsibility for a particular activity, e.g., the introduction and screening of the cultivars of a particular crop, to one country only.

Another major weakness of existing programs is the small amount of work done on-station. Facilities for on-station work are grossly inadequate in most countries, and there is a tendency for work that could be done more efficiently and appropriately on-station and at less cost, to be done on farmers' fields. More on-station research would permit the introduction into the on-farm testing stages of treatments already known to have a very good chance of success. This situation appears to have arisen from reliance on core funds provided by the national governments for on-station work. Under the project, provision for experiment station operating expenses is made only for St. Lucia and Antigua. The Mission strongly recommends that every effort be made to remove this constraint to the provision of back-up research under the FSRD Project.

While the agro-socioeconomic data collected during Phase 1 of the Farming Systems work was too detailed, it seems to the Mission that much more attention needs to be directed to the collection of such information during on-farm testing and validation. The nature of the information needed will depend on the practices to be evaluated and requires careful assessment during the design of trials to ensure that resources are not wasted through failure to collect the right type of information or in the collection of unnecessary information. There needs to be much closer interaction between experimentalists and the social scientists. (Discussed in more detail in Section 4.4.2).

The Mission believes that there is a need for greater recognition that FSR is a methodology which, if used with proper understanding, can be a powerful research tool, but it is no stronger than the information it generates and the ideas fed in; nor does it replace the need for well-designed trials both on-station and on-farm. In a report to the second Annual Review and Planning Workshop of the FSR project, surprise was expressed at the many unscientific presentations of results of experiments and surveys in annual reports. The Mission endorses this

view and has particularly noted a series of trials carried out in one country in 1983-84, in which the same plot yields recur, probably because plots were small in relation to the unit of measurement. The data presented also show the three plot yields for the control plots in one trial to be the same as those for another crop in a second trial. If it is a typing error, as it is presumed to be, this still demonstrates lack of attention to detail in reporting, and careless editing. Also taking into account the high variability in these trials, the validity of the conclusions drawn from them must be open to doubt. The Mission was further surprised to learn that, at least in one country, plot observations are largely left to the farmers. There is a clear need for the biometrician to be involved in the design, analysis, and interpretation of trials and in editing reports before publication, as well as providing further instruction in the basic principles of statistical theory where this may be needed. These principles are not difficult to explain or understand, and the biometrician has already produced an excellent manual on trial design and layout for the Caribbean region. CARDI's credibility will depend on its reputation for sound professional work and the impact that work makes on production. There is no room in a regional institution for anything other than high-quality work.

#### 4.2.3 Belize

CARDI has a good team in Belize. Relations with government are excellent and the team leader is a senior adviser to the Minister of Agriculture. The team's work is primarily directed at import substitution in the light of studies that have been made of likely substitution benefits and which take full account of the foreign exchange costs incurred by large-scale crop cultivation. This work underscores the importance of substitution of edible oil and fat imports, and CARDI's program in Belize is primarily concerned with the evaluation of a range of oilseed crops (soybean, sesame, sunflower, rape and mustard, and peanuts), the introduction and testing of a wide range of vegetable cultivars, agronomic practices, and the economics of production. The work is appropriate and seems to meet the country's needs but, from the point of view of the Mission, it should form part of a regional oilseed network program.

#### Recommendations

- \* That CARDI establish firm guidelines on the priority to be given to the different activities of country teams, review the program of each team, and reduce each to a manageable number of projects.
- \* That greater emphasis be given to experiment station trials in order to provide improved back-up to the FSRD program.

#### 4.3 Country Unit Research in the Medium-Developed Countries (MDCs) of the CARICOM

CARDI has yet to make a niche for itself in the MDCs. National research services are numerically strong, even though their quality may sometimes be questionable. They are able to look to donor support in research fields where they are weak and supply national staff for training

overseas or for counterpart training by scientists supplied to fill key positions under technical assistance. A nonspecialized regional research institute is not essential for the furtherance of their research programs and, in three of the four MDCs in which CARDI works, there is undoubtedly a feeling that CARDI duplicates activities of national programs, or does what they could do just as well.

In Jamaica there is a country unit of four professional officers and an engineer with regional responsibilities. One of the staff, an entomologist, makes an important contribution to a project on the control of coffee-berry borer carried out in collaboration with UWI and the Coffee Board. Surveys have been made to establish crop loss due to the borer in the Blue Mountain region and island-wide and to evaluate the progress of, constraints to, and benefits from activities related to post-harvest sanitation. Studies have been carried out of pest population dynamics to establish seasonal and spatial changes in populations in relation to crop phenology, variety, and weather. The efficiency of insecticide control has been evaluated and work begun to determine factors affecting the surface deposit of endosulfan, the insecticide currently used for control. The work is highly professional, and the Mission believes it provides a good example of the type of input that can be best made in the MDCs by CARDI. In contrast, the rest of the unit's program is diffuse and largely concerned with cultivar evaluation and multiplication of food legumes, root crops and choyote, and production practices for peanuts and garlic. While this work is competently done, it is rather pedestrian and should be equally well performed by the national agricultural research service. However, in the opinion of a representative of a major international agency, CARDI gets high marks for practicality and field relevance in contrast to what he observed in the national public-sector agencies.

The Trinidad & Tobago unit has six professional officers: two general agronomists, a pasture agronomist, a plant pathologist (team leader), an animal breeder, and an economist. The unit provides a specialized input into a sheep development project in Tobago in which CARDI collaborates with the Ministry of Agriculture, Lands and Food Production, UWI, and Winrock International, and studies are made of the production performance of goats. Forage seed production and pasture development is supported as part of a larger EDF project based in the Eastern Caribbean.

The crop production program is largely concerned with maintenance and description of germ plasm collections of cassava, tannia (taro), sweet potato, and yam (a total of about 270 accessions); the introduction and evaluation of these root crops and a number of food legumes, drawing upon expertise in plant pathology and nematology; the development of tomato varieties with multiple resistance; cassava intercropping studies and the testing and validation of home production systems for vegetables in Tobago. The research output is small in terms of the numbers of staff and their experience and reflects the very limited resources available to the group which, for operational expenses, depends on what funds are available after payment of salaries to staff employed in Trinidad & Tobago and is shared with the running costs of headquarters and CAL. Most, if not all, of this work could equally well be done by national agricultural research workers who far outnumber the CARDI team.

The Research Division of the Ministry of Agriculture employs about 65 professionals. A further 10 senior research personnel are employed by CARONI Limited, and the UWI input amounts to an estimated 20 man/years.

The unit in Barbados is made up of three professional officers, the leader having regional responsibilities for animal science in the Eastern Caribbean. The program is manageable, with emphasis on biological and integrated pest control, production of virus-tested yam planting material, the development of a package of practices for cassava production for livestock feed, onion, and sweet pepper production, and on forage improvement and evaluation in terms of milk and beef production. A good self-teaching manual has recently been published on hair sheep production. The Barbados work is professionally done and emphasizes CARDI's special advantage in biological control of pests, tissue culture, and animal production. However, there is room for better liaison with the Ministry of Agriculture, to discuss and agree on the program of work and the division of effort between the two organizations.

CARDI has a team of two in Guyana, supported by two graduate assistants. After a false start in the interior, the current program is still small. The main activity is a milk production systems project, located at Moblissa in the Intermediate Savanna, financed by IFAD. The project is concerned with forage germ plasm collection and evaluation, forage conservation, use of by-products for feed, and the evaluation of pasture management systems. The Mission judged this particular line of investigation to be conducted satisfactorily, and it is a field in which CARDI has a special advantage in the region. It should therefore make a contribution as an appropriate CARDI activity.

If CARDI is to make further real contributions to agricultural research and development in the MDCs, it will need to redirect its support to lines of work where it has or can acquire recognized expertise and experience not available to national agricultural research services and, therefore, where it has something worthwhile to offer. CARDI will lose credibility if it extends its activities too widely and into areas where the work can be as well done by national scientists and where it appears to compete rather than to support.

#### Recommendation

- \* That CARDI should rethink its role in the MDCs. It should not attempt to do what national agricultural research systems are able to do as well. CARDI should seek to provide an input into lines of work only where it has, or can develop, an advantage as a regional institution.

#### 4.4 Main Research Areas (Specialist Research)

##### 4.4.1 Biological sciences

CARDI has a wide range of expertise in agronomy, plant protection, and animal production. As well as those staff filling specialist support positions, country team members include entomologists, pathologists, soil scientists, and animal scientists. A number have very considerable experience of the Caribbean.

Two resource agronomists are located in Antigua and St. Lucia to provide back-up for the FSRD Project. The agronomist in Antigua is also farming systems research coordinator for the Leeward Islands and technical coordinator for the FAO regional variety testing project on short- and medium-duration pigeon pea, as well as of peanut work carried out in collaboration with the University of Georgia (CRSP). In 1983-84, the agronomist's main activities in agronomy were variety testing of pigeon pea, cowpea, garlic, and eggplant, and maintenance of genetic stocks of a number of grain legumes.

The St. Lucia agronomist was concerned with cowpea, tomato, and cabbage variety trials, and the development of production systems using Leucaena. The agronomist is also concerned with the maintenance and description of a collection of sweet potato germ plasm and on-farm intercropping trials.

Both specialists are very experienced, but their work output is seriously limited by the resources available to them and in the case of the Leeward Islands agronomist by his various coordination and management duties. Both need more funds and some support staff if they are to make the full contribution of back-up research of which they are capable. The nature of CARDI's support for LDCs implies that their work should continue to be adaptive and that it be directed to providing back-up research for the small islands in the preliminary screening of material and testing of new techniques.

Plant protection specialists include a virologist, a plant pathologist, and a nematologist stationed at headquarters in Trinidad & Tobago: an entomologist, two plant pathologists, an agronomist, and a weed specialist in the Eastern Caribbean; two entomologists in Jamaica, one entomologist in Belize, and one plant pathologist in Guyana.

Funded from core, with minimal resources for research activities and travel, the plant protection group at headquarters, though experienced scientists, have through no fault of their own only a small research output. The nematologist has recently been concerned with nematode monitoring and control work in support of Caroni Limited and the Citrus Rehabilitation program of the government of Trinidad & Tobago, and with the evaluation of nematode problems in vegetable crops in Tobago. On conclusion of the research element and subsequent establishment of a virus-tested yam tuber multiplication project, the virologist has been primarily involved in relatively routine work in evaluating root crop and food legume materials for virus resistance. While recognizing the financial constraints on the development of an effective work program, the Mission feels that more thought needs to be given to how these specialists can better contribute to CARDI's work program in the present circumstances. One way would be the production, in collaboration with the pathologist of the Trinidad & Tobago unit, of illustrated disease and nematode control handbooks for the use of research and extension workers in the CARICOM region.

As part of an EDF-financed project, a plant pathologist and a plant breeder, based in Dominica, and with support staff in each of the four Windward Islands, have as a main objective the identification of the causal organism of a damaging root-rot disease of tannia and its control

by the use of suitable fungicides, tolerant clones, and/or the production and rapid multiplication of clean planting material. Work is also done on the cause and control of dasheen corm rots. The work is good and shows considerable promise of successful results.

The entomologist in Barbados leads and provides the professional input into an integrated pest management project in the Eastern Caribbean, supported by Barbados Sugar Industries Limited and Barclays Bank International Limited Development Fund. The project commenced in 1977, the entomologist coming to it from the Ministry of Agriculture, Food and Consumer Affairs, Barbados, where he had previously worked on biological control of the sugarcane moth borer. There are technical support staff and rudimentary laboratory facilities in St. Kitts and St. Vincent. Support from the sugarcane industry continued under the project, and work has been extended to food crops. The terms of reference of the present phase of the project are: development of biological, chemical, and other relevant measures to control important crop pests; mass breeding and release of selected species of parasites and predators; monitoring the pest/parasite complex of selected insects and determination of effective agronomic practices; provision of technical assistance in integrated pest management; provision of training and development of extension materials.

The work in biological control, in which the entomologist has international status, has been excellent and has resulted in substantial savings to the sugarcane industry. The continued support of industry is an excellent testimonial to the value of the work. Its weakness, as a CARDI program, is its over-emphasis on biological control in what should be an integrated pest management program. For example, country teams in Antigua, Belize, and St. Vincent have felt obliged to evaluate insecticides for the control of diamondback moth of cabbage because of lack of success of efforts to achieve control by parasites. The widespread use of insecticides by growers, to control a range of pests of vegetable crops, militates against the biological control of pests of these crops. The Mission believes it to be unrealistic to expect only one entomologist to carry out a program of integrated pest management to meet the needs of the Eastern Caribbean. The work needs to be strengthened by the addition of a plant protection specialist with experience in chemical control measures.

A weed specialist is stationed in St. Lucia, in support of the FSRD Project. He is also technical coordinator for the Windward Islands and provides administrative support to the project leader. He has initiated a survey of weed problems and weed control practices of farmers and undertakes some screening of herbicides. His efficiency as a specialist is limited by the time he is able to assign to weed work. The Mission believes that during the next year his time could most usefully be occupied by completion of a weed control handbook for the Caribbean.

Like the other specialists in Trinidad, the animal nutritionist lacks operational funds and is not able to make a contribution to livestock production work compatible with his experience. He has, however, provided major inputs and leadership to the milk program in Guyana. He is also able to do some work on the evaluation of grass/legumes forage fed to sheep and, with support from the university, to work on dairy cattle rations; but lack of resources has made it impossible to maintain

a significant program in animal nutrition. The livestock specialist in Barbados has done useful work on the carrying capacities and stocking rates of improved pastures and on by-product utilization for beef cattle and sheep.

The Mission concludes that there is a wealth of specialist expertise among CARDI staff, but that, through lack of core resources, its potential is largely wasted. But the Mission feels that, with firm leadership, more could be achieved even in the present situation. Where biological sciences specialist staff have free time because of inability to do research, they can, for example, be profitably occupied in producing advisory handbooks and aids to the identification of pests and diseases and their control.

#### 4.4.2 Socioeconomics

CARDI is weak in the social sciences and during the past five years has produced and utilized little socioeconomic research either as disciplinary contribution in one of the social sciences or as part of the technology generation and utilization process.

In 1979, the Institute had one M.Sc.-level agricultural economist. In 1985, there is an anthropologist (Ph.D.) and an agricultural economist (M.Sc.), both working in the FSRD Project, and a second agricultural economist (M.Sc.) assigned to the Trinidad country team. The central staff of CARDI has no social scientists. Less than 4% of CARDI's resources are assigned to social science work. CARDI's input into marketing/agro-processing and anthropology/rural sociology is moderate and in the FSRD Project only. In microeconomics it is weak and in macroeconomics nil.

Potentially, social sciences can be used in CARDI research in the following ways:

##### i) Ex-ante research

CARDI's social scientists have not been involved in the selection of research issues, nor in providing assistance in establishing research priorities. For constraint identification, the first phase of the FSRD Project made extensive studies describing small-farm agriculture in the Windward and Leeward Islands, but this voluminous material was not properly analyzed and used (or useful). More recently, within FSRD Project, more narrowly targeted studies are being designed for the identification of small-farm production problems in microenvironments.

##### ii) During the technology generation and testing process

A limited amount of work within the FSRD Project is now being initiated on gathering cost data on on-farm trials. Some work in the FSRD Project has also started on exploring the demand for certain vegetable crops. There is no work on constraint removal and none on the economic viability of farm-level technologies.

iii) Ex-post research

There is no work at CARDI on the evaluation of research results or on impact. At no time has CARDI made any attempt to properly evaluate the results of its research program, except as required by funding agencies.

The early phase of the USAID-sponsored FSRD Project collected a huge set of data on small farmers in the islands. The surveys were designed by the agricultural economics department at UWI. The Mission was told repeatedly that due to design and data problems this material could never be properly analyzed. While the resulting general understanding of small-farmer problems was beneficial for securing additional financing, it appears that this massive and costly effort is not presently considered useful.

During the last year, the FSRD anthropologist has developed a simpler and geographically narrower reconnaissance survey method, called AFS (area-focused study). This method was originally developed for one microregion in Trinidad and subsequently applied in the Mabouya Valley in St. Lucia. It is claimed that AFS, in addition to describing farm systems within a defined agro-economic area, will determine to what extent the proposed alternative production system is compatible with labor and input requirements, and with existing local preferences and beliefs. It is also asserted that AFS will provide information for "documenting and evaluating improved production systems which permits its application in agroecosystems other than where it was developed and tested." While AFS seems to have improved on the former shotgun attempts at reconnaissance, the claims for it in its present form may be rather optimistic. It appears to be more a beginning of a process of social science participation, especially if AFS is carried through by small teams of different disciplines.

Within the FSRD Project, some very useful simple market surveys have been initiated, focusing on the overall and seasonal local demand for vegetables (hotels, supermarkets) and also on export possibilities. This work, which started in St. Lucia, on marketing channels, commodity flows, and seasonal fluctuations, is highly relevant and should be extended. Because CARDI does not have an agricultural marketing specialist, 75% of the anthropologist's time is now spent on marketing work. It would be advisable to secure the services of a full-time marketing economist, especially one experienced in agribusiness, rather than an academically oriented person.

Besides marketing, the greatest need at CARDI in the social sciences is in production economics. Virtually all decisions on technology choices depend on some economic assessment, and as technologies are tested, their economic viability should be systematically evaluated. The FSRD Project economist, located in St. Lucia, has been in the job for only three months. He has begun to collect some data on costs and returns, and has designed a form to be filled out by all FSRD Project staff performing farm trials, which has been coded for computer analysis. However, the need for socioeconomic work greatly exceeds present capacity for the FSRD Project. The original project document called for two economists and one anthropologist. Project leadership recognizes this deficiency. For 1985, two short-term economists have been requested under the SECID

technical assistance allocation, one to design a marketing system for ornamentals, the other to strengthen microeconomic analysis and software application. A request is being prepared to IDRC for funding two agricultural economists for two years to do multivariate farm modeling and systems analysis.

The Mission views positively all attempts to strengthen the socioeconomic component of CARDI's work. However, it seems to us that at this stage of modest capability, very limited and deficient data, and poor integration with the biological scientists, CARDI should avoid over-sophistication and reliance on complex mathematical techniques. What is most needed is to complement the agricultural adaptation process with relatively simple economic assessment and social feasibility analysis. For example, in Belize, the crucial problem in introducing soybeans is the relatively high import content of inputs. Incentives for intercropping in Grenada and elsewhere need to be established. Yield targets of forage and legume crops for minimal profitability must be found. Some of this assessment should be done *ex ante*, before too many resources are committed to any one line of work (identifying economically promising technologies and those which appear unprofitable or too risky), but much of it should be done during the research phase itself.

In this sense, the Mission observes that the social scientists at the FSRD Project are not yet well integrated with the rest of the research team. There is consultation but no interdisciplinary effort. The crop is left to the agronomist, the survey to the anthropologist, and the desk work to the economist. This is not what a farming systems project is supposed to do. The most critical characteristic required for achieving success in a multidisciplinary team is identification with a single project in which they can all participate and for which they are equally responsible. Purposeful teamwork at all stages of the process would minimize conflicts and enhance the product.

Beyond farm-level microanalysis, social science inputs are also needed in other dimensions. As was mentioned in the section on research policy (Section 3.5), economists could make a contribution to CARDI's setting of research priorities and by providing the Institute with current judgments on macroeconomic trends which affect the periodic reassessment of the regional research program. It is not suggested that CARDI at this stage should acquire a macroeconomist, but that CARDI management should become more sensitive to these needs and take every opportunity to obtain assistance on a consultancy basis, or perhaps from the CARICOM secretariat or CDE.

More important is the socioeconomic of what may be called the intermediate level, to help CARDI to make intelligent decisions at the country or subregional levels. For example, in the FSRD Project it is becoming clear that responses to the availability of new production opportunities depend on the relative market-orientation of the farmers. Farmers who are more subsistence-oriented and depend on non-farm sources of income respond slowly or not at all, while commercial entrepreneurs (who may not even be full-time farmers) respond rapidly and because of the often small acreages involved, can often capture the entire market.

What is needed, therefore, is a much better targeting of research within the small-farm spectrum. Another problem is the determination of the ethnic Caribbean market in North America and Europe. If it is elastic, there is scope for expansion; if it is fixed or declining, then all one achieves is to reshuffle the supply from one island to another. A good practical production economist at headquarters level could service the entire CARDI network, especially if he or she had good local-level collaborators.

#### 4.4.3 Research support services

The research support services are located in CARDI headquarters. They comprise a biometrician, statistician, senior scientist/editor, pesticide chemist, analytical chemist (on secondment to another organization), and a documentalist.

The biometrician provides a good biometrics and computer service for CARDI and, traditionally, for the region. He gives support, as requested, to UWI (including lecturing); the Ministry of Agriculture, Lands and Food Production, Trinidad; Caroni Limited; and various other institutions in the region, including WINBAN, GUYSUCCO, the Barbados Sugar Cane Breeding Station, and the Coffee and Coconut Boards, Jamaica. He has produced an excellent and simply explained manual on the design and layout of field experiments in the region for the guidance of agricultural research workers. The quality of his work is excellent. However, he is able to visit other countries only when funds are made available from special projects. These have been forthcoming from the FSRD Project, and the project leader invites the biometrician to all planning meetings. Nevertheless, he needs to travel more widely to monitor field experimentation and give advice as needed. This is particularly important in the Caribbean region, where uncontrolled variations present in field station experiments, and more so in on-farm trials, present a notoriously serious problem. Experimentalists need to be instructed on how to cope with this problem and funds need to be provided, both to enable the biometrician to give short courses and to follow-up by field visits. The Mission notes with approval that the biometrics service is to be strengthened by the addition of a technical cooperation officer supplied by ODA, London, United Kingdom.

Surprisingly, the biometrician and the statistician, who provide a data analysis service, do not work as a team. They report separately to the Director of Research. This arrangement is clearly unsatisfactory, and the Mission recommends that the statistician be made directly responsible to the biometrician.

Laboratory services are headed by a senior scientist, who is also CARDI's editor. The CAL was inherited from the RRC and provides a regional service for CARDI and other institutions for routine analysis of soil, plant, animal feed, and pesticides. Clients include UWI, the Ministry of Agriculture, and Caroni Limited. It employs 15 support staff.

In the seven years before CARDI took over the laboratory, it handled an average of 7,800 samples (40,000 analyses) a year. The number of samples processed fell immediately after the change of ownership was effected and

is attributed to a decrease in samples submitted by UWI and the termination of the Citrus and Soil Survey Units. It occurred despite an increase in the size and scope of the laboratory with the incorporation of the Animal and Pesticides Laboratories. In the seven years prior to the establishment of CARDI, the laboratory processed an average of 7,800 samples (40,000 analyses) a year. In 1983, it processed 710 samples (2,619 analyses) and, in 1984, 2,338 samples (9,185 analyses).

The laboratory participates in the network of analytical laboratories, centered at Wageningen, Netherlands, to monitor the accuracy of analytical determination; it performs well in analysis of test samples in comparison with other institutions. However, buildings are now in a sad state of disrepair. The air-conditioning does not work, fume cupboards leak, and the equipment is old and needs to be replaced and updated. The unit is uneconomic to run, needs complete refurbishing if it is to remain effective, and is much too large for the demands on its services. The Mission recommends closure of the present laboratories. CARDI will need to review whether its essential analytical requirements can be met in some other way, either by maintaining some minimal but more sophisticated facilities or by contracting out the work. Contracting out might have some merit in causing staff to look more closely at their real analytical needs.

Under a grant from IDRC, the Institute has set up a library and literature service (CARDILS) in late 1981, to serve as a basis for its scientific information service.

The main purpose of this library, headed by a trained documentalist, is to provide CARDI's staff with an effective scientific information service in the form of acquisition, processing, and distribution of relevant literature from sources within and outside the region. In addition to the documentalist, two library assistants and a typist are paid from IDRC funds, as well as an office assistant and a darkroom technician paid from the CARDI core budget.

The library collects, catalogs, and stores material deemed useful to CARDI's field staff. Most of this material is in the form of journals, reports, processed papers, and publications of various government, international, and private agencies. There are very few books or journal series, but these are available at the UWI main library on the campus. The CARDI library serves as a repository of the Institute's own publications and technical documents. It has an exchange arrangement with all the major agricultural research centers and organizations around the world and also serves as a distribution center for material produced by CARDI, CARDI staff, or publications in which CARDI has cooperated with other sponsors.

The most important service is the literature search either done manually or by computer, at the request of a CARDI scientist, and the subsequent acquisition and distribution of specific items requested by the user. The library regularly circulates current literature reviews and content pages or current journals received from the UWI library. During the past year, 111 literature searches were performed. Of CARDI's 75 staff members, about half use the reference service periodically and about 15 scientists use the service regularly. Significantly, these are not the headquarters specialist staff, whom it is presumed use the UWI library.

The library has purchased microfiche equipment and has begun to collect and distribute material to CARDI field units in this form. Beginning in 1983, computer peripherals were installed on a rented basis and, with the help of the biometrician, a computerized accession list was devised which permits convenient storage, retrieval, and periodic dissemination of cumulative acquisitions. There is a large backlog of titles not yet entered in the computerized file.

Complete reliance on outside funding has made the library service's future precarious. The original grant of US\$232,000 expired last year. CARDI's application for a three-year renewal was not accepted by IDRC, which restricted its support for only one additional year and mostly to the documentalist's compensation. One reason for IDRC's limited interest in this project is that they intend to fund a Caribbean-wide information service at UWI. This, once again, raises the issue of CARDI's relationships with the University.

CARDI's library mainly serves CARDI's staff and those of its member countries, and the UWI library serves the University's students and professors. Presumably, what a donor would like is to extend agricultural information service to the government staff and other potential users throughout the region. The UWI library, with its much larger collection and coverage is potentially the best central place for a regional agricultural information network. That the CARDI special information service is not part of the UWI library system clearly results from CARDI-UWI relationships. Without reinforcements and extra equipment, the UWI library at present could not offer equivalent-quality service to CARDI scientists. But in the longer run if CARDI remains on the Trinidad campus, one solution would be integration, in which the CARDI collection could become a specialized branch of the UWI library system. Extending the clientele is the only cost-effective way to justify the maintenance of an information staff at CARDI.

If CARDI as a whole should improve its relationship with the University, the research information service, operating out of the UWI library under CARDI's technical guidance, would make up a logical region-wide subprogram. As matters now stand, even the classification systems are different: CARDI uses a modified version of the FAO AGRIS classification (which is convenient for rapid commodity and subject matter identification), while the UWI library uses the US Library of Congress system.

For the publication of its materials, CARDI has adequate cartographic and printing services.

#### Recommendations

- \* That the specialist group in St. Lucia be strengthened, the better to backstop work in the LDCs.
- \* That the present personnel of the Trinidad & Tobago and headquarters units be redeployed to the extent necessary to better contribute to CARDI's work program pending proposed reorganization.

- \* That CARDI strengthen its work in market economics and production economics and use social science expertise for planning, as well as for research support.
- \* That the information/communication role of CARDI be strengthened to permit elaboration of a significant data base of use to the region.

#### 4.5 Development Activities

There is no clear boundary between research and development. In the context of its study, the Mission has taken the division between the two activities to be at the point where the main purpose of an activity ceases to be information collection. Thus, even at the extension stage of farming systems work, CARDI's role is, or should be, the collection of information about the effectiveness of improved strategies and is thus, research. (See also Section 3.12).

Apart from an input into pasture and forage development in Trinidad & Tobago and Barbados, and dairying development in Guyana, CARDI's development work is in the LDCs. In the Eastern Caribbean, there are four development activities of note: forage seed production and pasture improvement; soil and water management; the production of virus-tested planting material of yam; the production of tolerant aroid planting material; and the Roseau Dairy Project, Dominica.

The forage seed and pasture improvement project is funded by EDF and has its headquarters in Antigua. The main components are seed production of selected grass and legume species in Antigua and Trinidad & Tobago and an outreach program to increase the use by farmers of improved forage species. The project provides technical assistance, supervision, and planting material for the establishment of new pastures. Seminars and field days are held for farmers and extension material produced. The project is a logical extension of CARDI's research activities and experience in this field to development in support of thinly staffed national extension services.

The soil and water management project is also financed by EDF and is based in Antigua. It is designed to be a research and development project to evaluate the seriousness of erosion problems and loss of land, to provide information on appropriate soil and water conservation practices, and to implement pilot projects. In practice, the project has so far been largely developmental, with emphasis on the establishment of small pilot projects involving restoration of tree cover, gully plugging, contour grass bunds, and minor engineering works on irrigation schemes. The project is worthy, but it is not clear to the Mission why CARDI, lacking experience in this field, is involved except as a convenient regional organization to which a donor could attach the project. The Mission, again, recommends that CARDI should not seek or accept special project funding in fields where it has no special advantage.

Arising from research work supported by ODA, a tissue culture laboratory has been established in Barbados (with EDF funding) to produce virus-tested yam planting material on a pilot commercial scale. The project has resulted in the production of more than adequate quantities

of virus-tested planting material for distribution to Barbados and other countries. At present, the laboratory is underutilized, but it provides a valuable facility for the production of virus-tested material of yam and other crops, research and training, and fully justifies the support given by donors.

The Roseau Valley Dairy Project, Dominica, is supported by the Canadian government. It aims to support the development of the country's livestock industry by the provision of improved yearling bulls and training in cattle management. Eight dairy farms near Roseau are being developed as demonstration units, and training in management will be made available more widely. The project is certainly within CARDI's expertise, but the Mission doubts whether it is sound policy for CARDI, as a regional institute, to undertake such small development projects.

In Belize, the CARDI country team leader has played an important, though largely unrecorded, role in promoting oilseed production. Through his contacts with farmers and entrepreneurs, he has helped promote groundnut production and the establishment of a commercial-scale peanut plant and is now moving into soya production and processing for fish food. As part of an EDF project, CARDI has undertaken the management of a CARICOM Pilot Farm Project in Belize. This is not an appropriate activity for CARDI, which has no special expertise in farm management in Belize or elsewhere, and should be discontinued the earliest possible opportunity, as soon as the experimental phase of establishment is over.

CARDI's agricultural engineering program is also essentially developmental. An agricultural engineer, stationed in Jamaica, and one previously in St. Kitts, were concerned with the development or modification of tools and machinery appropriate to the area. Most of the effort to date has been directed to production of a peanut lifter, a peanut thresher, a simple chipping machine for cassava, and hand-operated seeders of the jab type. It has largely involved small modifications to existing equipment, is of an elementary nature, and given the need for CARDI to concentrate its activities, can hardly be justified.

CARDI's development activities are rightly focused on the LDCs. The MDCs have less need for such support. However, if the Institute is to function as a regional research and development institute, rather than as an executing agency to which donors may offer projects, it must focus on activities for which it has a special advantage rather than respond to availability of special-project funding.

The Mission believes that CARDI should, for example, function as an outreach arm for any of the IARCs wishing to extend or initiate their activities in new locations in the Caribbean region. At present, a number of centers are in communication with several neighboring states of the region. It is felt that much duplication could be avoided and an integrated program could be developed in which CARDI would undertake a liaison role in the CARICOM territories.

#### Recommendations

- \* That CARDI should not seek or accept special-project funding in fields where it has no special advantage.

- \* That CARDI strengthen its association with those IARCs having programs of significant importance to the region, acting in a liaison function specially on behalf of the LDCs.

#### 4.6 Training

CARDI states its main emphasis in training to be: short in-service courses or workshops, principally for extension personnel; short-term attachments to CARDI staff; supervision of post-graduate students; collaboration with UWI in training extension officers under the USAID-funded CAEP project. In practice, the training activities are not part of a single coherent plan. They have arisen as opportunity presented itself.

From its inception with many former UWI teaching staff, CARDI staff at headquarters have, as already indicated, continued to lecture, supervise students, and act as internal examiners for UWI. On a team-to-team basis, CARDI staff provide an input on teaching and materials for bulletins -- to the UWI/CAEP project and in collaboration with the Midwest University Consortium for International Action (see Section 3.12). Funds are also available for training both technical staff of agricultural ministries and farmers, in the EDF project. The major training activity is, however, provided under the FSRD Project, through the attachment of government counterpart staff to CARDI country teams in the Eastern Caribbean.

While unplanned and uncoordinated, CARDI's training activities are not insignificant. They constitute as much as the Institute could or should attempt in its present straitened financial circumstances. As and when the financial situation improves, CARDI should plan to increase what should be its most significant training role, the provision of opportunities for post-graduate research work in collaboration with UWI. This will not only provide the future cadre of research workers but will also enable CARDI to usefully expand its own programs.

A consolidation of CARDI's program into a few well-defined areas and networks recommended by the Mission should permit the planning and budgeting of a much more effective training program as an integral part of the research work.

#### 4.7 Program Balance

The present balance of CARDI's program has resulted as much from its financial circumstances and the availability of special-project funds as it has from interpretation of a very broad mandate.

Lack of core resources for operating expenses has reduced its core activities at headquarters to the point where in some disciplines they are ineffective; nor is there adequate back-up support, as on-station research, for the FSRD Project. Both need to be remedied if CARDI's research program is to be fully credible. One move to this end, as mentioned before, would be the closure of the CAL, which is a drain on CARDI's resources, too large for current demand, and increasingly run-down in terms of accommodation and equipment.

In the LDCs, CARDI has correctly seen its role as adaptive research plus development. This meets the needs of the area and, as far as can be judged in the time available to the Mission, the balance between R & D in the LDCs is about right. The Mission recommends that until research has more to offer, development activities should not be increased above their present level. They should be confined to those activities where CARDI has a special advantage, and examples are given in Sections 4.2-4.8 of some present activities that the Mission considers to be inappropriate.

As discussed in previous sections of this report, in developing its research activities in the LDCs, CARDI has too readily responded to government requests for assistance and has spread its resources too thinly over a wide range of crop and livestock activities. Individual country teams tend to attempt too many projects. The Mission recommends, therefore, that CARDI immediately establish firm guidelines on the priority to be given to the various activities of country teams, review the programs of each team, and reduce each to a manageable number of projects.

At the same time, the Mission recommends the initiation of a process towards complete replanning of CARDI's program. The goal is to arrive at manageable major lines of work, in addition to the FSRD Project for the Eastern Caribbean and to design a master strategy for developing a ten-year regional research program utilizing a network concept.

Networking would mean sustained research on specific sets of problems involving as many countries as possible, using common methods, sharing experiences and materials, and maintaining linkages within and outside the region. Each commodity group or problem area could have a lead country. Previous sections of this report already suggest some ideas of what the Mission considers to be possible regional research priorities. In the following paragraphs these suggestions are summarized.

The main constraints to increased livestock production are feeding, management, and marketing infrastructure, and with special need for research on improved use of existing resources, forage, and by-products. This is a field where CARDI has a special advantage and should continue to give priority.

Vegetable production is important in all the islands and has a good potential market, both for import substitution and for export to the USA early in the year. It, too, could continue to receive priority, but the number of vegetable crops on which country teams work should be reduced. Present duplication of work by CARDI's country units and NARS could be overcome by the establishment of appropriate networks.

The export market for tropical foodstuffs, notably root crops to Canada, the United Kingdom, and the United States, seems likely to diminish as eating habits change. However, an exception, and a notable omission from CARDI's program, are the fruit tree crops, for which export prospects are most promising. They are important throughout the Caribbean and are of high value but receive little attention. The Mission recommends that CARDI establish a research capability in a few carefully identified fruit tree crops. The Mission thinks that this new activity could be assimilated by scaling down activities in root crops and pulses, on which UWI also works.

CARDI also needs to carefully assess whether work should continue on sea island cotton. There have been previous, but unsuccessful, attempts to rehabilitate sea island cotton production in the Caribbean.

Yields of the few remaining growers remain low. The low yield potential of Montserrat sea island and other cultivars, the need to hand pick, high labor costs, the cost of effective crop protection, and the relatively sophisticated management needed to utilize inputs to the best effect, give cause for some doubt that the crop can be made attractive to growers.

The present emphasis on oilseeds in Belize seems appropriate to the country's needs and potential. Oilseeds and grain legumes have a considerable potential in the region. CARDI could have a comparative advantage and could develop a successful network in this area.

The farming systems approach should continue to ensure that advice on new technology offered to farmers is appropriate and realistic, but on-station research should be considerably strengthened.

At this stage, the Mission once again recommends that CARDI rethink its role in the MDCs. It should not attempt to do what national agricultural research systems are able to do as well. Instead, CARDI should seek to provide an input into lines of work where it has, or should have, an advantage as a regional institution. This implies research, not development, as at present, but with a different focus.

In conclusion, the Mission recommends the following priorities for CARDI's future regional thrusts: (1) forage improvement, livestock and pasture management; (2) tree crops; (3) selected vegetables; (4) oilseeds and grain legumes. Beginning with the establishment of a research capacity in a few fruit tree crops, CARDI should aim in the longer term to extend its activities to other important tree crops of the region.

Coconut is one example and is a commodity in which research is presently very much on a care and maintenance basis. It would also make good sense for CARDI to be assigned, with its funding, responsibility for the maintenance and utilization of the International Cocoa Genebank, Trinidad. This activity would be much more appropriately carried out by the regional research body than by the University. Banana research is well handled by WINBAN, but the Mission can see advantages to both organizations if the work, staff, and resources could be merged or affiliated status achieved. It would extend CARDI's activities to a major export crop of the region and would give the WINBAN research workers better access to a wider range of expertise. Similarly, the maintenance of the very valuable banana germ plasm bank in Jamaica might be considered a suitable activity for a well-established regional entity. Again appropriate funding would need to be allocated.

The above recommendations assume the restructuring and streamlining of CARDI, which is essential if it is to be viable.

#### Recommendations

- \* That CARDI establish firm guidelines on the priority to be given to the different activities of country teams, review the program of each team, and reduce each to a manageable number of projects.

- \* That the priority areas for CARDI research outside the farming systems program should be forage improvement and pasture management, vegetables (in the LDCs), oilseeds (in Belize) and tree crops, including fruit and, eventually, other commercial export crops.
- \* That CARDI needs to rethink its role in the MDCs. It should not attempt to do what national agricultural research systems are able to do as well. CARDI should seek to provide an input into lines of work where it has, or should have, an advantage as a regional institution.

#### 4.8 The Quality of CARDI's Work

It is evident from the Mission's comments on various aspects of the program that the quality of CARDI's work is very variable. Some excellent work has been done. The ongoing research on the biology and control of coffee-berry borer is of notably high quality and offers good promise for improving present control measures. The work on biological control of insect pests is excellent. It was begun by the present entomologist before he joined CARDI, and biological control of the sugarcane borer-moth since 1968 is estimated to have achieved savings of about US\$1.5 million for the sugar industry in Barbados. Work done on the identification of virus diseases of yams and the rapid multiplication of virus-tested material, with ODA technical assistance and support from the Scottish Horticultural Research Station, and its subsequent development with EDF support, has already had a valuable impact. Virus-tested yam planting material has already been distributed by CARDI within the region, and it is estimated that 20% of the Barbados crop was grown with virus-tested material in 1983-84, and 40% in 1984-85. The peanut project resulted in doubling yields in traditional areas and increasing the national production in Belize from 13,000 to 150,000 kg per annum.

Good work has been done in pasture improvement, animal feeding, and management, as well as dairying, and the work on aroids is professional. However, much of CARDI's work remains pedestrian and of moderate quality. The majority of country units attempt too diffuse a program and, as a result, the treatment of individual projects tends to be too superficial. The level of field experimentation -- its design, conduct, interpretation, and reporting -- is often weak (Section 4.2.2). It needs to be, and can easily be, improved.

The Mission reiterates the views expressed throughout the foregoing report that CARDI has definitely made progress in offering to the region quality research supplementary to that of the NARS. In its earlier years, the impact of such work was region-wide, of importance to MDCs and LDCs alike. In the last five years, as MDCs' own NARS have become stronger, and CARDI's special project work (especially FSRD) has played a more significant role in its activities, those activities have become more strongly concentrated on the LDCs. A clear picture emerges that whenever the research work was quite specific and even targetted, with continuity in team work and financing, good results were achieved. Region-wide research services have not materialized sufficiently, except again in very specific areas having sustained staff capability and in which an effectively strong demand for such services has been

maintained. Little progress has been made in ensuring regional research coordination, except perhaps in the fields of information and publication, but this perhaps results more from resistance to being coordinated, on the part of other services, than to lack of effort on CARDI's part. The Mission believes firmly that there is a continuing need and potentially stronger role for CARDI. The experienced resources are available but have been constrained by poor leadership, inadequate financing, and constant reshuffling in management. A major reorientation, good technical leadership, and secure, long-term financial support should permit CARDI to regain a position of preeminence in Caribbean agricultural research.

Chapter 5

5. PROPOSALS FOR STRENGTHENING CARDI'S REGIONAL CAPACITY

5.1 Introduction

CARDI's present adverse situation has arisen from:

- i) Lack of clear direction from its Board, which should have taken remedial action much earlier as it became clear that CARDI had serious financial problems and that organization and management needed to be tightened. This also indicated a lack of commitment by governments and an unwillingness to face the financial problems of an organization they created.
- ii) Too broad and diffuse a mandate and lack of a well-defined strategy and guidelines for CARDI's R & D program, resulting in response to different short-term needs of both LDCs and MDCs at the expense of proper recognition of broader regional needs. No clear policy regarding the relative emphasis to be given to R & D and lack of a continuum between the two. Failure to achieve the regional coordinating role envisaged for CARDI in its mandate.
- iii) Lack of appropriate leadership in terms of priority setting, scientific guidance, and all aspects of organization and management, contributing to misunderstandings with UWI, permitting over-extension of the core staff and concomitant overspending of the core budget, and thus leading to continuing loss of credibility in the eyes of donors.
- iv) Lack of reliable core funding, reflecting doubts of some governments about CARDI's core operations in Trinidad & Tobago, compounded by the high cost of core and country unit operations in that country. Low productivity of research in Trinidad & Tobago because of lack of operational funds and consequent ad hoc operations. Elsewhere, R & D is heavily reliant on special-project funding, with little resources for back-up research. Availability or otherwise of funds to do meaningful work has resulted in polarization of CARDI.

CARDI cannot be expected to survive as a credible regional R & D institution unless sweeping changes are made and its core finances are guaranteed and fully recognized by the MDC governments as, in part, a contribution towards operations in the LDCs.

## 5.2 Options for Action

The following options are presented by the Mission with indications of their probable feasibility. All were discussed in some detail during the course of the Mission's visit to the Caribbean.

Whichever of the foregoing options is found most acceptable, it must be emphasized that the Mission's main aim was to seek a means of improving CARDI service in agricultural research to the member countries of CARICOM. For such an improvement to be realistic it must depend on an acceptable level of operational funds; in other words, on an improved personal emoluments/operations ratio. The Mission does not believe this to be achievable with the present levels of core staffing and core funding; even if all arrears were paid up and current financing was brought up-to-date there would still remain a considerable deficit. For this reason, the Mission has repeatedly stressed in the foregoing chapters the real need for CARDI to be slimmed down, especially in Trinidad & Tobago, as a first step towards improvement. Coupled with this retrenchment one would like to see an earnest of good faith from the member governments themselves in making good the deficiencies in their financing of CARDI. There is little hope of obtaining continuing external financing in the face of lack of support from the Institute's own members.

### Option 1: To maintain the status quo.

To maintain CARDI's present organizational structure and proceed with present plans to improve the efficiency of administrative procedures, personnel management, financial and accounting systems; to develop and implement project management and documentation systems; to establish project preparation and evaluation capabilities, and establish a Research Advisory Committee made up of members of the international agricultural research community.

The Review Team does not consider this to be a practical option. At the present levels of governmental funding, it does not face up to the fundamental problem of finance and program direction. Foremost of the budget issues is the drain on core resources caused by the large number of underutilized support staff (approximately 54) in Trinidad & Tobago. The cost of their emoluments alone diverts core resources from support of work in the LDCs and does not leave enough funds for meaningful work to be carried out by the headquarters staff and the Trinidad & Tobago unit, leaving them relatively unproductive. Any remedial measures which do not take account of this problem will only delay what is likely to be CARDI's bankruptcy. All previous attempts at auditing/evaluation have avoided the issue and have recommended only fine-tuning, usually amounting only to reshuffling management and confounding confusion.

### Option 2: To close down CARDI, phasing out existing projects.

The dissolution of CARDI would create severe problems for the LDCs. The MDCs, however, maintain that they do not depend on CARDI, although CARDI disagrees. Whatever the quality of their agricultural research services,

they are numerically strong. Thus, in Trinidad & Tobago, for example, there is a pool of about 95 professionals engaged in national agricultural research in the Ministry of Agriculture, UWI, and Caroni Limited. The MDCs can obtain most of the support they may need through bilateral aid or by participation in regional networks. However, the LDCs depend on CARDI to conduct what is in effect their national agricultural research. Their research programs are too weak to enable them to participate in networks as equal partners and to benefit from participation. CARDI provides an institution through which donors can most effectively channel aid to the small states, and it can thus play a significant role in promoting networking. If it ceased to exist, a similar organization would need to be created.

Even in the MDCs, CARDI could play a very positive role in highly selected research areas, as discussed elsewhere in this report. The region would lose a potentially important connecting link in research. Furthermore, for all its weaknesses, CARDI does provide some stability and contributes to the retention and effective use of Caribbean agricultural scientists.

For these reasons, the team believes that CARDI must continue to exist but, if it is to be viable, must be streamlined and focused on a limited number of priority research areas of regional significance and networking, where it has a special advantage.

Option 3: CARDI restricted to the LDCs.

One possible solution would be to further slim down CARDI to a small regional organization working exclusively for the LDCs: the Windward and Leeward Islands and Belize. It would consist of a small administrative unit, a core of specialists, and outposted staff. As at present, there would be about 16 country team members working on the R & D problems of eight countries but with greater coordination of effort to prevent duplication, which the region cannot afford, and a restricted number of activities. A major role would be to ensure LDC participation in regional research network activities.

Core support would include a systems agronomist, a forage agronomist, a tree crop specialist, a horticulturist, a biometrician, a socioeconomist, a soil and water management specialist, and a documentalist. For support in other specialized areas, as needed, CARDI would look to the university and donors. Headquarters could be in St. Lucia and would comprise the Executive Director, the Director of Research and Development, and an Administrative Officer. Additional staff would be employed as necessary under special-project funding.

Even such a slimmed down CARDI (about 30 professional officers) would require continued financial support from the MDCs if it were to be viable. And furthermore, the LDCs would have to be in a position to provide a high percentage of core costs on a regular basis. The initial costs would be high in terms of redundancy and severance payments, but this problem will need to be addressed, probably sooner rather than later, with the existing organization or whatever reorganization is attempted. The new CARDI would serve a total of about 53,000 holdings

with about 86,000 ha of land under crops (about 38,000 ha in Belize) but including a substantial area of bananas (25,000 ha), the most important cash crop of the LDCs -- on which CARDI does no work at present.

Option 4: LDC CARDI amalgamated with WINBAN Research Department.

The merging of a streamlined CARDI (Option 3) with the research services of WINBAN (6 specialists) has merit, extending CARDI activities to a major export crop and giving WINBAN access to a wider range of expertise.

CARDI would still be a participant rather than a leader in regional networks except insofar as it could become a candidate for the Caribbean regional headquarters of INIBAP. It is recognized that WINBAN operates essentially in four banana-growing Windward Islands only.

Option 5: Refocused regional CARDI, servicing the LDCs and concentrating strictly on a few regionally significant and specialist activities, including the MDCs.

CARDI could still play an effective role regionally, including in the MDCs, by providing support in fields where it has, or would be justified in developing, special expertise. These are on-farm research, forage, commercial commodity and fruit tree crops, selected vegetables, legumes, and oilseeds. As in Option 4, this expertise would be extended to bananas.

CARDI would aim to set up and lead networks in those fields where it has special advantage. Under this option, it would have two main functions: backstopping farming systems activities in LDCs, and leading specific network activities in such crops as fruit trees, cocoa, coconut, bananas, and animal-production-associated activities, such as pasture and forage improvement.

Specific work would be undertaken in the MDCs at the request of governments and paid for by their contribution, or through special projects, and with additional country staff hired for the purpose and for the duration of the project. Some strengthening of core staff would be needed, and consequently any activities added would need to be accompanied by appropriate added funding. The existing staff can best be used in an interdisciplinary mode. More can be made of the resources of regional ministries of agriculture, universities, national and international agencies.

In support of Option 5, it is desirable that CARDI reestablish its accord with UWI in order to obtain additional technical support in fields such as plant protection, soil and water management, and economics. This would be best achieved by the establishment of a fund for contracting university research. Research grants could be allocated by a small-grants committee independent of both CARDI and the University. As indicated in Section 4.4.2, CARDI will also require, from time to time, to contract the services of an eminent economic planner.

CARDI'S MANDATE AND POLICY STATEMENT1. Introduction

In the Agreement (1975) establishing the Caribbean Agricultural Research and Development Institute (CARDI), the stated objectives were:

- (a) to provide for the research and development needs of the Region as identified in national plans and policies;
- (b) to provide an appropriate research and development service to the agricultural sector of Member Countries\*;
- (c) to provide and extend the application of new technologies in production, processing, storage, and distribution of agricultural products of Member Countries;
- (d) to pursue for specified periods long-term research in pertinent areas;
- (e) to provide for the coordination and integration of the research and development efforts of Member Countries where this is possible and desirable;
- (f) to undertake teaching functions normally at the post-graduate level, limited to the development of the relevant research by any Member Country;
- (g) to seek to achieve the optimum decentralization of facilities.

To achieve these objectives, CARDI develops a Work Program in concert with the Governments of the Member Countries, National and Regional Organizations. The Work Program is reviewed and revised on a continuing basis as needs and priorities change, as projects are completed, and as new funds become available.

The Institute participates in project identification and planning and becomes the implementing agency.

2. Process of Work Program Development

The Work Program consists of many projects, generally grouped within certain major programs.

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\* Antigua, Barbuda, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts-Nevis, St. Lucia, St. Vincent, and Trinidad & Tobago

Projects develop in several ways:

- \* Those undertaken at the specific request of a regional or national organization of Government, sometimes in a "new" area.
- \* Those undertaken as technical assistance to a regional or national project, and intended to solve specific problems or provide ongoing monitoring and technical advice to management.
- \* Those supportive of major CARDI programs and aimed at furnishing specific information necessary for that program.
- \* Those identified by national and regional bodies.

All projects are developed on a collaborative basis with Ministries of Agriculture and/or other national agencies, such as Commodity Associations or Statutory Boards. They reflect national priorities and form integral parts of national programs. As far as local resources allow, technical staff of Ministries and other organizations collaborate in projects. Ministries and other organizations or private farmers usually support projects by providing land, equipment, and other facilities, as appropriate. CARDI allocates its resource staff to provide specialist services and to augment country staff.

In summary, the process of development of the Work Program from the initial project request to its implementation takes into consideration the priorities of the country and region, and the resources available to the Institute in the form of manpower, finance, and other facilities. External funding is requested where possible to support the work program activities which otherwise may not be possible or be undertaken in only a few countries or areas.

### 3. Mission Statement

CARDI'S MISSION IS TO CONTRIBUTE TO AGRICULTURAL DEVELOPMENT THROUGH THE GENERATION AND DISSEMINATION OF APPROPRIATE TECHNOLOGY FOR THE BENEFIT OF THE CARIBBEAN PEOPLE.

The Institute seeks to execute its mission principally by developing and demonstrating appropriate technology for increasing production, productivity, and utilization of food commodities for domestic and export markets through the following mechanisms.

- (a) Development and implementation of Research and Development Programs which respond to the needs of Caribbean Member States at both the National and Regional levels.
- (b) Development of a Work Program taking into account National and Regional priorities, resources and capabilities of the Institute, work being done by other Institutions and the availability of funding from Member States and other sources.

- (c) Collaboration with and establishment of mutual support systems with National and Regional Institutions concerned with Production and Marketing and support services to Agriculture.
- (d) Establishment and maintenance of contracts with international agencies active in areas beneficial to the work of the Institute.
- (e) Pursuit of appropriate funding from international sources in support of program areas.
- (f) Development of a system for information transfer so that the outputs of its Research and Development activities are channelled to appropriate agencies and to farmers.
- (g) Provide for ongoing review of its performance, thrust, and priorities.
- (h) Strengthening and developing the Institute's capabilities in Agricultural Research and Development.

#### 4. Research Policy

The adoption of the Regional Food and Nutrition Strategy (RFNS) by CARICOM Heads of Government at the Fourth Conference of Heads of Governments in July 1983, has meant that the policy of regional organizations should be based on the philosophy and objectives of the RFNS, to ensure not only relevance but also coordination of activities among the regional organizations and between them and the national executing agencies. It follows, therefore, that the policy of CARDI as a regional research and development Institute must be rooted in concepts and goals of the RFNS.

The objectives of the RFNS of direct relevance to CARDI can be summarized as follows:

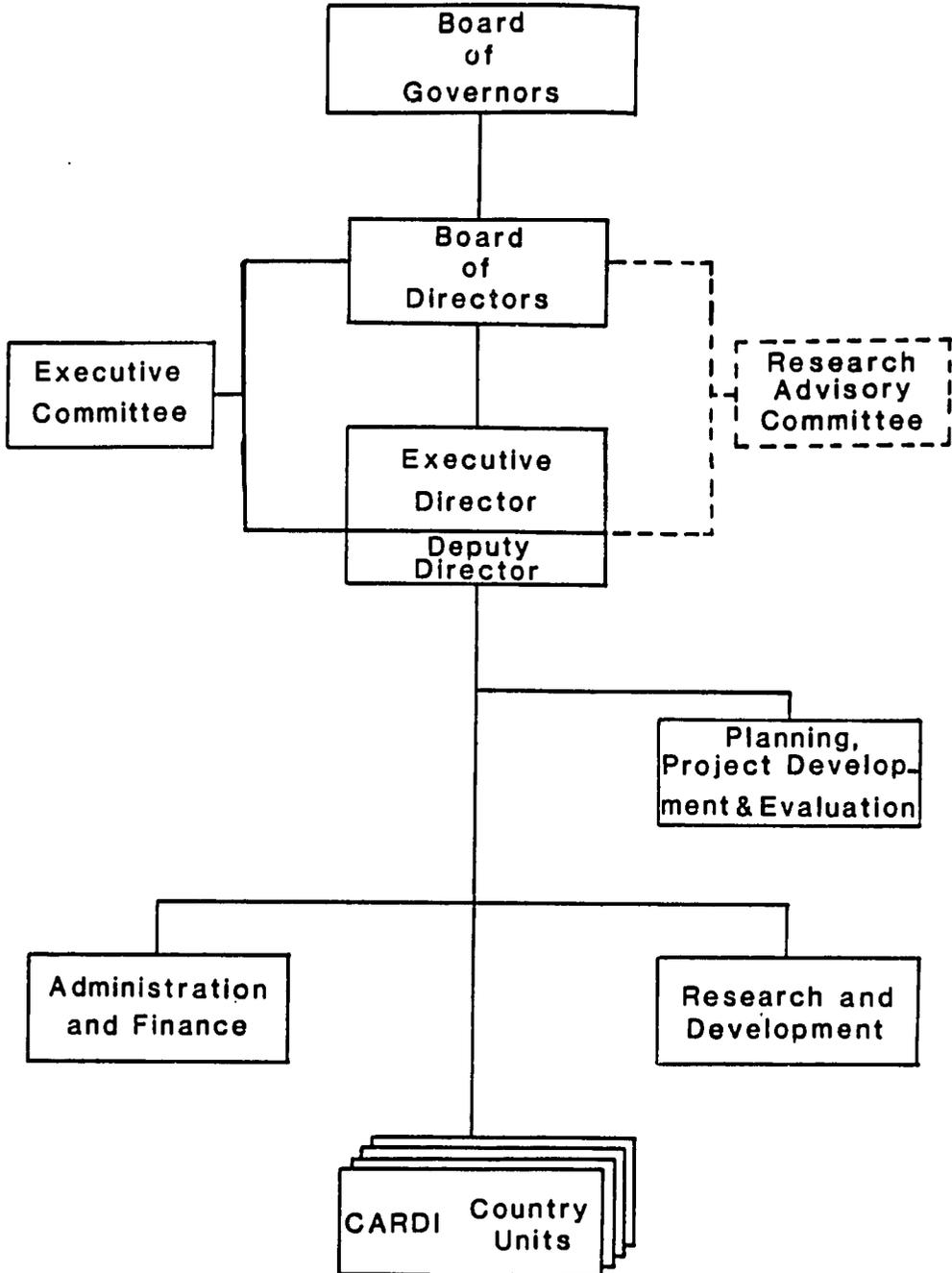
- (a) increased production in the food sector;
- (b) increased proportion of domestic foods in total food consumption (increased production, distribution, and utilization);
- (c) the conservation and generation of foreign exchange (increased domestic production, reduced imports and increased exports);
- (d) the reduction in the food import/export ratio;
- (e) increased proportion of energy and protein intake from domestic sources (increased root, pulses and legume production);
- (f) increased proportion of energy and protein intake from domestic sources;
- (g) increased food reserves (through reduced losses).

It is clear that (while not ignoring foreign exchange earning consideration) the primary focus for the agricultural sector over, say, the next 5 to 10 years is in the production of food for the regional market and increases in regional food security. This comes against a background of a food import bill of approximately US\$1 billion per annum. Against this background, certain factors become important in the development of CARDI's research program:

- (1) an assessment of requirements of the regional market, as well as Third Country market opportunities;
- (2) given small or stagnant increases in growth rates projected for the regional economy over the next five years, food consumption patterns are likely to be relatively stable. This means that if domestic food production is to be increased significantly, they will have to be done at the expense of food imports;
- (3) some Member States are putting in place national food plans, while all Member States will soon agree on the institution of a Common Protective Policy (CPP) to facilitate protection of the regional market from Third Country imports.

Given CARDI's Mission, its original objectives and those of the RFNS and the development taking place within the region, a basis has been provided for formulating a research policy that is responsive to the needs of Member Governments.

### CARDI ORGANIZATION (ISNAR Proposal)



C A R D I CORE PROFESSIONAL STAFF

Staff at Inception in '75			Staff at Feb. '76	Staff at Feb. '78	Staff at '79	Staff at '81	Staff at '85
1. Agric. Econ.	(T&T)	L. Hankine	L. Rankine	R. Carew	R. Carew	R. Carew	R. Carew
2. Agron. Herb.	(T&T)	J. Hammerton	J. Hammerton	-	J. Hammerton	J. Hammerton	J. Hammerton**
3. Plant Breeders	(T&T)	W. Charles	W. Charles	-	-	-	(Dom) H. Adams**
4. Agron.*	(T&T)	B. Williams	B. Williams	B. Williams	(Agron) B. Ahmed	B. Ahmed	B. Ahmed**
5. Entomologist	(Jam)	V. Royes	-	(Agron) W. Rao	(Agron) L. Daisley	L. Daisley	-
	(T&T)	S. Parasram	K. Buckmire (Temp)	S. Parasram	S. Parasram	S. Parasram	-
7. Nematologist	(T&T)	N. Singh	N. Singh	N. Singh	N. Singh	N. Singh	N. Singh
8. Pl. Pathologist	(T&T)	C. Brathwaite	-	-	-	-	-
9. Pl. Pathologist	(T&T)	R. Phelps	R. Phelps	R. Phelps	R. Phelps	R. Phelps	R. Phelps
10. Agron.*	(Jam)	R. Pierre	-	-	(Agron) A. Thomas	A. Thomas	A. Thomas
11. Virologist	(T&T)	S. Hague	S. Hague	S. Hague	S. Hague	S. Hague	S. Hague
12. An. Nutritionist	(T&T)	P. Osuji	P. Osuji	P. Osuji	P. Osuji	P. Osuji	P. Osuji
13. Soil Chemist	(T&T)	D. Walmsley	D. Walmsley	D. Walmsley	D. Walmsley	D. Walmsley	D. Walmsley
14. Agron.*	(T&T)	R. Dalal	-	-	C. George	C. George	-
15. Soil Physicist	(T&T)	L. Arya	L. Arya	-	L. Singh	L. Singh**	L. Singh**
16. Soil Surveyor	(T&T)	J. Stark	J. Stark	-	(An. Sc.) H. Harricharan	H. Harricharan	H. Harricharan
17. Anal. Chemist	(T&T)	A. Kerr	-	St. C. Forde	St. C. Forde	St. C. Forde	St. C. Forde
18. Agron.*	(T&T)	J. Morris	J. Morris	J. Morris	J. Morris	J. Morris	J. Morris
19. Agron.	(Bds)	R. Baynes	-	-	V. Sargeant	V. Sargeant	-
20. Agron.*	(T&T)	T. Ferguson	St. C. Forde	J. Collins	P. Collins	P. Collins	P. Collins
21. Agron.*	(L. Is.)	St. C. Forde	-	C. Walter	C. Walter	C. Walter	L. Daisley**
22. Agron.*	(Jam)	H. Payne	H. Payne	H. Payne	H. Payne	H. Payne	H. Payne
23. Biometrician	(T&T)	B. Springer	B. Springer	G. Taylor	B. Lauckner	B. Lauckner	B. Lauckner
24. Statistician*	(T&T)	J. Sanchez	J. Sanchez	J. Sanchez	J. Sanchez	J. Sanchez	J. Sanchez
25. Executive Director*	(T&T)	J. Sanchez	R. Pierre	J. Bergasse	J. Bergasse	J. Bergasse	S. Parasram
26. Agron.*	(Guy)	-	-	L. Daisley	R. Fletcher	R. Fletcher	(Mont) R. Fletcher
27. An. Scientist*	(Guy)	-	-	H. Harricharan	(Agron) W. Massiah	(Agron) W. Massiah	-
28. Admin. Director	(T&T)	-	-	-	-	-	-
29. Pesticide Chemist*	(T&T)	-	-	A. Ali	A. Ali	A. Ali	A. Ali
30. Farm Manag. Sp.*	(T&T)	-	-	B. Greene	J. Cropper	J. Cropper	-
31. Public Rel. Off.*	(T&T)	-	-	-	K. Donawa	K. Donawa	-
32. Admin. Assistant*	(T&T)	-	-	M. Daniel	M. Daniel	M. Daniel	-
33. Admin. Assistant*	(Jam)	-	-	-	F. Roberts	F. Roberts	F. Roberts
34. Agron/Physiol.*	(Bds)	-	-	Norgrove	(Pl. Path) W. Small	-	F. Roberts
35. Animal Product.*	(Bds)	-	-	H. Jeffers	G. Proverbs	G. Proverbs	F. Chandler
36. Agric. Engineer*	(Jam)	-	-	C. Madramootoo	C. Madramootoo	C. Madramootoo	G. Proverbs**
37. Entomologist*	(Bds)	-	-	M. Alam	M. Alam	M. Alam	M. Alam
38. Pl. Prot. Spec.*	(Guy)	-	-	-	-	-	G. Mueller
39. An. Prod./Nutr.*	(Jam)	-	-	-	E. Johnson	E. Johnson	-
40. Economist*	(Jam)	-	(T&T) E. Lewis	E. Lewis	E. Lewis	-	Agron/Hort (T&T) B. Cooper
41. Agronomist*	(Jam)	-	N. Prendagast	N. Prendagast	N. Prendagast	N. Prendagast	J. Suah
42. Entomologist*	(Jam)	-	J. Hammerton	J. Hammerton	J. Reid	J. Reid	J. Reid
43. Agron.*	(Bel)	-	J. Lowery	J. Lowery	-	B. Rai	B. Rai
44. Agron.*	(Bel)	-	N. Kirton	N. Kirton	J. Lowery	(St. Kitts) J. Lowery	J. Lowery**
45. Agron.*	(Slu)	-	Devers	V. Barkley	-	-	W. Massiah**
46. Agron.*	(Anu)	-	-	(Slu) A. Ali	-	-	V. Sargeant**
47. Agric. Econ.*	(Anu)	-	-	K. Buckmire	-	A. Ali	A. Ali
48. Agron.*	(St. Kitts)	-	K. Buckmire	J. Grant	(Green) K. Buckmire	J. Grant	K. Buckmire**
49. Agric. Engineer*	(Jam)	-	-	-	J. Grant	N. Kirton	J. Grant
50. Agronomist*	(St. Vincent)	-	-	-	-	-	-
51. Accountant*	(T&T)	-	-	-	-	-	-
52. Dep. Exec. Dir.*	(Slu)	-	-	-	-	-	C. George

\* new positions

\*\* currently paid by Projects

EXTERNAL PROJECT SUPPORT SOURCES FOR CARDI  
1975-1984

## COMPLETED PROJECTS

## Canadian International Development Agency

* Control of nutmeg wilt (I)	1979-80	US\$	22,000
* Control of nutmeg wilt (II)	1980-81		18,000
* Control of burning disease of tannia (taro)	1980-81		18,000
* Internal parasite control in sheep	1980-82		20,000
* Production and development of Leucaena as a forage and feed ingredient for livestock	1982-83		24,000

## Caribbean Development Bank

* Farm records	1977-79		20,000
* Testing of animal feed blocks	1978-80		24,000
* Trickle irrigation for bananas	1977-80		88,000
* Cableways for bananas (includes New Zealand Technical Assistance)	1978-81		106,000
* Control of monkey crop damage	1980-81		47,000

## Food and Agriculture Organization

* Regional survey of food legumes	1977-78		5,000
* Development of regional program for food legumes	1980-81		35,000

## Ford Foundation

* Travel to promote international contacts	1977-78		12,000
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## Overseas Development Administration (UK)

* Control of yam viruses	1975-79		169,000
* Appropriate experimental designs	1975-79		210,000

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United States Agency for International  
Development

* Field station development	1976-78	US\$ 249,000
* Farming systems	1978-82	2,200,000
* Accelerated food production	1980-81	100,000
* Fruit forest survey	1980-81	36,000

United Nations Development Programme/CDB

* Farming systems and commodity improvement	1978-81	746,000
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International Development Research  
Centre (Canada)

* Production of forage legume seed	1977-80	90,000
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Consortium for International Crop  
Protection

* Pesticides management workshop	1980-81	60,000
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Barclays Bank International  
Development Fund

* Integrated pest control I	1978-81	25,000
* New production technology (St. Vincent)	1980-82	25,000
* Production of "how-to-do-it" materials	1980-82	74,000

European Economic Community

* Equipment, vehicles, and buildings	1979-82	1,950,000
* Production of forage legume seed	1980-81	85,000
* Production of virus-tested yams	1980-83	305,000
* Improved peanut production systems	1980-83	500,000

CURRENT PROJECTS

International Development Research  
Centre (Canada)

* CARDI literature service	1981-84	232,083
* Milk production systems phase 1	1982-85	314,750
* Milk production systems phase 2	1985-87	367,512

Barclays Bank International Development Fund

* Integrated pest control II	1981-84	US\$ 170,000
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United States Agency for International Development

* New headquarters building (soft loan to UWI)		(3,200,000)
* Farming systems research and development project 538-0799	Began 1 July 1983, to end 30 June 1988.	7,000,000
* Farming systems research and development project 538-0099 -- Granada component	Being developed at present.	550,000

Canadian International Development Agency

* Pilot project for increasing milk production among coastal farmers in Guyana	1984/85 (Mission- Administered Funds - Barbados) Approved in 1984 to begin immediately.	40,000
* Publications of popular literature on agricultural practices for extension officers and farmers in Leewards and Windwards	Approved for 1 year. Started in 1983/84. Will end mid-1984.	8,000
* Assistance to small farming systems project in Trinidad and Tobago	(Mission- Administered Funds)	10,000
* Garlic production project	1983-84	18,300
* Rcseau Valley dairy project		37,037

Commonwealth Fund for Technical Cooperation

* Provision of 2 specialists -- one each in post-harvest technology and soil and water management	Continuing. Began mid-1983.
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## European Economic Community

* Assistance to CARDI		
(a) Forage seed production		
(b) Soil and water management	1982-86	US\$ 3,000,000
(c) Aroid development		
(d) Technical assistance CARICOM Farms Ltd., Belize		
* Integrated pest control II		
	Sugar Producers' Association, Barbados.	96,250
	1981-84 Arrowroot Assoc. and Sugar Producers, St. Vincent.	32,500
	NACO -- St. Kitts.	16,500

## Food and Agricultural Organisation/UNDP

* Upper watershed management socioeconomic survey	End of March, 1984.	24,000
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## Jamaican Coffee Board

* Coffee berry borer control	Beginning 1980 -- Continuing to 1985. _____	50,000
		US\$22,429,932
		TT\$54,302,865

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