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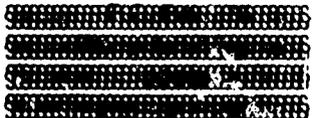
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**EMPLOYMENT GENERATION
THROUGH
INDUSTRY AND COMMERCE
VOLUME I**

**Project Summary and Budget,
Technology Information Unit
and
Technology Research Fund**

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Contract AID Lac-C-1268

AN EQUAL OPPORTUNITY
EMPLOYER/MAF

Foreword

The unemployment in the Less Developed Nations of the Caribbean is alarmingly high, and, at present population growth levels, promises to increase rapidly in the near future. Migration, which for years has been a recourse for the young, is no longer a viable option. Agriculture has a very limited labor absorptive capacity, and employment in public works is already in excess of need. The authorities have recognized that only industry and commerce offer possibilities of absorbing the unemployed work force.

However, Caribbean markets for industrial products are themselves too small to absorb the industrial production required to create sufficient employment. Therefore, the industrial programs envisaged, place substantial emphasis on extra regional markets as an outlet for Caribbean production.

This project responds to these constraints, and provides direct instruments for the achievement of an industrial production mix to serve diverse markets, and also provides indirect instruments to service the industrial/commercial entities which will contribute to that product mix.

The direct instruments are two: an investment promotion effort designed to attract companies which are experiencing increasing cost pressures in the Far East; and a system of assistance to small enterprise which will enable them to function more efficiently, and with greater responsiveness, to domestic, regional, and extra regional markets; and will enable them to utilize more fully the industrial credit system.

The indirect instruments are three: (a) a program of restructuring and reform of the Development Finance Corporation in the eight LDCs, so that those institutions may play a more effective role in providing development credits; (b) an additional small industry loan fund to provide a line of credit designed to meet the needs of small enterprise; (c) a technology information system designed to facilitate the use of appropriate technology, and to fund desirable investigation and research, for development of techniques which would be particularly effective in the Caribbean.

The project, its rationale, and costs, are set out in three volumes.

The volumes, taken together, provide the information required for an AID project paper.

The documents are organized as follows:

- Volume I. PROJECT SUMMARY, CONSOLIDATED BUDGETS, TECHNICAL INFORMATION UNIT AND TECHNOLOGY RESEARCH FUND
- Volume II. EMPLOYMENT GENERATION - EXPORT INDUSTRY PROMOTION AND ASSISTANCE TO SMALL INDUSTRY
- Volume III. EMPLOYMENT GENERATION - RESTRUCTURING OF DEVELOPMENT FINANCE CORPORATIONS AND ESTABLISHMENT OF SMALL INDUSTRY LOAN FUND

The work of the BASIC consultants drew heavily upon reports, the observations and judgements of CDB personnel and of personnel of the various agencies expected to participate in the project. The earlier analysis of the DFCs carried out primarily by Mr. de Fonseca and Mr. Iyer was particularly thorough and useful. Where BASIC's observations and conclusions coincided with those of the earlier analytic reports, excerpts from those reports have been incorporated herein.

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VOLUME I

PROJECT SUMMARY AND BUDGET,
TECHNOLOGY INFORMATION UNIT
AND
TECHNOLOGY RESEARCH FUND

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Volume I

This volume is divided into two parts, the first, Part A, presents a summary of the entire project.

The second, Part B, presents the first major project activity, the establishment of a Technical Information Unit and Technical Research Fund in the Caribbean Development Bank.

PROJECT DESCRIPTION

A. Goal & Purpose

1. Goal

The goal of the project is the increase of employment and output of the industrial and the informal sectors of the MDC's and LDC's of the English-speaking Caribbean. ^{1/} The goal has been selected as a result of rising concern over worsening unemployment levels and the recognition that employment generation must be accomplished within an appropriate economic framework.

The inability of the public sector to provide employment possibilities, the limited labor absorptive capacities of the agricultural and tourism sectors, and the increased restrictions on external migration, limit the employment generation options available. Increased development of export oriented industry and local market oriented production and services, have emerged as implicit public policy in the LDC's and the MDC's. This project is intended to add substance to the emerging policies by providing a strategy, instruments, and the resources required to advance their achievement. The goal will be attained when employment and output in the industrial sector are stabilized and begin to rise.

2. Purpose

The project is designed to stimulate industrial growth in both the MDC's and LDC's, by increasing investment in labor intensive productive enterprises servicing local and extra regional export markets. The project is planned to increase the rate of investment, by stimulating and facilitating the investment process, and at the same time to maximize the production and employment effects of existing capital.

^{1/} The project will focus primarily on the LDC's and Barbados; however, any Bank member will be eligible for the activities financed under the Project, except the contributing members of Trinidad and Tobago, Venezuela, Colombia, U.K. and Canada. Regional projects and research activities involving Trinidadian institutions will be eligible.

Since the bulk of the fabrication processes expected to be established for penetration of the Foreign Markets are labor intensive, the twin purposes of employment and output optimization seem readily compatible. Similarly, with few exceptions, increases in production for domestic and regional markets, in the absence of mass markets, will not require large capital components. However, the wide range of small projects envisaged will involve the financial institutions in "high cost" lending. This "high cost" element is one of the constraints addressed in the project. Resolution of lending problems is crucial to the attainment of fuller resource mobilization e.g. local raw material usage, and utilization of local skills.

The purpose of the project will be considered achieved with the creation of 2,000 jobs and indirect employment generation of 500 jobs, together with effective usage of the established institutional infrastructure. Collaterally, a net increase in CDB and DFC industrial lending will be entailed in purpose achievement. Successful project completion will also provide for substantial strengthening of institutions, regional and national.

B. Description

1. Summary

The project has been designed to facilitate the flow of resources to the "ultimate decision maker" - the entrepreneur/manager, and to increase his options for the mobilization, direction, and employment of those resources. Fortuitous circumstances make it probable that acceleration in the rate of the entry of foreign owned industry may be induced by appropriate actions. That entry is expected to be accompanied by technology transfer, additions to the available managerial pool, and an increase in markets and marketing knowledge.

It is the intent of the project to increase local participation in the exporting ventures, thus stabilizing the tenure of foreign owned firms, increasing the stock of Caribbean managers, technicians, and enlarging Caribbean marketing horizons. Employment and output will be increased while building a greater degree of Caribbean self-sufficiency in those skills essential to further industrialization.

Local and regionally focused industry presents another avenue of economic growth and employment generation, but this has special constraints. The effects of small markets, limited resource bases, and scarcity of management and technical skills, are exacerbated by imperfectly functioning developmental institutions. These inst-

institutions, supported by very small populations (the largest of which is equivalent to a small city in the United States) are clearly unable to allocate resources at levels commensurate with the tasks at hand. Thus the project relies heavily on the use of regional entities under which essential activities may receive the support necessary while lowering the fiscal burdens on individual LDC's.

(a) Strategy

The project addresses six constraints:

1. The limited entrepreneurial options as now perceived in the Caribbean business community.
2. Limited (quantity and quality) managerial competence.
3. The limited resource base in the MDC's and LDC's.
4. The limited technical options presently available to firms, (actual and potential).
5. The limited availability of equity finance.
6. The inadequacy of financial institutions, and loan fund options to serve the needs of small entrepreneurs.

The constraints are to be overcome through recognition of appropriate and proper confluence of public and private interests, and provisions to strengthen each sector in performance of its allotted role. The actions to be taken will be procedural, institutional and financial; with the institutional and financial elements designed to reflect the needs of, and make provision for, effective and productive decisions of the private sector.

The limited options presently constraining accelerated industrialization are expected to be lifted in part by an effort designed to induce firms now operating in the Far East to set up operations in the MDC's and LDC's of the Eastern Caribbean. The introduction of these plants will serve the immediate public interest in job creation and export earnings. It is also expected that equity positions in many of them will be available to Caribbean investors, and that the success patterns of these industrial plants will give rise to changes of market perception by the more wealthy Caribbean nationals, whose ventures are now largely mercantile in nature. Further, the conditions which make for company migration from the Far East also make for opportunities for Caribbean owned companies to be formed to produce under license or contract for buyers formerly purchasing from Far Eastern areas. The opportunities for new export production facilities in the MDC/LDC's, range from light assembly to organized cottage industry. Thus an appropriate response to export opportunities should be felt at every level of enterprise.

In addition to opportunities provided by export based industries, the options of small enterprise will be expanded by a series of actions designed to relate local production capacity and distributive changes to local market expansion. In the technical assistance to be provided to small producers, provision will be made for inducement of those producers to respond to internal markets which are at present unknown to them, but will be identified through project activities.

The managerial constraints are addressed by obtaining greater Caribbean participation in the management of "migrant" industry, and by the provision of technical assistance to small enterprise managers. (A program of in-plant training is being proposed under the sponsorship of CIDA and possibly another by the IBRD. These are also expected to contribute to the improvement of middle management.)

Of special importance in the development of managerial skills is the role of "contract" purchasers and licensors. These normally may be expected to assist local entrepreneurs in the establishment and management of plants which serve them.

The limited resource constraint is addressed primarily through accelerating the establishment of industries which make the best use of the locational advantages possessed by the MDC's/LDC's, the relative abundance of manpower and the high productivity rates which characterize export production in the Eastern Caribbean. Nevertheless, fabrication processes, which utilize local materials, and thus increase "value added", will be given priority in the project, and will be emphasized in that element of the project which provides for technology transfer and/or adaptation of technology to Caribbean conditions.

The technical constraint is similarly addressed by provision for a flow of technical information, so focused and disseminated as to be of timely relevance to the entrepreneur's needs. The need for increases in stock of technicians is expected to be addressed by proposed IBRD plans, a program which complements this project.

The constraint imposed by limited availability of equity, is addressed primarily by the existing programs of the CIC, which is mandated to provide equity capital throughout the LDC's (under certain guidelines) and to re-place those capital issues to the public. With the wider investment options available to it under this project, the CIC may be expected to increase the tempo of the investments, and with the improved record of companies financed by the CIC it is reasonable to expect that private placements will increase.

The inadequacy of Development Finance Corporations in the LDC's is directly related to the small fixed capital markets which they individually serve. The loan fund restrictions which further limit their lending options, also contribute to their present precarious state. The project seeks to strengthen the DFC's and render them viable by programs designed to reduce operating costs on one hand, while on the other increasing their revenues. This is expected to be accomplished by strengthening effective demand for fixed capital, improving DFC developmental lending practices, and facilitating their access to local private sources of savings.

The measures for operational and marketing improvement will be supported by the loan of \$5.0 million. The loan will be structured to provide the initial resources for increased capital needs generated by the program, and is expected to provide a model for subsequent lending from other international organizations.

OVERVIEW OF PROJECT

The project consists of five major activities to be undertaken under the guidance of the CDB; (1) a small Business Technical Assistance Program; (2) a DFC restructuring program; (3) a labour intensive export program; (4) a program for technology information services and applications research; and (5) creation of a loan fund for small industry.

The activities are designed to bring about efficient delivery of services or completion of desired events in the LDC's; but in the interest of cost effectiveness, and best utilization of scarce resources, the "motor" of each activity will be regional organizations. Those organizations strengthened and partially restructured, will assist in the re-design and re-organization of LDC entities in such a form as to facilitate effective division of responsibility between the regional entities and the LDC cooperating agencies.

The CIC will have dual responsibilities in this project, reflecting its regional mandate to promote industrial development and to provide T/A to industry. Its first responsibility will be to identify foreign companies for relocation in the LDC's and will assist the LDC's in creating the ambiance, institutions and procedures to facilitate such relocation.

A second responsibility will be to organize a unit and set procedures to provide business counseling services to small enterprise in the LDC's. The delivery system will be manned by CIC staff, with additional field support provided by U.S. Peace Corps Volunteers. In addition to counselling, the Corporation will coordinate the provision of production related technical services to the small enterprise community; and in conjunction with the DFC's, prepare individual entrepreneurs for utilization of FDC loan funds.

The selection of the C.I.C. as prime agent for two important roles in this project; investment promotion and T/A to small enterprise; is predicated, in part, upon the fact that the C.I.C. is mandated to function regionally as a promotion and technical assistance agency, and in part from the efficiencies and cost reductions inherent in a centralized operation, which can in this instance, be effected only by a regional organization. Further the facility for equity participation by the C.I.C. in new plants brought into the Caribbean, will greatly enhance the attractions of a Caribbean location to potential "migrants" firms.

The suitability of the C.I.C. as an executing agency is, however, conditioned by the following concerns:

(1) The corporation has not to date achieved financial viability; is unlikely to do so unless fresh capital is injected into its operations and new criteria and procedures are instituted for the performance of its function as a provider of equity and specialized lending.

(2) Given the foreseeable financial position of the C.I.C., even with additional capital injections, it is unlikely that profitably and cash flow generation will be adequate to support the investment promotion effort after the termination of the AID Grant funding. Therefore it is essential that the Investment Promotion effort be self-financing from its initiation.

The investment promotion function would be a felicitous link to the corporation's ability to identify profitable equity situations. However, unless the C.I.C. is brought to a state of viability, it cannot avail itself of the advantages of the linkage, and the investment promotion effort would itself be jeopardized.

Various LDC government have advanced plans to establish individual investment promotion programs. It is expected that the LDC's will utilize part of their available funding to subscribe to the C.I.C. services for "migrant" firm identification, and be represented in initial contacts with such firms. A system of preferences would be established to give each LDC, in turn, first option on dealing with potential relocating firms so identified. It would be incumbent upon the individual LDC export promotion offices to develop and utilize appropriate mechanisms and procedures to respond to and negotiate with firms identified on their behalf.

(3) The role of the C.I.C. as a T/A channel to small businesses is also jeopardized by financial plight. Should the hoped for turn-around in the C.I.C. financial position occur within the four year period for this project, it is still unlikely that the Corporation could or should bear the costs of the T/A function. It is therefore essential that one or more of the cost recuperation devices described elsewhere in this paper accompany the initiation of this program.

The CDB will be responsible for three regional activities. It will undertake DFC reform through detailed policy and procedural changes while, in some instances temporarily operating responsive DFC's under "Trust" arrangement. A Technical information unit to be organized within the CDB, will provide a wide range of technical information and applications research in support of the main components of the project and as a service to all public and private agencies involved in production in the Caribbean.

To provide financial resources to the DFC's and through them to the small business community, the CDB will administer a special small business loan fund, 60% of which will be earmarked for the LDC's and 40% for the MDC's. The fund will be designed primarily to support labour intensive private sector projects. Individual projects will, in many instances, be reviewed by the Technical Information Unit to assure that capital outlays produce the greatest employment effect commensurate with technical considerations.

Project Management

The CDB will provide a single point of coordination, evaluation and oversight function for the entire program, to insure coordination, proper and effective use of resources according to plan, and redeployment of resources should that become desirable. The management of the CDB will rely heavily upon the facilities of the Industry Division for technical and administrative evaluations in support of this function.

2. Functions

The managers of the TIU, CIC/SETA, CIC/Regional Investment Promotion Division and DFC projects described above, will submit progress reports periodically to the CDB for analysis by the Industry Division. These reports will include projects' activities accomplishments, expenditure and immediate plans. This reporting is not intended to be a detailed financial accounting, but will emphasize operational accounting, and progress reporting. At regular intervals of not less than three months, the Director of the Industry Division will meet jointly with the project managers to determine ways in which the various program elements can reinforce each other. These meetings could be timed to follow closely the reports described above.

Based on the above information, and on any studies he may request from analysts in the CDB or from outside technical assistance entities (see below) the Industry Division Director will evaluate the manner and degree to which the different elements of the program are functioning effectively and are achieving the individual project and overall program goals. He will keep the President of the CDB informed of these evaluations and of any needs to modify or redirect the program.

Where individual projects within the program are not functioning as desired, the Industry Division Director will first discuss the problems with the manager of that project in an effort to remove any real blocks and improve performance. In limited cases, where the addition of small contingency funds would help, the Director will recommend to the CDB President that funds be reallocated within the program, and will present a plan and justification for the proposed reallocation.

3. Training

No training is contemplated under this portion of the program although, if identified later, it would be eligible for project purposes.

4. Technical Assistance

The Industry Division Director will be able to call on outside financial and management experts, as needed, to assist him in making the above evaluations and in preparing any plans and justifications needed to support proposed program changes.

5. Activity Budget

<u>ITEM</u>	<u>YEAR 1</u>	<u>YEAR 2</u>	<u>YEAR 3</u>	<u>YEAR 4</u>	<u>TOTAL</u>
Technical/Asst.	25	10	-	-	35
Contingency	-	15	20	20	55
Total	<u>25</u>	<u>25</u>	<u>20</u>	<u>20</u>	<u>90</u>

Table

CONSOLIDATED BUDGET
(US \$000)

Item	YEAR									
	1		2		3		4		TOTAL	
	AID	CDB	AID	CDB	AID	CDB	AID	CDB	AID	CDB
TIU	170	116.5	384.5	116.5	389	111.5	--	--	1142.5	345.5
Personnel	43.0	23.0	57.0	23.0	57.0	23.0	--	--	216.0	70.0
Operations	11.5	8.5	11.5	8.5	11.5	8.5	--	--	34.5	25.5
Travel	16.0	--	11.5	--	15.5	--	--	--	43.0	--
Training	4.0	--	1.5	--	1.5	--	--	--	7.0	--
Equipment	10.5	--	3.0	--	3.5	--	--	--	17.0	--
TA	35.0	--	20.0	--	20.0	--	--	--	75.0	--
Tech Fund	250.0	85.0	250.0	85.0	250.0	80.0	--	--	750.0	250.0
Small Enterprise	213.5	4.0	131.5	23.0	98.0	27.0	52.5	11.5	496.0	65.0
Personnel	40.0	--	40.0	10.0	40.0	10.0	22.0	3.0	142.0	23.0
Operations	5.0	14.0	13.0	13.0	17.0	17.0	8.5	8.5	43.0	42.0
Equipment	5.0	--	4.0	--	--	--	--	--	10.0	--
Travel	2.0	--	9.0	--	5.5	--	5.5	--	22.0	--
Training	--	--	40.0	--	--	--	--	--	40.0	--
Survey	45.0	--	--	--	--	--	--	--	45.0	--
Special	--	--	15.0	--	15.0	--	6.0	--	36.0	--
Studies	--	--	10.5	--	20.5	--	10.5	--	157.0	--
Tech Assist.	116.5	--	--	--	--	--	--	--	--	--
Expert Industries	251.0	30.0	101.0	37.0	50.0	35.0	30.0	25.0	432.0	127.0
Personnel	30.0	22.0	30.0	22.0	30.0	22.0	10.0	16.0	100.0	82.0
Operations	5.0	8.0	5.0	15.0	5.0	13.0	--	9.0	15.0	45.0
Equipment	10.0	--	--	--	--	--	--	--	--	10.0
Travel	28.0	--	15.0	--	15.0	--	20.0	--	78.0	--
Tech Assist.	178.0	--	51.0	--	--	--	--	--	229.0	--
DFC Program	221.0	15.0	166.0	15.0	66.0	15.0	17.0	5.0	470.0	50.0
Personnel	15.0	15.0	15.0	15.0	15.0	15.0	10.0	5.0	55.0	50.0
Travel	16.0	--	10.0	--	14.0	--	7.0	--	47.0	--
Training	13.0	--	33.0	--	33.0	--	--	--	87.0	--
Equipment	13.0	--	--	--	--	--	--	--	13.0	--
Tech Assist.	164.0	--	104.0	--	--	--	--	--	268.0	--
CDB Coordination	25.0	--	25.0	--	20.0	--	10.0	--	90.0	--
Tech Asst.	25.0	--	10.0	--	--	--	--	--	35.0	--
Contingency	--	--	15.0	--	20.0	--	20.0	--	55.0	--
Credit Fund	--	--	1333.0	--	1333.0	--	1334.0	--	5000.0	--
TOTAL	1080.5	165.5	2141.0	191.5	1956.0	188.5	1453.5	41.5	7630.5	587.5

NOTE: Table contains rounded figures.

TABLE
CONSOLIDATED BUDGET
 (U. S. \$000)

<u>ITEM</u>	<u>AID GRANT</u>	<u>AID LOAN</u>	<u>CDB</u>	<u>TOTAL</u>
<u>TIU</u>	<u>1,129.0</u>	<u>-</u>	<u>359.0</u>	<u>1,488.0</u>
Personnel	216.0	-	70.0	286.0
Operations	345.0	-	255.0	60.0
Travel	43.0	-	-	43.0
Training	7.0	-	-	7.0
Equipment	3.5	-	13.5	17.0
Technical Assistance	75.0	-	-	75.0
Technology Fund	750.0	-	250.0	1,000.0
<u>Small Enterprise</u>	<u>446.0</u>	<u>-</u>	<u>63.0</u>	<u>561.0</u>
Personnel	142.0	-	23.0	165.0
Operations	43.0	-	42.0	86.0
Equipment	10.0	-	-	10.0
Travel	22.0	-	-	22.0
Training	40.0	-	-	40.0
Survey	45.0	-	-	45.0
Special Studies	36.0	-	-	36.0
Technical Assistance	157.0	-	-	157.0
<u>Export Industries</u>	<u>432.0</u>	<u>-</u>	<u>127.0</u>	<u>559.0</u>
Personnel	100.0	-	82.0	182.0
Operations	15.0	-	45.0	60.0
Equipment	10.0	-	-	10.0
Travel	78.0	-	-	78.0
Technical Assistance	229.0	-	-	229.0
<u>DFC Program</u>	<u>470.0</u>	<u>-</u>	<u>50.0</u>	<u>520.0</u>
Personnel	55.0	-	50.0	105.0
Travel	47.0	-	-	47.0
Training	87.0	-	-	87.0
Equipment	13.0	-	-	13.0
Technical Assistance	268.0	-	-	268.0
<u>CDB Coordinator</u>	<u>90.0</u>	<u>-</u>	<u>-</u>	<u>90.0</u>
Technical Assistance	35.0	-	-	35.0
Contingency	55.0	-	-	55.0
<u>Credit Fund</u>	<u>-</u>	<u>5,000.0</u>	<u>-</u>	<u>5,000.0</u>
<u>Total</u>	<u>\$ 2,577.0</u>	<u>5,000.0</u>	<u>601.0</u>	<u>8,218.0</u>

PART II

TECHNOLOGY INFORMATION UNIT

AND

TECHNOLOGY RESEARCH FUND

Section I

INTRODUCTION

The Caribbean Development Bank (CDB) has recognized a need to develop a wider base of information on technologies that will be useful to the development of the Caribbean region. Within its present organization, the CDB has already taken important steps in this direction. At the same time, there is a need to develop procedures for getting the optimum use from this information, not only within the CDB, but throughout the region, and for well-focused research to expand and adapt various technologies for specific, needed applications.

Meetings were held with Bank officials and potential information users in the Caribbean area and with U.S.-based organizations that gather, supply, and use technical information from world-wide sources. In addition, information was gathered about organizations in Europe, Asia, Africa, and Latin America that are similarly concerned with technical data. A list of these organizations is attached as Appendix A.

Although these organizations provided a variety of useful models, none of them quite fit the needs of the Caribbean situation. On the other hand, a new Caribbean organization, as described in the following pages, will be able to greatly increase its scope and effectiveness at little cost, by drawing skillfully on the resources of existing organizations.

The following pages describe:

- the needs and uses for technical information,
- the types of information to be collected,
- criteria for the organization and operation of the Technical Information Unit, and
- a specific scope of work, organization, implementation plan, and budget.

These items are briefly summarized in Section II and described in more detail in succeeding sections.

Section II

SUMMARY AND CONCLUSIONS

The lack of adequate technical information, or the application of inappropriate technical information, in developing countries often leads to lost opportunities and the waste of human, financial, and material resources.

The Caribbean region, like most less developed areas, does not have the highly integrated network of information resources that are available to the industrialized countries. The information links that do exist tend to be focussed on the United Kingdom, Canada, and the United States. The potentially useful connections with other countries, especially in the developing world, tend to be weaker or non-existent.

On the other hand, world recognition of technology's importance to the development of any society has led to an explosive proliferation of technical information resources -- information banks, publications, computerized systems, and accompanying information organizations run by private business, voluntary organizations, national governments, and international agencies.

To bridge this gap between the numerous, complex, and often confusing outside networks of information resources, and the needs of Caribbean development for appropriate technical information, it is recommended that the CDB create a Technical Information Unit within the Bank. This unit would provide a wide range of technical services and would help administer a Technology Research Fund.

The Technical Information Unit (TIU) would function primarily as a staff service to the Industry, Agriculture, and Technical Divisions of the CDB.

In addition, it would serve the technical information needs of the national Development Finance Corporations (DFCs), other Caribbean development organizations, and the private sector. To the extent resources are available, the TIU would also assist non-Caribbean development and information organizations, especially where the assistance is reciprocated.

The Technology Research Fund (TRF) would be used by the CDB for research and pilot projects to adapt, define, and/or demonstrate specific technologies appropriate to the needs of the Caribbean region. Emphasis would be placed on projects in the less developed countries and on projects of specific benefit to lower income groups.

Both the TIU and the TRF should support and reinforce the growing network of Caribbean information and research resources.

The costs of the TIU for the first three years are estimated at US\$488,000 and the TRF would spend US\$1 million over the same period.

* * *

Following are brief descriptions of the operations of the TIU and TRF.

TIU Information Service

The TIU would be the focal point within the CDB for locating, gathering, storing, evaluating, selecting, and disseminating technical information. Technical information in this context would cover manufacturing processes and equipment (at all appropriate scales, from cottage industries on up), agriculture and agro-industry, fishing equipment and techniques, construction materials and processes, energy, and supporting natural resources data. The TIU would maintain a library of basic

technical information and a much wider collection of references about outside technical information resources. These TIU operations would be closely coordinated with those of the CDB Library to get the most efficient use of equipment (microfiche printers, etc.), space, and skills. Although the TIU would be responsible for the technical information resources of the CDB, this material would be regarded as part of the CDB Library collection.

Information requests would come to the TIU from a variety of sources, including CDB and DFC loan officers who are formulating or analyzing projects, businessmen, development corporations, research organizations, government departments, and voluntary service organizations. The TIU staff, based on their own technical knowledge, would select the appropriate information from their files, or would acquire it from outside sources.

Project Review

On all CDB projects, the TIU would be available to assist the loan officers to obtain and evaluate needed technical information. On those projects involving an expected investment exceeding \$7500 per job created, the head of the TIU would participate in the Project Team's "technical study, including consideration of alternatives," specified in the CDB Policies and Procedures Manual, paragraph 327.2 II,5(b). If the Project Team did not concur with the TIU on a proposed alternative technical approach, the TIU alternative suggestions and supporting arguments would be submitted to the Loans Committee concurrently with the loan proposal.

Information Coordination

The TIU should coordinate closely with other Caribbean information banks, such as CARDI and CARIRI, to avoid unnecessary duplication and to make the best use of specialized skills. For certain categories of information, each organization should specialize on behalf of all the organizations. Throughout the Caribbean, the TIU should make cooperating organizations aware of what resources each can provide and insure that vital information gaps are closed, either by the TIU or by another organization.

Newsletter

To assist in coordinating and disseminating technical information, the TIU should publish a small newsletter on a monthly basis, describing selected technical items of specific interest to Caribbean development, including research projects, both in and outside the region, new product developments (particularly those suitable for small-scale applications), publications, profiles of Caribbean information and research organizations, and regional meetings and conferences.

The newsletter would exchange information among cooperating institutions, inform outside organizations of relevant developments, reduce duplications of effort, and focus on areas needing further work. Other organizations should be invited to make regular contributions in their areas of interest.

Meetings

In his role as information coordinator and action stimulator, the head of the TIU should periodically confer with various development research and information organizations in the Caribbean. If it appears from

these contacts that a meeting of selected specialists would help clarify and define specific development research needs, the TIU should assist in organizing such meetings.

Technology Research Fund

In the course of the CDB's work, including that of the TIU, certain areas will appear where relatively small expenditures of research, development, or demonstration funds will seem likely to provide substantial development benefits. To take advantage of these opportunities, a Technology Research Fund (TRF) should be established in the CDB.

The TIU would prepare project proposals for funding by the TRF and for execution by selected outside research institutions. These proposals would be coordinated and reviewed with the appropriate operating division (Industry, Agriculture or Technical) and with CDB Management.

Projects for TRF funding should:

- focus on "key information" needed to unlock specific development potential, as described below;
- contribute, if successful, to development projects that increase employment and/or income, or reduce costs, or improve housing or other aspects of living conditions;
- focus on benefits to lower income groups;
- lead to projects for which there is a felt need and potential individual or institutional support;
- result in near term useful results; and

- utilize and support existing Caribbean research and development institutions.

TIU Organization and Staffing

It is recommended that the TIU be initially attached to the CDB Industry Division, where similar technical information services are presently being provided on a smaller scale. However, the CDB Management should consider having the TIU and the present CDB Library combined at a later date into one unit.

The TIU operations would be carried out by its staff, assisted by an Advisory Committee. The TIU staff would consist of a Head and three Information Specialists, assisted by a Secretary, and two Librarians.

The TIU Advisory Committee would help the TIU establish, modify, and carry out the details of its operating program. This committee would not "direct" the TIU operations, but would assist it to extend its view of development information needs, particularly outside the CDB.

Committee members should be selected to bring a wide, useful range of organizational representation, technical backgrounds, and geographic distribution. The initial composition of the Committee would include the Directors of the Industry, Agriculture, and Technical Divisions of the CDB, the Head of the TIU, and six additional representatives selected from development, research, and information organizations, both in the Caribbean and outside.

The Head of the TIU would serve as the Secretary of the Committee. The Committee would meet at least quarterly to review the work of the TIU, suggest useful changes or additions to the TIU's activities, discuss methods of better coordinating and up-grading technical information availability and use in the region, and propose initiatives (research

projects, conferences, publications, etc.) to deal with specific unmet information needs of the region.

The following sections of this report discuss the requirements for, and operations of, the TIU and TRF in more detail, including a proposed operating plan, and requirements for technical assistance and personnel training.

Section III

TECHNICAL INFORMATION: SOME BACKGROUND CONSIDERATIONS

Development involves economic, human, and physical factors. This report on technical information is concerned with data on the physical factors -- equipment, materials, and physical processes (including weather) involved in manufacturing, agriculture, construction, transportation, and energy. In addition, appropriate choices of technology also involve requirements for, and availability of, skills, spare parts, and maintenance.

The industrialized nations' great capacity to generate, store, retrieve, and use technical information contributes significantly to their high rate of economic growth.

The less developed countries generally depend on imports of technology from the industrialized countries. These flows of technical information normally follow patterns of trade, investment, and aid. In addition, the givers and receivers of this information usually share a common language. In the English-speaking Caribbean, technical information commonly comes from Great Britain, Canada, and the United States.

The choice of foreign technology is generally determined by its source, e.g. the development advisor, the equipment salesman, the package plant builder, or the foreign corporation establishing a subsidiary. The receiving country often has little choice, in most cases because of inadequate knowledge about alternatives. Even when technical choices are being made by local businessmen or professionals, they tend to be influenced by their education or experience in more developed countries, where appropriate technical choices are based on different circumstances.

Obtaining the best or most appropriate information is only one of the problems. A greater problem occurs when people who could use certain technical information are unaware of its existence.

The power to make or control technical decisions depends largely on having adequate knowledge. For developing countries to have this power, they must have control over the access to necessary information, and a system to identify, locate, evaluate, interpret, and use needed information.

"Total self-reliance in technological matters is not an attainable goal; even the largest industrial countries rely to some extent on technology imports. What is attainable, and should be actively sought, is a high degree of "technical autonomy", meaning that decisions about the adoption of new knowledge, particularly that embodied in new capital investments, should rest in the hands of local people. The power of decision on technological matters, as it increases, means that foreign technology is bought on better terms, from the best sources, with fewer tie-in clauses, in a disaggregated rather than in a turnkey way; that a careful choice is made to obtain technology which is not incompatible with local conditions (climate, use of natural resources and local inputs, employment creation, etc.); that adaptation of the technology may take place through local scientific and technological efforts; that locally generated scientific and technological knowledge will be used to the fullest extent; finally, that foreigners will be used as advisers but not as the final decision-makers."*

*"An approach to Science Policy and Planning" by Alberto Araoz, seminar paper given to National Scientific Advisory Council, St. Augustine, Trinidad, February 1974.

The magnitude of this task should not be underestimated. The types, sources, and flows of technical information in the modern world are so complex that even a specialist in a highly developed country has difficulty keeping up with his specialty alone. For example, there are probably well over a hundred periodicals in the field of medicine alone, and ten times that in the field of engineering. The National Technical Information Service in the United States, which is principally concerned with reports paid for by the U.S. Government, lists over a million titles. Other "information banks" operate at similar magnitudes of size and complexity.

The problem is to devise a solution for the Caribbean that can provide adequate access to outside information, and can interpret and deliver this information to users scattered from Belize to Guyana at a reasonable cost. Doing this will require maximum understanding and use of resources outside the Caribbean, and maximum cooperation among Caribbean institutions.

Before designing a system to accomplish this, let us examine:

- the nature of information needs,
- some basic sources, and
- some existing systems in the Caribbean and how they are meeting Caribbean requirements.

Information Needs

There are two kinds of situations. In the most commonly recognized situation, someone has selected a specific goal and wants help in

reaching it. If he wants to set up a bakery, he needs to know the kind of equipment that will perform adequately, that he can afford, and that can be maintained satisfactorily. If the project is a cement plant or a canning factory, the problems are somewhat more complex, but basically similar.

In the Caribbean, small and scattered markets generally dictate fairly small-scale production. The problem is to find machinery that can economically compete with imports created in large-scale, capital-intensive factories located outside the Caribbean.

A similar problem occurs in agriculture, where equipment development has been concentrated on larger, high-capacity, and more automated equipment. Development of small-scale, inexpensive equipment has been generally neglected (except for gear for the home gardener, which may be unsuitable for farming).

Suitable equipment is available, however, but a thorough search is often required to locate it. Each situation presents a unique set of circumstances. In lieu of finding a solution from the customary North American or British manufacturers, the answer may lie in Japan, Korea, India, or other less familiar markets. And, since these markets are less familiar, the problems of evaluating reliability, maintenance, and spare parts availability are more difficult.

In this kind of situation, the questions are clear, although the answers may be hard to find. However, there is another kind of situation where the first problem is to define the right question. Following are some examples:

- If the problem is construction, should the question be -- how to improve concrete blocks, where to find clay for bricks, or how to make lime-laterite blocks?

- If the problem is water for bananas, should the question be -- where to find enough water for ditch irrigation, where to buy pumps for sprinkler irrigation, or how to install a trickle irrigation system?

- If the problem is inadequate water, should the question be -- what equipment is needed to get more water, or what techniques are available to prevent evaporation losses, or how do we get good results with less water?

The examples can be multiplied indefinitely. In each case, however, there is a common theme. We do not know what questions to ask unless we are aware that alternative solutions exist, i.e. that good blocks can be made from local lime and laterite; that trickle irrigation devices do exist and have proven useful in certain situations; that evaporation can be reduced in open ponds; and so forth.

Someone must understand the needs, be aware of potential solutions, and convey this information to those that can use it.

Information Sources

The next step in analyzing the requirements for the proposed TIU is to look at some basic sources of information.

Manufacturers

Manufacturers' catalogs, data sheets, and correspondence provide the most useful single source of information. In general, manufacturers' information is collected in response to specific information requests. The problem is to know which manufacturer, in which country, can supply the most useful product under the best conditions of price, spare parts availability, and service.

Local manufacturers and manufacturers' agents provide fairly easy access to data, except for the need to insure that local agents are not adding unreasonable price markups. In addition, most countries have commercial directories, such as Thomas Register (U.S.), B.D.I. (West Germany), Denmark Export Directory, or Japan International Trade Directory. Both the CDB and CARIRI have good collections of such directories, which simply need to be kept up to date.

Periodicals

Professional societies (e.g. Institute of Civil Engineers or Society for International Development), commercial publishers (e.g. Pergamon Press or McGraw-Hill), and institutions (e.g. Tropical Products Institute or Food and Agriculture Organization) publish regular periodicals that contain useful articles, product news, advertisements (in some cases) and information references. The problem is to sort out the most useful information from the merely interesting, or even worthless material. Any information service should be very selective, or it could easily become buried in thousands of magazines.

There are two methods for dealing with the problem. The first is to restrict regular subscriptions to the few most useful general magazines

in each field. These subscriptions can be supplemented by limited subscriptions to more specialized magazines for background information on specific projects (e.g. "Ceramic Industry" magazine in connection with a project to make porcelain ware).

The other method is to farm out periodicals to readers who will note and report on items that should be cataloged or passed on to other interested parties. This process usually requires a clear set of instructions on what items to note and how to record them, combined with a continuing followup process to see that a reasonably complete job is being done.

Information Banks and Reference Services

Governments, international organizations, voluntary agencies, and even private companies are increasingly forming information banks and/or information reference services. (An information bank would supply the data needed; a referral service would tell one where to find the information.)

A new and small information service (like the proposed TIU¹ can be cost-effective only if it is equipped to draw on the resources of existing services elsewhere. Following are brief descriptions of some of these services.

The National Technical Information Service, located near Washington, D.C., is one of the largest government information services. Their data bank includes over a million reports, most of them prepared for the U.S. Government. Most of these reports involve very high technology, although NTIS does include reports prepared for USAID, and is increasingly seeking out non-U.S. Government material on intermediate technologies.

NTIS publishes periodic lists of material in a number of specialized categories. One of these lists is designed for use in developing countries, but contains a very high percentage of high technology material. NTIS also produces custom bibliographies on a variety of subjects.

NTIS operations are entirely supported by its income from selling publications. (In Latin America, AID pays NTIS the cost of its publications on appropriate technology.) In many countries, NTIS has local agencies that collect orders and local currency payments, and receive a 25 percent discount to cover their operating costs. NTIS would like to use CARIRI as its Trinidad agent and has discussed using CDB as its Caribbean regional agent. This could be considered by TIU after it is in operation.

The Small Enterprises National Documentation Centre (SENDOC) in Hyderabad, India functions as a clearinghouse of information for specialized agencies connected with the development and promotion of small-scale industries. It now produces:

- "Industry and Technology" monthly digest of new products and processes, new machinery and equipment, SENDOC services, and abstracts of current technical literature,
- "Appropriate Technology Documentation Bulletin" bimonthly, and
- three similar publications covering development economics, management, and general news.

Volunteers in Technical Assistance (VITA), located just outside Washington, D.C., and Intermediate Technology Development Group (ITDG),

in London, both include a central core staff specializing in small-scale, intermediate technologies, supported by a large group of specialist volunteers. Both organizations publish material of general interest and answer inquiries about specific problems. VITA has developed a particularly well-organized system for handling and monitoring inquiries and occasionally undertakes to train outside individuals in their system.

Many of the other organizations listed in Appendix A perform similar services as information banks. The above examples are only intended to illustrate some of the available services.

Library Systems

Libraries are increasingly being served by shared-time computerized bibliographic systems. Individual libraries only need a computer terminal, through which they enter their own cataloging information over telephone lines into a centrally-located computer. The individual library can also use the terminal to ask the computer where specific material can be located in other libraries. The University of West Indies campus at Cave Hill, Barbados is considering joining the Ohio College Library Center (OCLC), one of the largest systems, with over 4,000,000 items in several hundred participating U.S. academic libraries. So far, OCLC has no participating libraries outside of North America and U.W.I. would face substantial costs for the telecommunication link if it joined. On the other hand, it appears that U.W.I. might be interested in a cooperative arrangement with CDB to help share these costs.

Consultants

Consultants provide the specialized skills to supply, interpret, select, and apply needed information. The category of consultants would include:

- private individuals and consulting firms;
- individuals and agencies in government service (e.g. Tropical Products Institute and U.S. Forest Products Laboratory) or in international organizations (e.g. UNIDO, ILO, and International Trade Center);
- voluntary or non-profit organizations (e.g. Technical Assistance Information Clearing House and Volunteers in Technical Assistance); and
- academic groups (e.g. National College of Agricultural Engineering and University of Arizona).

Many international organizations, such as the World Bank, UNDP, and UNIDO, keep extensive consultant's registers. To be useful, such registers need to be cross-indexed by name, countries, and major specialties. One method of drawing on the work of others would be to negotiate cooperative access to existing registers and to use similar formats in establishing any new register.

Research Councils

Most industrialized countries and many developing countries have organizations to help define and coordinate national policies on science and technology. There is for example, a Commonwealth Science Council in

London, a Scientific Research Council in Jamaica, and a nascent science council in Guyana.

Some of these organizations in the industrialized countries have formed units to help transfer technology to less developed countries. One example, created by the U.S. National Academy of Sciences, is the Board on Science and Technology for International Development (BOSTID). BOSTID, with funding from USAID, performs two principal functions:

- organizing panels of experts to write authoritative reports on technical subjects of critical interest to a large number of developing countries; and
- arranging conferences in developing countries that bring together local technical specialists with top experts from around the world.

The advantage of working with an organization like BOSTID, or its equivalent in other countries, is its facility and experience in identifying and drawing on the best talent available, usually on a short-term volunteer basis.

Existing Caribbean Information Sources

Recognizing the need for better technical information, several Caribbean institutions have established information units. Some typical examples are discussed below.

The Caribbean Industrial Research Institute (CARIRI) was formed by the Trinidad and Tobago government to perform research for private companies as well as public agencies. Private research is done on a proprietary

fee basis. Although it is a national organization, it responds in some cases to regional needs.

Several years ago, the Organization of American States gave CARIRI funds to establish a Technical Information Service. This now has a staff of four technically-trained professionals, plus supporting staff, and an extensive library on products and processes for industry, including agro-industry. Since CARIRI is located on the University of the West Indies' St. Augustine campus, the TIS also has easy access to the University library.

The information service is free for queries that take a minimum of staff time and a charge is made for longer searches.

The original OAS funds have now run out and negotiations are underway to replenish or replace them. The OAS wants to fund a regional service, rather than a national one, and is looking for evidence of other support for TIS outside of Trinidad. The TIS approached the Caribbean Development Bank and the CARICOM Secretariat for such support. At the time of this report, the future is uncertain, although the CARIRI/TIS is obviously filling a real need in a capable manner.

The University of the West Indies (U.W.I.) has a Department of Engineering and a Department of Agriculture located on the St. Augustine campus in Trinidad. The University library houses a good collection of technical books and periodicals. As would be expected of a university collection, these focus on the latest state-of-the-act and contain little manufacturers' information and negligible information on "appropriate technology" in the current sense of low or intermediate technology.

The Caribbean Agricultural Research and Development Institute (CARDI), also located in Trinidad, is a regional organization focussing on

research in crop selection and testing, cultural practices, and related questions. In several cases, CARDI has helped to manage CDB-funded agricultural research. One of these projects is the development of a banana cableway system, at the WINBAN Research Centre in St. Lucia. This project will be expanded to demonstration units on four of the Windward Islands. A separate project involves demonstration of trickle irrigation systems for small farmers on four farms in St. Lucia.

Although CARDI is the regional center for agricultural research in the English-speaking Caribbean, it does not appear to have a unit specializing in collecting and distributing information.

Christian Action for Development in the Caribbean (CADEC) works through the Caribbean to improve the social and physical development of the people especially "the poor and powerless." CADEC has recently established an Appropriate Technology Resource Service in Barbados to gather and disseminate information from organizations like the Intermediate Technology Development Group in the U.K. and Volunteers in Technical Assistance in the U.S. The small resource staff does not appear to have a broad technical capability to evaluate proposed solutions. CADEC does appear well-equipped to deal with unsophisticated people and local groups.

The Produce Chemist Laboratories in most of the Caribbean countries experiment with processing methods for local agricultural products and can perform some composition analyses. In general, they are not well prepared to disseminate information or even to take a broad view in problem solving.

Certain industry associations, particularly among the sugar and banana growers, perform both research and information services. Some of these are quite good, within the particular industry served. In most cases,

the ties to work being done outside the English speaking Caribbean need to be strengthened.

The Caribbean Development Bank already has a central library and a separate technical information service. In addition, the CDB sponsors research in various forms. Each of these are discussed below.

The CDB Librarian coordinates the acquisition, inventorying, and custody of the books, reports, periodicals, and other information required by the Bank's operations. Requests for acquisitions come from the Bank's staff and must be approved by an inter-divisional committee, based on perceived need and budgetary limitations. The library also stores many of the unsolicited brochures and catalogues sent to the CDB.

Once an item has been acquired and inventoried, it may be stored in the library shelves, or put out on temporary or semi-permanent loan to the office that most uses the item. The library records its location in case it may be needed by another user.

The space allocated to the library is now crowded and there will be a problem placing any sizeable quantity of new acquisitions. For this reason, the library has ordered a microform reader/printer to use with new acquisitions that can be made in microfiche or microfilm form, and plans to reduce some of its present material to microform to release existing space.

None of the library staff is trained in technical subjects, so that the choice and use of technical materials is largely made outside the library. The Librarian, Mrs. Nancy St. John, is trained in library systems and procedures and is very active in organizations that promote cooperation among Caribbean libraries and better training for library staff.

The CDB Industry Division now has an informal technical information unit, operated by one person, Mr. Jerome Singh. Mr. Singh primarily works with the Industry Division, although he does help the Technical and Agriculture Divisions, and keeps informed about the work of other organizations.

Mr. Singh has collected, with the help of the library in some cases, a number of project studies and reports, some basic technical books and periodicals, a wide variety of manufacturers' and distributors' information, directories of manufacturers in a number of countries, data on information sources in several national and international organizations, and brochures and proposals from technical and economic consultants.

This collection has resulted from:

- information sought out by a loan officer or by Mr. Singh in response to a specific need or request (e.g. appropriate equipment for small bakeries, printers, woodworkers, and metalworking shops);
- information sent to the CDB from manufacturers and consultants wishing to increase their business; and
- information sought out by Mr. Singh as potentially useful. This information has been gathered by correspondence and by trips, such as his recent trip to visit six U.K. industrial trade fairs.

Since Mr. Singh has a broad technical background, he is well equipped to identify, locate, and interpret the technical information needed in a variety of situations. His operation is the logical nucleus of the proposed CDB Technical Information Unit.

Research in the CDB now takes several forms. The work being carried out by CARDI on the banana cableway and banana trickle irrigation has already been mentioned. A forthcoming project is expected to produce coir fiber from coconut husks. The Bank plans to loan the money to a private businessman, who will undertake the project. If the project is unsuccessful, the loan will be cancelled and the Bank will recover the salvage value of the equipment. A third type of CDB research will be undertaken under a recent USAID project. USAID grant funds will be used for research in agro-industry, focussing on processing and conversion of agricultural products. The CDB Management may, or may not, wish to coordinate these projects under the proposed TIU.

Present Needs

As can be seen from the above descriptions, many of the present information needs are being dealt with to some degree. There are, however, several important deficiencies, some of which are listed below:

1. Although present organizations seem to be doing as good a job as their budgets and charters allow, many important information sources are not being canvassed systematically.
2. Present data searches and research projects generally result from inquiries based on assumptions about the problem and assumptions about the nature of the potential solution. In some cases, these assumptions are limited by the inquirer's experience. Wider knowledge about work done elsewhere would help this situation.
3. Not enough is being done to seek, develop, and apply intermediate technologies suitable for small farmers or artisans. There is a particular need to join a strong technical perception to an ability to

communicate with, and influence, less sophisticated segments of the population.

4. There is no Caribbean organization that is systematically looking over the entire field of technical information needs to assess what gaps are inhibiting potential development.
5. In some cases, needs are recognized, without any understanding of the backup data required. (For example, several Caribbean leaders have expressed a desire to use windpower to generate electricity, but no one seems to be doing the preliminary weather data analyses that must underlie any practical technical judgments.
6. Many research decisions are made bilaterally, between a company and a research group, or between a country and an aid-giving organization. In either case, the larger regional potential may be ignored.
7. No comprehensive effort is being made within the English-speaking Caribbean community to "advertise" useful technical information to those who might profit from it.
8. Aid advisors and consultants are normally limited to experience recorded in their own country or their own language. Even within the Caribbean, there is surprising ignorance in the English-speaking areas about developments in nearby French-speaking or Spanish-speaking countries. Even less is known about developments in French-speaking Africa, in India, or in Indonesia.
9. In short, a great deal of vitally useful information is available. Because of limits of vision and funds, only a small part of it is being applied systematically to developing the Caribbean economy.

Section IV

CRITERIA FOR A TECHNICAL INFORMATION UNIT

Following are some general guiding principles that should be considered in defining the scope of work, organization, budget, and program for the CDB/TIU.

1. The TIU should be a service organization, expanding and clarifying the technical choices available to the CDB and others so that they can make their own decisions in an informed, responsible, effective, and coordinated way.
2. To do this, the TIU will need to maintain close and frequent contact with its clients, so as to understand, and even anticipate, their needs for technical information, especially those needs not adequately met elsewhere.
3. Given finite resources, the TIU must establish some priority ranking as to what data it will accumulate, what interpretive services it will provide, and whom it will serve.
4. The TIU should make a special effort to see that information is collected and/or developed on technologies appropriate to the needs of the poorer and less developed segments of Caribbean society.
5. Since masses of information, indiscriminately furnished, can be confusing, misleading, and harmful, the TIU should be staffed and operated to select and evaluate information relevant to the inquirer's specific needs and should insure that adequate interpretation and guidance is available.

6. The TIU should recognize that the poorer and less sophisticated levels of society will require more interpretation and guidance than the TIU can provide with its own skills and resources. To serve these groups effectively, the TIU should work through intermediary groups, such as CADEC, that have experience and skills in communicating with less technically sophisticated people.
7. Throughout its operations, the TIU should be conscious of the need to build up local and regional institutions. Where research is required to adapt existing information or to fill information gaps, the TIU should see that Caribbean institutions are used.
8. Similarly, the TIU should take an active role in building and coordinating a network of Caribbean information banks in order to promote diversity and interaction, utilize a wider base of skills and resources, and reduce wasteful duplication.
9. Recognizing that information is useless unless used, the TIU should actively inform the Caribbean community about relevant technical information and about sources of this information.
10. Finally, since no one can predict all future possibilities, the TIU should have a method of objectively reviewing its performance and its clients' needs, and adjusting its procedures and goals accordingly.

Section V

LOCATION, ORGANIZATION, AND STAFFING

The CDB has been working for some time to increase its store of technical information and to improve its use. This has been done without a large or specialized organization and without elaborate procedures.

Because the Bank is a relatively small institution, and because of the personalities involved, this informal arrangement has worked fairly well. As the technical information services expand in size and scope, however, special care must be taken to preserve the present person-to-person effectiveness against the normal tendency of any expanding operation to become less flexible and less cost-effective.

This section discusses how the TIU could be located, organizationally and physically, and the requirements for its Advisory Board and staff.

Location In The Bank Organization

At present, the technical information operations are located in, and principally serve, the CDB Industry Division. The CDB Library, on the other hand, is located for administrative purposes in the Economics Division. As the work of the TIU expands and it begins to serve a wider audience, CDB Management may wish to consider combining the TIU and the Library into one administrative unit serving both technical and non-technical information needs.

For purposes of this discussion, however, the ultimate location of the TIU is not critical, as long as it is able to work closely and cooperatively with the Library.

Physical Location

The Caribbean Development Bank building in Wildey is now essentially filled and the Bank is considering acquiring additional space. An easy and obvious solution would be to place the TIU in such new quarters. The advisability of doing this would depend on several factors.

The TIU is designed primarily as an operating service to the project divisions of the Bank. Removing it from them, even a short distance, would inhibit the type of easy interchange with Bank loan officers that would contribute significantly to TIU's understanding of Bank information needs, and to the Bank staff's understanding and use of the information resources. Many useful exchanges of ideas that happen when someone "just drops by" would never take place if the loan officers had to travel outside the Bank building to reach the TIU.

If the Bank were to build an extension onto their present building, or build an adjacent structure, the above problem would not exist. However, this solution is not likely to be available until long after the TIU starts operation.

The Bank is considering leasing space in the Cable and Wireless building nearby and relocating some of the project divisions there. If the TIU were located there with most of the project staff, part of the problem would be solved.

However, another consideration is the physical relationship between the TIU and the present Bank library. They are both performing similar services for the Bank's staff, using some of the same skills and procedures. Even if the two organizations are not merged, as discussed elsewhere in this report, they should be located close to each other,

if possible, to promote mutual uses of equipment, such as microfiche printers, and even common shelving and cataloging.

The eventual solution will probably be a compromise in which the above considerations should be weighed.

Organization

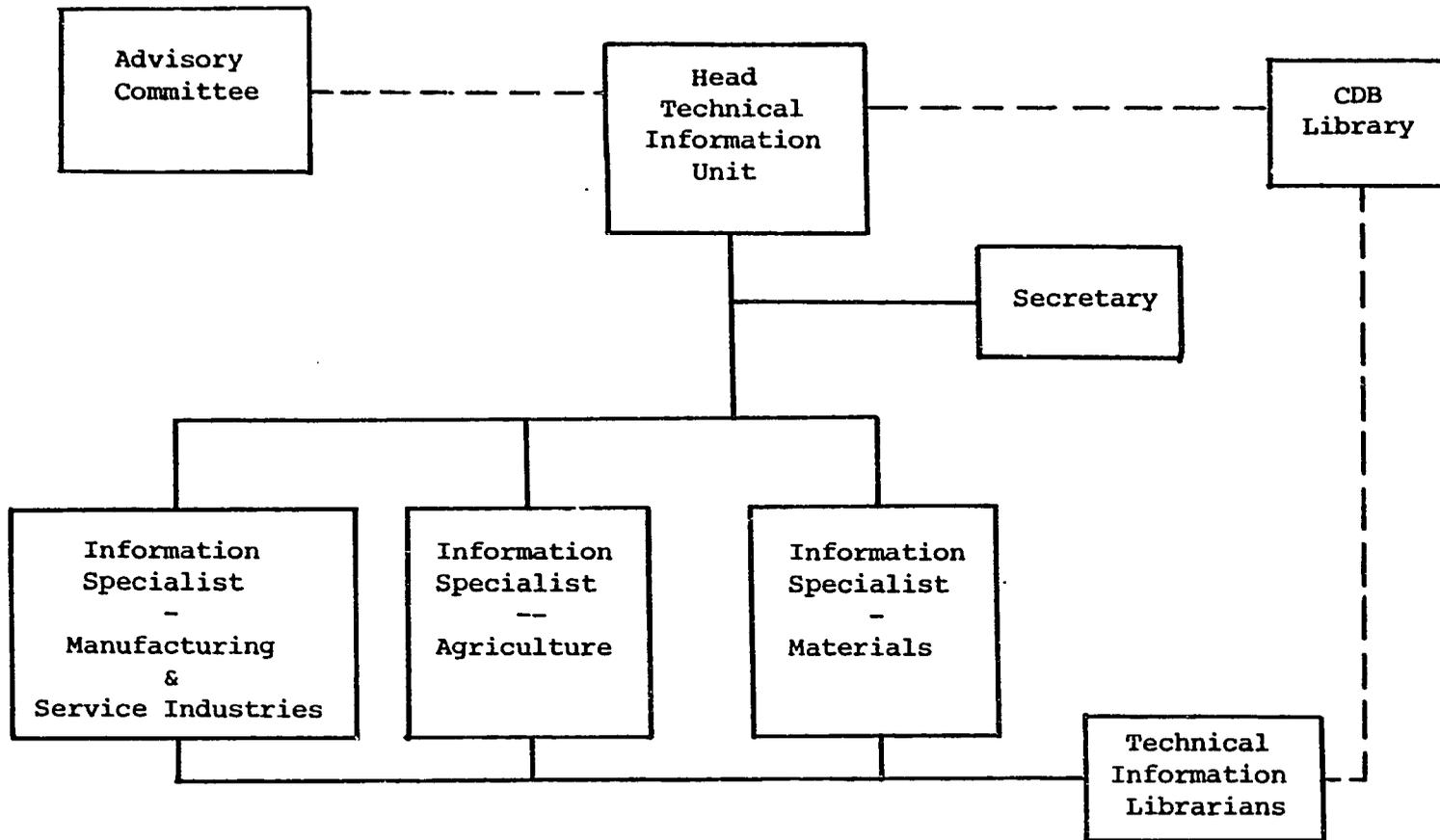
The TIU Head would be assisted by an Advisory Committee and a staff of three Information Specialists, a Secretary, and two Librarians, as shown on the following page.

The Advisory Committee would provide a formal link to the Bank's project divisions and a method of regular communication with information sources and information clients outside the Bank. The Advisory Committee would not "direct" the TIU operations, but would, as its name implies, advise it -- extending its perspective on Caribbean information needs, providing an informal audit of the TIU's effectiveness, and helping to coordinate TIU activities with those of cooperating organizations.

The Bank members of the Committee would include the Directors of the Technical, Agriculture, and Industry Division, and the Head of the TIU. Outside members should be selected to bring a wide, useful range of organizational representations, technical backgrounds and, where possible, geographic distribution.

The four Bank members of the Advisory Committee would select six outside members from the following suggested list of organizations:

- Caribbean Industrial Research Institute (CARIRI);
- Caribbean Agricultural Research and Development Institute (CARDI);



Organization Chart

Technical Information Unit

- Tropical Products Institute;
- Scientific Research Council (Jamaica);
- Association of Caribbean Universities and Research Institutes (UNICA);
- Board on Science and Technology for International Development;
- University of the West Indies, Schools of Agriculture and Engineering.

Other organizations could be added to this list if deemed useful by the four Bank members. However the Committee membership should not become so large that an atmosphere of informal interchange is lost.

The Committee would meet at least quarterly to review the work of the TIU, suggest useful changes or additions to the TIU's activities, discuss better methods of coordinating and up-grading technical information availability, and proposing initiatives (research projects, conferences, publications, etc.) to deal with specific unmet information needs of the region.

Following are descriptions of the job activities and personal requirements of the TIU Head and his staff:

TIU Head - Job Description

1. Prepare annual budget and program for all TIU activities and submit to appropriate Bank supervising official. Prepare monthly status reports on activities and expenditures.

2. Serve as Secretary of the TIU Advisory Committee, responsible for preparing agenda and implementing decisions.
3. Select and administer TIU personnel.
4. Establish and maintain contact with selected outside information and research organizations (see Appendix A) through mail, phone, telex, etc., and through travel and personal visits.
5. Establish internal procedures for selecting, acquiring, reviewing, storing, retrieving, and disseminating information. Storing and retrieving procedures would be coordinated with the CDB Librarian.
6. Edit TIU Newsletter. (This function may be delegated, depending on staff abilities and preferences).
7. Review loan projects for CDB funding and assign TIU staff responsibilities for technology analysis. Review and coordinate staff recommendations and transmit to the appropriate Division.
8. Set priorities and procedures for handling information requests from agencies outside CDB.
9. Recommend program changes where appropriate.
10. Perform Information Specialist tasks.
11. Select and define proposed research projects, with assistance from the Advisory Committee, Bank officials, and others as appropriate. Prepare project descriptions and budget. Negotiate with cooperating organizations to carry out projects.

12. Participate in training programs as agreed by Bank supervising official.
13. Prepare recommendations for outside technical assistance to TIU and evaluate results with Bank supervising official.

TIU Head - Person Description

1. Broad technical knowledge and experience.
2. Demonstrated capabilities as a manager that can lay out and administer a program.
3. Ability to work well with other people of divergent backgrounds and interests.
4. A good innovative, analytic mind that can distinguish the essential from the merely interesting, with a willingness to dig beyond the conventional wisdom.
5. Background and experience in information systems would be helpful, but is not so important as the above qualities, since the systems information can be acquired or developed as required.

Information Specialists - Job Description

1. Receive information requests and analyze the type and probable source of the data required.
2. When required, work with the source of the information request to help define or redefine goals and probable solutions.

3. Locate data in TIU files or outside. Review data found for suitability and transmit to requester.
4. Work with Librarians to review routine incoming information (periodicals, etc.) to determine which items should be signaled outside TIU (via the newsletter or otherwise) and which information should be particularly noted in the cataloging system.
5. Determine which periodicals, books, etc., should be ordered in the Specialist's area of responsibility.
6. Assist TIU Head in maintaining contact with outside sources of information.
7. Help determine, structure, and supervise suitable research projects, as directed by the TIU Head.
8. Travel as required to visit cooperating institutions and projects needing TIU assistance in the specialist's area of responsibility.
9. Participate in training programs as directed by TIU Head.

Information Specialists - Person Description

1. Broad technical experience in a designated area (manufacturing, agriculture, etc.).
2. A curiosity and interest in continuing study and learning, in both formal training and in job-related duties.
3. An ability to communicate verbally and in writing.

4. The capacity to substitute for the TIU Head in his absence.
5. Command of a foreign language and a background in information systems would be helpful, but not essential.

Secretary

The duties and requirements of the TIU Secretary will involve heavy typing for several people, travel arrangements, telephone messages, and similar items involved in any executive secretarial position.

Librarians - Job Description

1. Locate materials requested by Information Specialists and make notes or duplicate as required.
2. Order source materials, as requested by the Information Specialists, and maintain logs of materials ordered.
3. Receive, shelve, and catalog incoming materials according to procedures developed jointly with the CDB Librarian.
4. With guidance from the Information Specialists, review incoming periodicals for items of specific interest.

Librarians - Person Description

1. Basic intelligence is the most important qualification, since even an experienced librarian will be required to learn vast amounts of new information.

2. A systematic and patient mind that can help create order out of chaos.
3. An understanding of some technical field and/or experience in library work would be helpful.

Section VI

IMPLEMENTATION PLAN

Creating and operating the proposed TIU and TRF will involve:

- recruitment,
- establishing the Advisory Committee,
- training,
- technical assistance,
- operations, and
- research projects.

The following plan is designed as a set of flexible guideposts, to be modified as circumstances and future judgments dictate. The plan is summarized in a flow chart at the end of this section.

When the TIU and TRF are approved, the CDB Management should decide where to locate the TIU in the Bank organization. Until the TIU Head is recruited and the Advisory Committee selected and convened, the TIU's Division Director would be required to initiate the first steps.

Recruitment

The most important first step will be to recruit a suitable TIU Head. A brief description of the proposed TIU operations, and the requirements for its Head, should be circulated among academic and development

organizations in the Caribbean and to overseas organizations in which suitable West Indians could be employed. Ideas and assistance should be invited from the organizations that the TIU would work with in the future.

If it appears that the recruitment process will take a long time, plans should be made to substitute a short-term appointment of an Interim Head from within the Bank, or from another Caribbean organization, or from an outside technical assistance organization.

The initial Information Specialist would probably come from the existing CDB staff. The Bank Librarian and Personnel Office could assist in recruiting the initial Librarian and Secretary. The remaining staff -- two more Information Specialists and another Librarian -- should be recruited after the permanent TIU Head has started work.

The timing of these events will depend to a large extent on where and when the desired talents can be found. The budget shown in Section VII assumes that the Head, one Information Specialist, one Librarian, and one Secretary could be recruited early in the first year and that the two other Information Specialists and the second Librarian would start at the end of the first year or the beginning of the second.

Advisory Committee

Another early step in establishing the TIU would be to select and convene the Advisory Committee.

The operating control of the TIU would remain with the CDB Management. The four CDB members of the Advisory Committee -- the Directors of the

Industry, Agriculture, and Technical Divisions, and the TIU Head -- would select the other members of the Committee for one year terms.

* * *

The remainder of this implementation plan assumes that the TIU Head is recruited early in the first year of operation. If this cannot be done, some adjustments should be made, particularly in the training and technical arrangements.

Training

Staff training would be focussed on two main areas:

- the operation of information systems, including hardware and procedures, and
- the substantive technical information itself -- where to locate it and how to apply it.

This training is best acquired, for a variety of reasons, at the sources of information. Although some of these are located in the Caribbean, many are outside.

The sources of information divide into several categories:

- primary sources, such as manufacturers, research institutes, and consultants, and
- secondary sources, such as the CARIRI Technical Information Service, the United States National Technical Information Service (NTIS), Volunteers in Technical Assistance (VITA),

Technische Ontwikkeling Ontwikkelings Landen (TOOL), Tropical Products Institute, SENDOC (India), INFOTEC (Mexico City), UNIDO, major libraries, trade associations, government industrial promotion offices, and similar institutions.

Training would be more intensive in the early months of the TIU, but visits to the above types of institutions should be continued on a regular basis at a lower rate throughout life of the TIU as part of its ongoing operation.

With the assistance of outside advisors, an initial training and familiarisation program would be set up for the TIU Head in the United States. This program would include 2 - 3 days in the VITA appropriate technology information system, two weeks at NTIS, and two weeks in other major data retrieval systems. It would also include visits to the Foreign Agriculture Service information library, the Board on Science and Technology in International Development, the Engineers Center, AID Office of Science and Technology, Ohio College Library Center, Appropriate Technology International, the Science Advisor in the IBRD, and other similar information centers.

These visits would help the TIU Head to decide on the system for cataloging and retrieving information, and the method of processing information requests.

Training requirements for the Librarians would depend on the cataloging systems selected and on the previous experience of the Librarians recruited. Initial training could be done on-the-job, or could involve a 2 - 4 week course at a selected institution.

The Information Specialists and the TIU Head will need continuing exposure to outside information sources to help them perform their basic

jobs of finding and processing information. Whether this is called "training" or "operations" is an arbitrary decision.

It is suggested that major regional sources be contacted at least once every six months, North American and European sources at least annually, and African and Asian sources at least every two years. The frequency of visits will be increased as required to handle specific problems that arise. The total estimated travel time for training and information contacts would be approximately 12 man-months over the initial three years of TIU operation.

Technical Assistance

The requirements for technical assistance would depend to some extent on the individuals selected to fill the various positions. The following assumptions are felt to be reasonable, but may have to be modified with time and experience.

Over the initial three years of TIU operations, an estimated nine man-months of technical assistance may be required. This assistance would be heaviest in the early months and would focus on initial problems of organization and management. In addition, during this critical formative period, there will be problems of staff selection and training (including some training outside of the region) that will increase management problems, while reducing staff availability to do productive work.

If substantial delays are encountered in obtaining the services of a suitable TIU Manager, additional technical assistance may be required to cover this gap. On the other hand, if a first-rate manager is available from the beginning, the technical assistance requirement may be reduced.

Two other forms of technical assistance may be required, or may not. Depending on the system of cataloging and information retrieval selected, some assistance may be required for a few weeks to set up the system.

Depending on the nature of future CDB loan and research projects, short-term specialists may be required to assist Bank staff in providing technical information and evaluations. Although such assistance has been used in the past, it might be decided that some future assistance should come under the TIU. This would be a CDB Management decision.

Operations

As discussed in Section III, the CDB has a technical information program operating in the Industry Division. The TIU Head should take care to see that the existing services are not disrupted for more than a brief period as the expanded TIU program is put into action.

The most critical first step will be to decide the method of cataloging data and handling requests. Once this is done, there will be a period of reorganizing the present system into the new system. This should be done as quickly as possible, by the people who will be working with the new system.

(It should be explained here that the present informal system does work sufficiently well for the present, small-scale, one-man operation. At a larger scale, with more people involved, the present system would quickly become impractical. Switching over would be most easily done in the beginning, before any sizeable volume of new material is incorporated.)

Space and equipment will be required from the beginning of the TIU's operations. Some decisions about information storage facilities would depend on the cataloging and storage systems selected. In general, open shelf systems would probably be most flexible and least expensive for books, periodicals (in slip cases), and files.

Another early requirement will be to prepare a concise, one-or-two-page description of the proposed TIU operation. This description can be used to:

- accompany requests for cooperation with outside organizations (see below),
- explain TIU to people being recruited, and
- inform potential information requesters about the potential and procedures of the TIU.

This description should be reviewed by the Advisory Committee every six months for the first year of operation and annually thereafter. After the first year, it might be useful to incorporate the description into a sort of operational annual report.

Contacts with outside information resources should be made as soon as possible after the TIU is approved and the above descriptions prepared. These contacts would introduce the TIU, prepare for staff visits and training, and arrange for the TIU to receive periodicals, bibliographies, and other mailings. An initial list of organizations to contact is included in Appendix A.

Following these initial steps, the normal TIU operations would include:

- operating the information system,
- reviewing projects,
- coordinating information with outside organizations,
- publishing newsletter,
- arranging meetings and conferences, and
- preparing research projects.

Information System

The principal responsibility of the TIU would be to select, acquire, retrieve, interpret, and disseminate technical information. This information should include:

- data on equipment and processes for manufacturing, mining, processing, fishing, agriculture, service industries (such as printing), construction, and energy production or conversion; and
- Caribbean natural resources data on soils, minerals, weather, hydrology, geothermal sources, fisheries, crops, and forests.

Since the body of potentially useful information is enormous, and the TIU's resources would be limited, the TIU should budget to acquire a limited number of basic technical books each year. On the other hand,

the TIU should budget a larger sum on acquiring reference and source information, including:

- technical bibliographies,
- manufacturing directories, and
- technical periodicals.

Although the above would cover a range of levels of technological sophistication, special attention would be paid to intermediate technologies being developed and applied in other LDCs and MDCs. This is needed because these intermediate technologies are generally covered in a separate range of publications, organizations, and people, although there are increasing overlaps.

The TIU should also budget time (but not much money) to building an extensive register of:

- trade associations,
- consultants,
- academic and research institutions,
- international development and technical organizations, and
- other technical information sources, including automated data banks.

In filling specific information requests, the TIU would spend time and money on correspondence, catalogs, books, specialized periodicals, and even technical assistance. The results of these efforts would also be cataloged and retained as part of the TIU's information resource.

All of the material collected would be administered by the TIU, but regarded as part of the CDB Library collection.

Information requests would come to the TIU from a variety of sources, including CDB and DFC loan officers, businessmen, development corporations such as CIC and BIDC, research organizations, government departments, and voluntary service organizations.

In filling information requests, the TIU would:

- locate and obtain information from its own resources and from outside organizations;
- analyze what is obtained to determine its relevance; and
- furnish the information to the requestor, with any necessary interpretation or caveats.

In general, all requests that could be answered in less than two hours of staff time would be handled immediately. Requests that take longer would be handled under a system of priority guidelines established by the TIU Head and reviewed by the Advisory Committee.

All requests would be logged. When an answer would be delayed for any reason (either work overload and a low priority rating, or because of delays in obtaining the information) or, if an answer cannot be given at all, the requestor should be informed promptly.

In selected cases, the TIU would followup after a month so to see how the information furnished was used.

The logging and followup system, which should be as simple to operate as possible, would keep requests from being lost and would enable the TIU Head to see what kinds of needs are being met and how well (or poorly) the system is functioning.

Project Review

On all CDB projects, the TIU would be available to assist the loan officers to obtain and evaluate needed technical information. On those projects involving an expected investment exceeding \$7500 per job created, the head of the TIU would participate in the Project Team's "technical study, including consideration of alternatives," specified in the CDB Policies and Procedures Manual, paragraph 327.2 II,5(b). If the Project Team did not concur with the TIU on a proposed alternative technical approach, the TIU alternative suggestions and supporting arguments would be submitted to the Loans Committee concurrently with the loan proposal.

Information Coordination

The TIU should coordinate closely with other Caribbean information banks, especially CARDI and CARIRI, to avoid unnecessary duplication and to make the best use of specialized skills. For certain categories of information, each organization should specialize on behalf of all the organizations.

In the field of agriculture, for example, the TIU could duplicate CARDI's coverage of frequently used, general-purpose publications, but leave the coverage of specialist publications (such as research journals

on crop genetics) to CARDI. TIU should, however, be aware of what material is available from CARDI. Similar allocations could be made with CARIRI for specialized information on certain industrial processes.

Thus, throughout the Caribbean, the TIU would make cooperating organizations aware of what resources each could provide, and would insure that vital information gaps are closed, either by the TIU or by another organization.

Newsletter

To assist in coordinating and disseminating technical information, the TIU should publish a small newsletter on a monthly basis, describing selected technical items of specific interest to Caribbean development, including:

- research projects, both in and outside the region,
- new product developments, particularly those suitable for small-scale applications,
- publications,
- profiles of Caribbean information and research organizations, and
- regional meetings and conferences.

The newsletter would exchange information among cooperating institutions, inform outside organizations of relevant developments, reduce duplication of effort, and focus on areas needing further work. Other

organizations, such as CARDI, would be invited to make regular contributions in their areas of interest.

The newsletter would contain address information so that interested readers could order listed publications or new product details directly from the source.

The newsletter would be distributed to DFC's, educational institutions, engineering firms, agricultural organizations, research centers, and professional organizations, among others. Interested organizations outside the Caribbean would be furnished copies on a reciprocal basis for a fee. Within the Caribbean, and within the newsletter's budget, designated development organization would receive free copies, and others would pay a nominal fee.

Meetings and Conferences

In his role as information coordinator and action stimulator, the head of the TIU should confer periodically with various development research and information organizations in the Caribbean. If it appears from these contacts that a meeting of selected specialists would help clarify and define specific development research needs, the TIU could assist in organizing such meetings.

(As illustration, TIU might work with the U.S. National Academy of Sciences to organize a meeting of tropical hardwood specialists, the U.S. Forest Products Laboratory, woodworking machinery experts, and wood marketing specialists to define the research needed to permit a wider demand for utilization of the plentiful Dominican gommier tree.)

Research

In the course of the CDB's work, including that of the TIU, certain areas will appear where relatively small expenditures of research, development, or demonstration funds will seem likely to provide substantial development benefits. To take advantage of these opportunities, a Technology Research Fund (TRF) should be established in the CDB with an initial funding of \$1,000,000 for the first three years of operation (\$750,000 from USAID and \$250,000 from the CDB).

The TIU would prepare project proposals for funding by the TRF and for execution by selected outside research institutions. These proposals would be coordinated and reviewed with the appropriate operating division (Industry, Agriculture or Technical), and with CDB Management.

Projects for the TRF funding should:

- focus on "key information" needed to unlock specific development potential, as described below;
- contribute, if successful, to development projects that increase employment and/or income, or reduce costs, or improve housing or other aspects of living conditions;
- focus on benefits to lower income groups;
- lead to projects for which there is a recognized need and potential individual or institutional support;
- result in near term useful results; and

- utilize and support existing Caribbean research and development institutions.

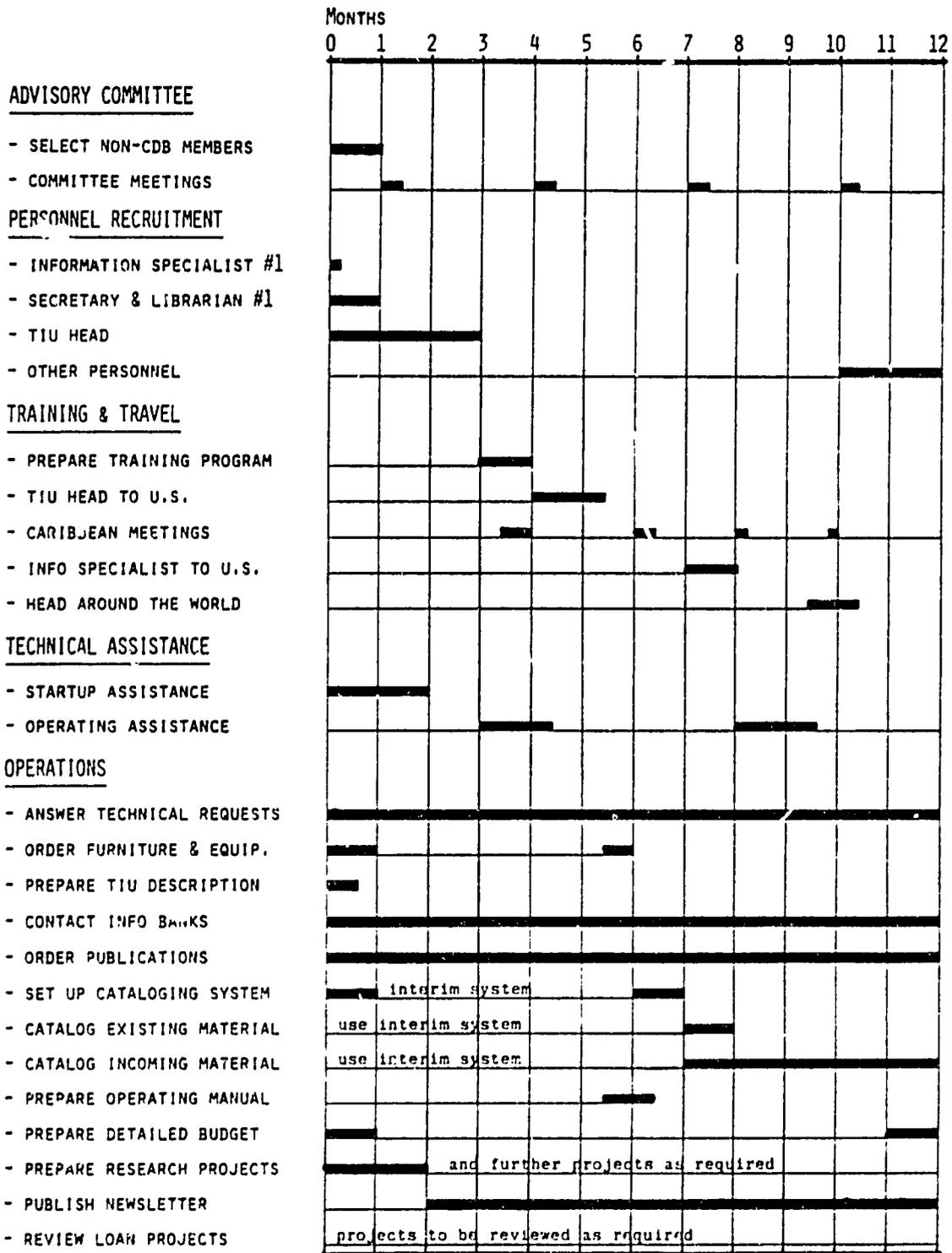
Appendix B contains descriptions of the following research projects that were being considered at the time of this report;

- Lime-Laterite Building Blocks - \$40,000
- Building Demonstration Project - \$90,000
- Weather Data Collection and Analysis - \$230,000
- Methane Production - \$35,000
- Sugar Byproducts - \$100,000
- Mulching Materials and Methods - \$30,000
- Fisheries Resources - \$120,000
- Solar Crop Drying - \$55,000
- Crop Storage - \$30,000
- Water Storage and Conservation - \$60,000
- Low-Powered Farm Machinery - \$150,000
- Belize Clay Products - \$50,000
- Swine Production Systems - \$30,000

For each of these proposed projects, the TIU would conduct a preliminary literature search to establish what is already known and available. In cooperation with the appropriate CDB project division (Industry, Agriculture, or Technical), the TIU would prepare a detailed research program, defining institutions to be involved, project goals, a project research plan, a schedule, and a budget. As these projects are defined in this detail, the estimated costs may vary from the above estimates.

It is recommended that AID initially release approximately \$450,000 in the first tranche of the proposed \$1 million TRF fund.

As these projects and their budgets are firmed up, and as additional projects are proposed, AID would release the remaining TRF funds.



Technical Information Unit - IMPLEMENTATION FLOW CHART - First Year

Section VII

BUDGET

Costs Summarized by Year

(US\$000)

<u>Item</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Three Years</u>
1. Personnel	66	110	110	286
2. Operations	20	20	20	60
3. Travel and Training	20	13	17	50
4. Equipment	10.5	3	3.5	17
5. Technical Assistance	<u>35</u>	<u>20</u>	<u>20</u>	<u>75</u>
Subtotal	151.5	166	170.5	488
6. Technology Research	<u>250.0</u>	<u>350</u>	<u>400.0</u>	<u>1000</u>
Total	401.5	516	570.5	1488

Costs Summarized by Contributors (US\$000)

<u>Item</u>	<u>AID</u>	<u>CDB</u>	<u>Total</u>
1. Personnel	216.	70.	286
2. Operations	34.5	25.5	60
3. Travel and Training	50.	----	50
4. Equipment	3.5	13.5	17
5. Technical Assistance	<u>75.</u>	<u>----</u>	<u>75</u>
Subtotal	379.0	109.0	488
6. Technology Research	<u>750</u>	<u>250</u>	<u>1000</u>
Total	1129	359	1488

Notes on Budget Categories

1. Personnel costs assume that the Head, one Technical Information Specialist, one Librarian, and one Secretary would be included most of the first year. Costs include normal CDB fringe benefits and allowances. At the end of the first year or beginning of the second, two additional Information Specialists, and another Librarian would be added.
2. Operations costs include postage, telephone, telex, and printing charges totaling \$9500 per year; subscriptions, books, and supplies totaling \$4500 per year; and costs of meetings and conferences totaling \$7000 per year.

The item for meetings and conferences assumes that all travel and associated expense for TIU personnel would be included in Item 3 below, and that any major travel and/or subsistence expense for non-Caribbean personnel attending conferences would be paid by other organizations. The \$7000 shown will cover only Advisory Committee expenses and expenses of some other Caribbean attendees at TIU-sponsored meetings.

3. Training and Travel Costs are shown in the tables on the following three pages.

3. Training and Travel Costs - US \$

<u>Item</u>	<u>Training</u>	<u>Air Fare</u>	<u>Other Travel and Subsistance</u>	<u>Total</u>
<u>First Year</u>				
Head - to U.S. to train at VITA, NTIS, OCLC, etc. (6 weeks)	2,500	500	3,000	6,000
Head - to ITDG, CSC, etc. (London), ILD (Geneva), UNIDO (Vienna), SENDOC, etc. (India) and return via Bangkok and Tokyo (4 weeks)	--	2,500	2,500	5,000
Technical Information Specialist (TIS) to U.S. for training and contacts (4 weeks)	1,500	500	2,000	4,000
Various trips in Caribbean (6 weeks)	<u>--</u>	<u>2,000</u>	<u>3,000</u>	<u>5,000</u>
Subtotal First Year	4,000	5,500	10,500	20,000

<u>Item</u>	<u>Training</u>	<u>Air Fare</u>	<u>Other Travel and Subsistance</u>	<u>Total</u>
<u>Second Year</u>				
TIS #2 to U.S. for training and contacts (4 weeks)	1,500	500	2,000	4,000
Trip to Europe for information contacts and trade fairs (4 weeks)	--	1,000	3,000	4,000
Various trips in Caribbean (6 weeks)	<u>--</u>	<u>2,000</u>	<u>3,000</u>	<u>5,000</u>
Subtotal Second Year	1,500	3,500	8,000	13,000

<u>Item</u>	<u>Training</u>	<u>Air Fare</u>	<u>Other Travel and Subsistance</u>	<u>Total</u>
<u>Third Year</u>				
TIS #3 to U.S. for training and contacts (4 weeks)	1,500	500	2,000	4,000
TIS to Europe for information contacts and trade fairs (4 weeks)	--	1,000	3,000	4,000
Head - round the world contact trip (2½ weeks)	--	2,500	1,500	4,000
Various trips in Caribbean (6 weeks)	<u>--</u>	<u>2,000</u>	<u>3,000</u>	<u>5,000</u>
Subtotal Third Year	<u>1,500</u>	<u>6,000</u>	<u>9,500</u>	<u>17,000</u>
Total Three Years	7,000	15,000	28,000	50,000

4. Equipment costs include office desks and chairs, three library tables, filing and shelving systems, three typewriters, two small microform readers, and a small offset press and platemaker. The TIU would also share the use of the CDB's microfiche reader/printer and the existing copying and printing equipment. In the third year, \$3500 is budgeted for purchase and installation of a data terminal.

5. Technical assistance costs include principally management assistance in organizing and programming the TIU, which will require the largest effort in the first year. In later years, depending on an assessment of needs, some technical assistance funds may be used for technical experts to help define and program certain research projects. A total of nine man-months, including associated travel and overloads, is envisaged.

6. Technology Research Funds will be spent according to detailed plans drawn up for each project and approved by the appropriate authorities. Expenditures in the first year are expected to be lower, because of the expected lag in preparing and approving the first projects.

Appendix A

INFORMATION SOURCES

Following is a partial list of information sources that should be contacted by the TIU. Some of these sources supply information generated by themselves. In most cases they publish bibliographies, reprints, or other references to information that originated elsewhere. Thus, the listed sources are connected by referral to many thousands of original information sources.

The TIU should be on the mailing lists of all of these organizations and should selectively receive the publications of many of them. The TIU should make personal contact with some of these organizations to insure the most productive mutual information exchanges. In addition to the organizations listed, most of which are international, governmental, or voluntary organizations, the TIU should be on the mailing lists of publishers specializing in relevant technical information, including both private publishers and university presses.

The CDB is already in regular contact with some of these sources, occasional contact with some, and has had no contact with some. Those organizations contacted in the course of this study are indicated by an asterisk (*).

There are over a hundred other organizations that could be involved. However, many of these are linked, in one way or another, with one of the organizations listed. For example, the Small Enterprises National Documentation Centre (SENDOC) in India, which is listed, collects information from a broad range of Indian sources, many of which are not listed. On the other hand, there are many organizations that are

basically consumers and distributors of technical information, but have little or no usefulness as sources of information. These have been generally omitted.

The list below should be periodically reviewed by the TIU to add new names and drop those that do not prove useful. In some cases, TIU's contact should be transferred to another specialized organization, such as CARIRI.

The order of listing below does not necessarily relate to the order of importance to the TIU.

General

International Development Research Centre - Canada

* National Technical Information Service - United States

INFOTEC - Mexico

* World Bank - United States

United Nations Development Program - United States

Centre for Research and Development in Housing, Planning and
Building - Ghana

* Society for International Development, Development Reference
Service - France

* Board on Science and Technology for International Development -
United States

* Agency for International Development, Office of Science and
Technology - United States

International Labour Organization - Switzerland (studies on labor-
intensive construction, especially roads)

Institute for Development & Research - Denmark

Commonwealth Science Council - Great Britain

Swedish Agency for Research Corporation with Developing Countries -
Sweden

North-South Center for Technical and Cultural Exchange - Puerto
Rico)

National Scientific Advisory Council - Trinidad

Scientific Research Council - Jamaica (and similar councils in other
countries)

COLCIENCAS - Colombia

Industrial Information

* Caribbean Industrial Research Institute - Trinidad

INFADOC - Austria (patent information)

International Ferrocement Information Center - Bangkok

United Nations Industrial Development Organization - Austria

Georgia Institute of Technology - United States (aid to small industry)

Japan Consulting Institute - Japan (small scale industry profiles, equipment and processes)

International Associates of Crafts and Small and Medium-sized Enterprises - Switzerland

National Research Council, Technical Information Service - Canada

Pakistan Council of Scientific and Industrial Research Laboratories - Pakistan

Small Enterprises National Documentation Centre - India

Applied Scientific Research Corporation - Thailand

Technology Consultancy Centre - Ghana

University of the West Indies, Department of Engineering - Trinidad

Energy

Smithsonian Science Information Exchange - United States

Geothermal Resources Council - United States

U.S. Department of Energy - United States

Agriculture and Agro-Industry

- * Caribbean Agricultural Research and Development Institute - Trinidad
- * WINBAN Research Centre - St. Lucia
- * Produce Chemists Laboratories - various Caribbean countries
- * University of the West Indies, Department of Agriculture - Trinidad

Tropical Products Institute - Great Britain

International Crops Research Institute for the Semi-Arid Tropics -
India

International Rice Research Institute - Philippines

Compagnie Internationale de Developpement Rural - France
(information on small-scale agro-industry)

Instituto Interamericano de Ciencias Agrícolas - Costa Rica

Jamaica Banana Board - Jamaica

National College of Agricultural Engineering - Great Britain

International Plant Protection Center - United States

International Center for Tropical Agriculture - Colombia

International Institute of Tropical Agriculture - Nigeria

Foreign Agriculture Service - United States

Food and Agriculture Organizations - Italy

Action for Food Production - India

Centre d'Etudes et d'Experimentation du Machinisme Agricole
Tropical - France

National Institute of Agricultural Engineering - Great Britain

Tanzania Agricultural Machinery Testing Unit - Tanzania

Centre International pour le Developpement Agricole - France

Appropriate (Intermediate) Technology

* Volunteers in Technical Assistance - United States

* Intermediate Technology Development Group - Great Britain

Brace Research Institute - Canada

* Technische Ontwikkeling Ontwikkelings Landen - Netherlands

Minimum Cost Housing Group - Canada

Volunteers in Asia - United States

* Appropriate Technology International - United States

Groupe de Recherches sur les Technologies Appropriees - France

Indian Institute of Science - India

Centro de Estudios Meso Americanos para la Tecnologia Appropriada -
Guatemala

Schweizersche Vereinigung fur Mittlere Technologie - Switzerland

Schweizersche Arbeitsgemeinschaft fur Alternative Technologie -
Switzerland

* National Center for Appropriate Technology - United States

Indian Institute of Technology, Appropriate Technology Unit - India

Auma Research and Development Facility - India

Gandhian Institute of Studies - India

Technology and Development Institute, East-West Center - United States

Instituto de Investigaciones Technologicas - Colombia

Asian Institute of Technology - Thailand

Regional Adaptive Technology Center - Philippines

Appropriate Technology Development Organization - Pakistan

Development Technology Center - Indonesia

Planning Research and Action Institute - India

Commonwealth Scientific and Industrial Research Organization -
Australia

Appendix B

RESEARCH PROJECTS

Following are brief descriptions of several research projects that:

- meet the criteria previously given in this report under the Technology Research Fund;
- are not contemplated for funding under existing AID grants, and
- are under active consideration by the CDB.

Lime-Laterite Building Blocks - \$40,000

It appears technically possible to make building blocks using only simple processes and low-cost materials (lime and laterite), which are readily available in certain Caribbean LDCs. The blocks can have appearance and strength superior to concrete blocks at half the cost.

The research project would include surveying and analyzing various known material sources in one island, and accelerated testing of blocks prepared from these materials with different mixes, curing times, pressures, and block forming techniques. The research could be coordinated by CARIRI.

This block-making technique could reduce building costs, be adaptable to self-help housing construction, and form the basis for local small enterprises making lime and blocks.

Building Demonstration Project - \$90,000

If the research on lime-laterite blocks is successful, the next step toward acceptance and implementation would be a demonstration home building project. Although the project would be basically loan-financed, some grant funds would be needed for technical assistance and monitoring in the production and use of the blocks to spot and correct any field problems not covered in the previous laboratory research. In addition, project observation and guidance would be needed to facilitate social acceptance of the new materials in construction. Arrangements should also be made for repeat observations of the finished homes at yearly intervals to confirm long-term material stability.

Weather Data Collection and Analysis - \$230,000

There is notable interest in several Caribbean countries in using natural resources of wind and sunlight to better advantage for heating, cooling, crop drying, water pumping, and electricity generation. The proposed project would focus on wind energy, but also include data collection on solar radiation.

The effective use of wind energy must be based on extended analyses of strength, dependability, and seasonal variations. Most present long-term records do not contain the right kind of data in useful form.

The research would be divided into several parts. First would be an analysis of existing recording methods (which vary in different locations) and conversion of existing charts into wind power data suitable for computer analysis. Next, based on these preliminary analyses, and on determination of specific locations where wind power could usefully provide irrigation water, small wind recording stations would be installed. These stations would produce wind speed data directly convertible to

potential wind power. Finally, the results of the above data would be analyzed by computer to show the costs and benefits, using different assumed types of wind-powered pumping systems.

The Caribbean Meteorological Institute would supply the existing information and supervise the installation and data collecting from the new recording stations.

The data analysis and cost studies could be done as a research project in the University of the West Indies School of Engineering. The TIU would provide data on windmill and pump characteristics and costs. The principal research funds required would be for the twenty (20) wind and radiation recording stations, at an estimated installed cost of \$10,000 each.

Methane Production - \$35,000

Agricultural wastes can be decomposed anaerobically to produce a methane gas with a calorific value similar to coal gas, plus producing a useful fertilizer byproduct. The process is well understood, but local applications need to be studied to optimize and demonstrate specific techniques of handling local materials.

The initial proposed project would be based on a small chicken farm, utilizing the droppings plus any other suitable organic wastes. The output gas would be used for heating water for cleaning and plucking and possibly for powering a stationary generator.

Sugar Byproducts - \$100,000

The soils and weather conditions in many of the Caribbean LDCs are more suited to growing sugar than almost any other agricultural product.

However, the sugar produced is largely an export product, subject to the variations of the export market.

The proposed regional study would investigate world literature on the products, processes, and costs involved in transforming the products of sugar culture (sugar, molasses, bagasse, etc.) into other products with economic potential. These would include alcohol, yeasts for animal feed, particle board and other byproducts. Test runs of particle board would be made in existing factories outside the Caribbean, using Caribbean bagasse.

The resulting study would identify products with economic potential, describe the inputs required, define the expected economic impact of production, and describe a reasonable pilot project for further study.

Mulching Materials and Methods - \$30,000

Farmers spend up to half of their time in weeding crops. The use of plastic mulches in the United States has drastically reduced the weeding problems and, at the same time, reduced evapotranspiration losses. Trials of these materials in the Caribbean have produced mixed results because of heat damage to the crop.

Experimentation is needed on the use of different mulching techniques on different crops. The goal is to find an economical material, preferably of local fabrication, that will suppress weeds and evaporation, while not promoting overheating, funguses, and other harmful side effects.

Due to the need for constant, trained observation and multiple testing, the project would be carried out on the University of the West Indies experimental farm in Trinidad. The two-year project costs would cover the purchase and/or fabrication of mulch materials.

Fisheries Resources - \$120,000

The CDB is lending about \$2 million for a fisheries project that is scheduled to start operations in 1980. This loan project is aimed toward improving the catches of pelagic species (tuna, kingfish, dolphin fish, wahoo, flying fish, etc.) as well as deep slope snappers and groupers. A local master fisherman will be employed as an instructor and a local biologist will monitor the catches.

Since no adequate estimate of the resources of the above fish has been made, it is felt that a research component could be piggybacked on the loan project to cover the costs of a specialist Gear Technologist, and a Fisheries Biologist, together with associated experimental gear, a Wesmar Sonar (to scan for deep shelf formations, and to detect schools of pelagic species), and field microscopes for the biologist.

Solar Crop Drying - \$55,000

Several types of solar crop dryers have been developed for use outside the Caribbean. An effort needs to be made to test and adapt these concepts for use by small farmers in drying peanuts, rice, corn, peas, beans and other crops.

This project would begin with background research on existing solar drying configurations, followed by construction of two prototype designs, using locally-available materials to the maximum extent. These prototypes would be used over a two-year period to test-dry various agricultural products. These tests would simulate typical small farm conditions, except that detailed measurements would be kept of the temperature/humidity conditions in the dryers and the resulting drying effect on the crops. The measurements would be made under the supervision of the local Produce Chemists Lab in the island selected for the test.

At the conclusion of the test, a report on the use and effectiveness of the two systems would be made and distributed to the Departments of Agriculture of each Caribbean country.

The costs of the project are primarily for personnel and travel, plus purchased crop materials and dryer materials.

Crop Storage - \$30,000

A high percentage of harvested crops is lost to pests and to spoilage due to the lack of suitable storage. This project would focus on development and demonstration of inexpensive storage facilities for small farmers. Information on the prototype structures and their use would be distributed to farm extension workers and to local organizations that could influence a general acceptance.

Water Storage and Conservation - \$60,000

On some Caribbean LDCs, such as Antigua, the availability of water is a major limiting factor in agriculture. Almost all supplies are from surface runoff, some of which is stored for dry season irrigation in surface ponds. A large percentage of this water is lost through evaporation.

This project would be conducted in two stages. The first would be a world-wide literature and materials survey of current water conservation technology, with estimates of costs and resulting water savings for each of four leading systems. The second stage would be a test and demonstration of the four systems, possibly on Antigua, at four farm ponds, plus a fifth pond for control. The demonstration would include a calculated and measured water balance over a twelve month period. The demonstration results would be published.

Low-Powered Farm Machinery - \$150,000

There is a substantial need for development of inexpensive farm equipment for use by small farmers (generally up to five-acre plots). Some development work has been done in Japan, India, and the United Kingdom, but some of the equipment, especially for tillage, does not work well in heavy Caribbean soils. In general, equipment manufacturers are not interested in developing equipment of this type because of expected small profit margins.

This project would involve four phases: First would be a world-wide survey of available designs and equipment suitable for small farm tillage, transport, coconut husking, and water pumping. Second, trial units would be acquired and field tested, without a demonstration program until suitability is established. Third, where required, equipment adaptations would be fabricated and tested. Finally, the equipment would be placed on operating small farms for field demonstration under the supervision of CARDI.

Belize Clay Products - \$50,000

Belize is interested in developing a factory for ceramic construction products (bricks, tiles, pipe, etc.). However, no adequate survey has been made to determine the location and characteristics of suitable clay deposits.

This project would cover the expenses of a geologist and associated laboratory work to locate, define, and evaluate one or more deposits suitable for the proposed factory.

Swine Production Systems - \$30,000

Most swine rearing systems in the Caribbean tend to duplicate temperate climate systems and are expensive for small farmers. There is a need for more appropriate and less expensive systems.

The project would consist of a TIU world literature search for information on inexpensive systems for use in tropical climates. One prototype swine penning system would be constructed on an actual farm, using inexpensive local materials. The project would be observed for a period of two years.