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JAMAICA AGRICULTURAL INSTITUTIONS

AND

RECOMMENDATIONS FOR IMPROVEMENT

A Report to the USAID Mission in Jamaica

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SUMMARY

While the Jamaican Government appears to have taken and be taking many of the right steps to strengthen the economy, the agricultural sector, by any measure, is not performing well. Agriculture's contribution to the GDP has declined significantly and currently accounts for only 5.5% of the total. Production of traditional export crops such as sugar and bananas has dropped sharply in recent years to the point that Jamaica is not even marketing its quota for these products in protected international markets.

The poor performance of Jamaican agriculture is reflected most dramatically in its low productivity. Yields of most Jamaican crops are below the average for all developing countries and even below yields of nearby Caribbean countries. For example, coffee yields are 40% of those in Haiti and cocoa yields are 26% of Haitian levels. Sugar yields are 80% of those in the Dominican Republic. In vegetable production, an anticipated growth area in Jamaica, even more striking productivity gaps exist. With some vegetables, Jamaican yields are less than 25% of the levels in the Dominican Republic.

In countries which have made satisfactory progress in agricultural development, it is recognized that the agricultural sector needs the support of public institutions which supply essential services. There are indications that many of the public services which normally support a nation's agricultural sector are weak and ineffective in Jamaica. Indeed this study leads to the general conclusion that problems with some of the public institutions serving Jamaican agriculture are limiting the performance of the agricultural sector and may actually become more serious inhibitors of agricultural development in the future. Some institutions seem to be performing reasonably well although they will be at risk if some of the problems in the institutional environment are not attended.

One of the obvious and, unquestionably, most serious problems limiting the performance of the agricultural sector is the weak research effort in the country. This is apparently a problem of long standing and has been well recognized in previous assessments of Jamaican agricultural performance. The USAID Mission's 1987 Agricultural Strategy Paper recognized the low productivity of Jamaican agriculture and emphasized that "Jamaica must improve its indigenous technology generation and transfer capacity." We fully agree and express the strong belief that until this is done, there can be little hope for substantial improvement in the nation's agricultural sector.

It is recognized that the MOA extension program, as well as the research effort, is weak. And while a case could be made to provide assistance for strengthening the extension program, we believe this to be a matter of lower priority than the research problem. There is little need for an extension program to disseminate technology unless

something is first done to develop a technology generation capacity. Furthermore, it is recognized that in addition to the MOA, many other organizations, including the commodity boards and associations, the Jamaican Society of Agriculture, and commercial organizations have extension programs which could be made much more effective if there were adequate research programs generating the technology to serve the needs of various aspects of the nation's agriculture.

The circumstances described herein underscore the need to have a strong, continuing capability within Jamaica to develop the indigenous technology needed to improve the productivity and profitability of Jamaican agriculture and to make its products more competitive in export markets. We believe this need can best be met through a public sector research organization, either in the Ministry of Agriculture or as a statutory, semi-autonomous body with close ties to the MOA. Unless some of the current problems limiting the effectiveness of MOA agencies can be resolved, we believe the second alternative would be preferable.

We fully recognize that there are major problems with Jamaican agricultural institutions that go far beyond issues of technology generation and dissemination. However, in view of the serious manner in which inadequate, indigenous technology is limiting the development of a viable, productive and efficient agricultural sector, and given the need for USAID to prioritize its development assistance efforts, we believe that USAID should give priority attention to assisting in the development of a strong, public sector program to improve the development and dissemination of relevant, indigenous agricultural technology.

Our examination of the Ministry of Agriculture in areas other than research and extension leads us to conclude that two categories of institutions seem to be performing relatively well -- those dealing with natural resources and those concerned with quality control of export commodities. In addition, significant progress is being made in plant quarantine. Institutions gathering and analyzing production information and dealing with policy analysis continue to function but under serious handicaps.

Some of the institutions under stress and risk are still producing service of value to other entities both public and private. This is not necessarily, however, a measure of institutional strength. Rather it is a function of the dedication of a few individuals who literally by their own sacrifice are keeping things going. It cannot be expected that such dedication will persist indefinitely.

The net effect is that Jamaican agriculture is not being supported adequately by its institutions, except in a few cases, and in those cases, the assurance of continued, adequate support is not strong.

The most visible factor limiting the effectiveness of these institutions is the low salary level for key personnel. That factor, however, can

mask and overshadow some factors dealing with management, such as the tendency to try to do too much and the lack of overall mission and specific shorter term objectives and goals.

Creation of statutory bodies in an effort to compensate for low institutional performance often contributes to a different set of problems, including dispersing of personnel and financial resources and confusion over institutional roles.

The salary issue is serious, in some cases more serious than may be readily evident. It actually threatens important resources that have been developed over time. No matter what the design of any one project is, its success is dependent upon certain institutional services in the sector. Furthermore, there is no evidence from experience that Jamaica can hope to build and sustain a prosperous agriculture without a means to provide adequate compensation to a certain level of technical expertise. Creation of new agencies to get around its own impeding rules is, in many ways, a losing game. It spreads scarce personnel over more program areas, it weakens old line agencies that still must provide essential services. In some cases it threatens the destruction of institutional resources built up over time with substantial investment.

Given the poor performance of Jamaican agriculture, and the obvious limitations of many of the public sector institutions serving the agricultural sector, we recommend that consideration be given to the implementation of one or both of the following proposed projects. One is specific, the other is more general. We believe that both might be implemented without the expenditure of large, additional amounts of resources -- either donor or GOJ. Yet both offer promise of improving the performance of key public sector institutions that serve agriculture.

The first might be identified as an agricultural research and development project. It would address one of the most serious problems limiting the productivity of Jamaican agriculture -- the lack of relevant indigenous technology. The second project would be related to some of the administrative reform efforts already underway within the government -- but would go further in providing greater flexibility in using available resources to carry out assigned responsibilities. This might be referred to as "MOA Management Reform."

Serious consideration is now being given within the Ministry of Agriculture to the development of the National Agricultural Research and Development Institute of Jamaica (NARDIJ). We believe that such an organization would offer substantial potential for improving the technology generation and dissemination efforts in Jamaica and could thus enhance further agricultural productivity. A project to support NARDIJ would not be limited to research but would also address the "development" function. This would involve researchers producing a "farmer-ready" technology and delivering such technology to the MOA

extension service as well as other entities having agricultural extension functions.

We believe that a NARDIJ-type organization must have a systematic planning procedure, a reporting program, and a monitoring-evaluation system. We further believe that the institution needs to be of size that is appropriate to the size of the economy that supports it and the sector of the economy it serves. In the Jamaican economy, this indicates a relatively modest size institution with a modest program that can be done well and is carefully designed to make an important difference in agricultural production. Such an organization must rely heavily on international sources for much of its science and technology. This needs to be reflected in a pro-active program for systematically developing and maintaining linkages that will facilitate tapping these international sources. The institution's own research and development program should be concentrated in developing (much of it on farms), adapting, integrating and disseminating technology. It must have a thorough institutional knowledge and understanding of the nation's agriculture so that it can prioritize its research efforts as well as interface effectively with international sources of technology and science.

We believe the USAID-funded grant project being administered by the Jamaican Agricultural Development Foundation has great potentials to complement the proposed agricultural research and development effort.

In reviewing the programs of the Ministry of Agriculture, it is readily apparent that one of the most urgent problems within the MOA is that of salaries for key personnel. Government salaries generally are low in response to the need to curtail expenses. The so-called austerity program within government has tended to further exacerbate a long-standing problem in this area. The problem may not be so much a question of total resources committed to salary, however, as it is one of salary structure. For this reason, solving the problem may not involve much, if any, additional cost.

The real problem is a lack of a competitive salary structure for key management personnel. The creation of statutory bodies and the opportunity to pay personnel therein salaries considerably in excess of those personnel under civil service has contributed to major difficulties in keeping key personnel within the Ministry of Agriculture and other government agencies. At the same time, there may not be a sufficient differentiation between salaries for key management and technical personnel and others performing more routine tasks.

We recommend that an additional dimension be added to the overall administrative reform efforts within the Jamaican government to include management reforms that would permit greater flexibility within government agencies in using budgetary resources.

The organizing concept is as follows:

Give Ministry management the authority or responsibility to identify "key personnel" and to compensate them at competitive levels, provided that management will effect the economies in the Ministry that will at least offset the extra cost in salaries.

This type of flexibility in achieving management reform could be enriched by the addition of certain management concepts that would specify program goals and objectives more clearly and measure achievements and progress towards these goals.

The purpose of this effort would be to assist the Government of Jamaica to improve the management of the Ministry of Agriculture in such a manner that general institutional performance could be strengthened at little or no additional cost to the Treasury.

In implementing such an effort, it would be necessary to conduct a management audit that would (a) identify a limited number of critical positions in the Ministry; (b) establish criteria for the personnel needed to staff these positions; (c) identify lower priority program activities ranging from components of programs to entire entities that could be terminated or reduced substantially with little harm to the Ministry or the agricultural sector which it serves. Obviously such an approach would involve the termination of low priority activities along with a management system for programs remaining in the Ministry that would emphasize program objectives and monitoring and evaluation of activities in achieving these objectives.

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JAMAICA
AGRICULTURAL SECTOR INSTITUTIONS

1.0 The General Setting

1.1 Government Policy and Program Direction

The Jamaican Government appears to have taken and to be taking many of the right steps to improve the environment for a prosperous agriculture in the future. Macro-economic policies that affect agriculture, as well as the total economy, seem to be achieving desired objectives. The exchange rate has been allowed to adjust to world conditions. The GOJ fiscal deficit appears to be under control. Subsidies and price controls have been reduced or eliminated. Government has been working to divest itself of land and other publicly owned enterprises, and significant efforts have been made to attract private capital, both foreign and domestic, into the economy.

Progress has, in some ways, been slower than expected. The USAID Mission, 1987 "Agricultural Sector Strategy" states, "These efforts have helped to slow and stabilize the economic decline but have not yet overcome it." Divestment is not simple, nor is its success assured. It takes some time for macro-economic policies to work their effect on the economy, for confidence to be restored among investors and for investments to begin to pay off. Falling world prices for bauxite have caused foreign exchange problems. Although the government's divestment efforts are well recognized, there is evidence that considerable government intervention exists in a variety of new forms.

1.2 The Agricultural Situation

1.2.1 Role of Agriculture

Agriculture accounts for about 5.5% of GDP and that percentage may be declining. It provides about 12% of exports, and employs 20% of the labor force. Domestic crops account for 53% of value of agricultural production, export crops for 18% and livestock for 22%. Fishing and forestry make up the rest (Data from the Agricultural Sector Strategy paper).

While sugar and rum are the largest agricultural exports, banana and sugar exports have declined severely, and a variety of yams, other tubers, fruits, vegetables, and ornamentals have increased substantially. Rising exchange rates have raised the prices of imported feed, which has affected the poultry and swine industries.

Agriculture does not dominate the economy, but it is significant, especially in foreign trade. Given a considerable amount of unused farmland and the generally low productivity, the potential for an expanded agricultural sector is considerable.

1.2.2 Agricultural Productivity

Productivity in Jamaican agriculture is surprisingly and consistently low in relation to other developing countries, including some of the nearby Caribbean island nations (Table 1). Low productivity characterizes the traditional export crops as well as some of the crops, such as vegetables, that seem to be growing in importance. FAO reports that Jamaican sugar yields are 80% of the level of the Dominican Republic and currently, Jamaica is not able to fill its quota in the world sugar market. Banana production is also too low to enable Jamaica to fill its quota in the UK market.

Coffee yields in Jamaica are 40% of the level in Haiti, and cocoa yields are 26% of Haiti yields. Jamaica claims a quality advantage in both these commodities. The USAID Mission Agricultural Sector Strategy paper questions whether superior quality compensates for the lower yields in cocoa. A consultant to CIDCO questioned the coffee strategy. Coffee producers have not accepted new coffee varieties because of the quality issue. They also have not increased plant density for the same reason.

Data is not available for productivity in the citrus industry, but Jamaican producers are using old varieties imported from California in the 1920s. Citrus growers look to the United States as an expanding market and regard Brazil as their major competition. They feel that they can compete with Brazil only because of the trade concessions provided by the U.S.-Caribbean Basin Initiative.

The coconut industry has not produced a surplus for export over domestic needs. The Mission Sector Paper questions its competitiveness in the world market.

Exports of yams, other tubers, and vegetables have increased in the last few years, leading to claims of their being a growth industry. However, yield levels for all these commodities are generally quite low. Only in pumpkins are Jamaican yields higher than the developing country average. Furthermore, vegetable yields in Jamaica are substantially below those in the Dominican Republic.

FAO data, such as that referred to herein, are often criticized. However, they show Jamaican yields consistently low, and some of the differences are so striking that they would be significant if heavily discounted.

The low productivity levels in Jamaican agriculture greatly affect the ability of farmers to carry on profitable operations as well as the ability of the country to be competitive with its agricultural products in export markets.

Table 1. Jamaican Crop Yields

A. Compared to Developing Country Average

<u>Crop</u>	<u>Yields (Kgs./Ha.)</u>		<u>Jamaica as % of Dev. Cntry.</u>
	<u>Jamaica</u>	<u>Dev. Cntry Avg.</u>	
Sugar Cane	50,094	57,611	87
Coffee, Green	436	518	84
Cocoa Beans	520	337	154
Rice, Paddy	2,841	3,106	92
Maize	1,333	2,121	63
Potatoes	9,211	12,990	71
Sweet Potatoes	9,302	15,147	61
Cassava	7,619	9,117	84
Broad Beans, Dry	693	1,185	59
Ground Nuts	1,132	1,056	107
Cabbages	9,655	17,253	56
Tomatoes	9,091	16,860	54
Pumpkins, Squash	11,364	11,152	102
Cucumbers	8,060	13,447	60
Eggplant	3,700	11,934	31
Peppers	3,125	6,087	51
Onions	7,143	11,007	65
Carrots	7,190	17,213	42
Watermelons	12,000	15,006	80

B. Dominican Republic Vegetable Comparison

<u>Crop</u>	<u>Yields (Kgs./Ha.)</u>		<u>Jamaica as % of Dom. Rep.</u>
	<u>Jamaica</u>	<u>Dominican Repub.</u>	
Broad Beans	696	950	74
Cabbages	9,655	11,250	83
Tomatoes	9,091	21,073	43
Pumpkins, Squash	11,364	16,148	70
Cucumbers	8,060	45,000	18
Eggplant	3,700	16,667	22
Peppers	3,125	22,798	14
Onions	7,143	8,030	89
Carrots	7,190	13,889	52

Other relevant comparisons:

- Sugar yields in Jamaica are 80 percent of level in Dominican Republic
- Coffee yields in Jamaica are 40 percent the level in Haiti
- Cocoa yields in Jamaica are 26 percent the level in Haiti

Source: FAO Production Yearbook. Vol. 38. FAO/Rome. 1984

1.2.3 Macro Policy and Programs

The agricultural sector has been affected significantly by the general policy orientation of the GOJ. Much of the divestment activity is aimed at sugar lands and other enterprises in agriculture. Exchange rate adjustments and the elimination of subsidies have been particularly important in agriculture. There has been a substantial influx of private capital. Efforts to attract investment have given the GOJ the image of being more interested in the large farmer and in export crops than in the small farmer and food crops. Indeed many resources, both human and physical, have been invested in the large farms to produce export crops. Much is expected of the private investor in agriculture. The GOJ expects the entrepreneur to provide a market and the high technology which is being emphasized in these enterprises, in addition to management and capital. Through the "mother farm" concept, the large farm is expected to provide technology and a market for small farmers. These are major services and place a heavy burden on the large farming enterprises.

There have been some dramatic failures. One is Spring Gardens, a vegetable producing operation which appeared to allow costs to become greatly excessive for the scale of operations. The chairman of the All Island Banana Growers Association was quoted in The Gleaner, 10-10-87, as follows: "...Eastern Banana Estates, Ltd. could possibly produce 15,000 to 18,000 tonnes in 1987, a figure which was projected in 1985. Perhaps after all the mistakes (and expenditure) this operation will produce as expected. But at what eventual stupendous costs?"

Jamaica has historically been a major exporter, especially of sugar, bananas and other tropical crops. One might assume, therefore, that the country has an export tradition along with considerable expertise. However, much of Jamaica's export history apparently has been market driven and has not developed export marketing expertise.

1.2.4 Future of the Agricultural Sector

The 1987 USAID Mission Agricultural Strategy Paper is not optimistic that the future of the Jamaican agricultural sector will be easy or assured. It cites the weakness of the economy; its narrow base; weakness in the two important export markets, sugar and bauxite; loss of market shares in such traditional exports as pimento, bananas, citrus, and cocoa; high costs induced by low productivity; lack of aggressive marketing strategy; a huge external debt service load; and continued austerity in the public sector budgets.

That report also states that a "severely weakened MOA" is now incapable of fulfilling a sector guidance, coordinating and management role, which is vital given the fragmentation of responsibilities. Reform of the commodity boards along with the problems of MOA appear to have weakened a technology generation and transfer system already deficient. The report also calls attention to the Jamaican management style which emphasizes organizational fragmentation and limited

delegation within organizations. The Strategy Paper also reports an inadequate expression of objectives.

The Strategy Paper emphasizes the loss of market share. Pimento exports are substantially below previous levels in terms of market share. Sugar cannot fill its quotas on two protected markets, and banana exports are less than 20% of the peak levels achieved earlier and substantially short of the quota in the UK market.

One of the Paper's conclusions is: "Low productivity is at the root of loss of market share. Although some technology...can be borrowed...Jamaica must improve its indigenous technology generation and transfer capacity."

2.0 Institutional Description and Discussion

Information concerning agricultural sector institutions was gathered from published reports and interviews with representatives of institutions which service Jamaican agriculture. Contacted were Ministries of Agriculture entities dealing with research and extension, natural resources, inspection and quarantine, marketing, information, commodity board monitoring, production data and analysis, and policy analysis; six commodity industry groups, two private enterprise support entities, an educational institution, two regional research teams, two donors, a general farmer organization, two consultants, and an agricultural entrepreneur. (See Annex 1 for discussion of "Institutions in Agricultural Development").

2.1 Overview

Most of the institutions serving agriculture directly are either in or closely associated with the Ministry of Agriculture. The MOA has delegated some responsibilities but the delegation is to groups more closely associated with the Ministry than is immediately apparent. In some cases the delegation is not as complete as it seems. The best example of this is the complex of commodity industry boards, some of which seem to have assumed responsibility for research, extension and marketing, both export and domestic, as well as processing. The MOA, appoints members to the boards (sometimes the chairman), is represented on some boards and monitors all board operations. It plays a critical role in approving budgets which come from commodity proceeds (either through a cess or marketing margins) and thus bear directly on the producer's income.

Of eight identifiable crop groups, only six are represented by an industry organization -- coffee, cocoa, coconut, citrus, sugar and banana. Neither pimento nor the horticultural crops have industry boards. The six industry boards are involved to various degrees in research and extension but only two have anything approaching adequate research programs. Some have relatively good extension but virtually no research, and some are inadequate in both.

The MOA has delegated some responsibility to the Jamaican Agricultural Society which is a general farm organization for producers who have no commodity representation. Unlike the commodity groups, the JAS is subsidized. It has an extension program and a farm supply program and is responsible for fairs and other promotions.

Some responsibility has been withdrawn from the MOA. Agro-21, a statutory body created for the purpose of divesting excess sugar lands has been assigned some de facto policy and operational responsibilities that would normally be associated with the MOA. An intermediate agricultural school, the Jamaica School of Agriculture, under the MOA, has been closed. It has been replaced by the College of Agriculture which is under the Ministry of Education.

A brief description of these institutions follows. A more detailed discussion of these organizations is found in Annex 1.

2.2 Ministry of Agriculture

The Jamaican Ministry of Agriculture has a somewhat conventional range of responsibilities, including research, extension, marketing, credit, inspection and quarantine, planning and economic analysis, data collection, etc.

In recent years, the Ministry has been impacted greatly by the government's "redundancy" exercises which have resulted in a major reduction in personnel. It has also been affected by the so-called "austerity" program aimed at holding down government expenditures as a part of the administrative and fiscal reform efforts of the GOJ. It should be noted, however, that the redundancy and austerity programs have been applied not merely to the MOA but to other Ministries as well. Furthermore, it should also be noted that a number of autonomous or semi-autonomous "statutory" bodies, created to carry out important functions, have not been subjected to the same redundancy and austerity exercises. Consequently, these organizations are in a more favorable position to perform their functions than many of the line agencies in the Ministry. A particular advantage these statutory bodies have is their ability to pay salary levels considerably in excess of those authorized within the Ministries.

2.2.1 Research

Research in the Ministry of Agriculture is the responsibility of the Science and Technology Research Department (STRD). The STRD was organized in the MOA when the Ministry of Science and Technology Research (STR) was terminated and staff and program were transferred to MOA. The Department of Science and Technology Research is headed by the permanent secretary of the old STR ministry and functions in the MOA as a permanent secretary, answering directly to the Minister.

STRD has three divisions dealing with environment and natural resources, industrial technology, and agricultural research and development. There are four research stations. The main station is at Bodles, about an hour by automobile from Kingston. There are three other stations -- at Orange River, Montpelier and Grove Place. Orange River is a tree crop station, and the other two concentrate on livestock.

An effort was made in the late 1970s to revitalize research, following a consultant's report that a prosperous agriculture was not possible without an adequate research program. That effort, supported by the Inter-American Development Bank, has had little impact. For example, no annual research report was produced from the initiation of the revitalization project until 1986 when a token report was issued.

In 1983, the MOA arranged for a management audit of the research program. That report identified three major problems -- civil service

salary structure, lack of policy and objectives, and no clear assignment of responsibility. It recommended that the Sugar Research Institute be given the responsibility for agricultural research and that its name be changed to the National Agricultural Research Institute (NARI). That recommendation was never implemented.

It is somewhat difficult to gain a full understanding of the research situation and its lack of success. Undoubtedly, many factors contribute to this situation.

All interviews with research personnel were dominated by concern over the low salary scale and the lack of operating funds. Program information generated in the interviews was scanty. The 1986 annual report added little. The 1987 Research Reporting Conference scheduled for Bodles was cancelled. Interviews did include some discussion of the proposed National Agricultural Research and Development Institute of Jamaica (NARDIJ). Some suggested that without such an institute there was little hope for future productive agricultural research.

Potential users of research results were generally negative about MOA research activities. ("Nothing ever comes out" is almost the universal appraisal.) Such comments came from industry groups and even from other entities within the Ministry. By any measure, MOA research is not very productive.

Salary level is, of course, a major problem. Top salary for an MOA researcher without administrative duties is about J\$38,000. Competitive entities report top salaries of J\$60,000. to J\$95,000.

The 1983 management audit explanation of lack of policy and objectives may be one factor accounting for the ineffectiveness of research. The fact that, four years later, there still is no evidence of "policy and objectives" may be explained by another finding of the audit report -- no clear assignment of responsibility.

Several respondents said that researchers were guided by their own interests and not by the needs of clientele. This was manifest in a new researcher starting new programs rather than continuing an ongoing project. In turn, when he left, his research stopped. It was also suggested that researchers left fund allocation decisions to accountants and did not provide research expertise to the budgeting process.

All of these circumstances have likely contributed to the overall ineffectiveness of the MOA research effort.

2.2.2 Extension

The MOA Extension program has been greatly affected by both the redundancy exercises and the austerity program. The Agency lost half its professional staff (from 400 to 200) and all of its field assistants in the redundancy exercises. The loss of staff has

continued. It currently numbers about 150. Of only eight authorized positions for specialists, four are vacant.

Extension is much maligned. A part of the explanation for its lack of effectiveness may well lie in the low productivity of research. Furthermore, extension workers are assigned various responsibilities such as assisting credit programs, working with the "mother farm" program, and helping with production data collection.

Extension personnel indicated that inadequate technology is an important cause of the low crop productivity in Jamaica. Extension personnel did not list MOA research programs as a source of technical information, even in response to direct questioning. Consequently, Extension has had to procure much of its information from various other sources including international organizations and private industry.

Extension suffers from low salaries at all levels and from low operating budgets. It loses personnel to commodity industry boards and private sector organizations. However, it maintains a positive attitude and is trying to recruit to fill its vacancies. It continues to emphasize training although training resources have been severely cut back.

The MOA Marketing and Credit Division, a temporary entity without tenure, is being merged with the Extension Division. Some of the Extension positions will be used to protect some of the positions in the Marketing and Credit Division. This could further weaken the Extension program and limit its future effectiveness.

Some observers hold that MOA Extension is beyond salvage. That probably is not true. In some respects it is easier to remedy extension problems than research problems. In most cases, Extension agents seem to do a respectable job when they receive a minimum of technical and logistical support.

2.2.3 Marketing and Credit Division

The Marketing and Credit Division of the MOA is a relatively new division, created as a component of a USAID project and does not have permanent status or tenure. It is performing some useful services and is being given additional responsibility, even though the Division will not endure beyond the termination of the project scheduled to terminate within the year. It will be merged with the Division of Extension and will use some unfilled authorized positions of that division to protect some of its critical positions.

Two export inspection services are located in this division. One is traditional, dealing with the quality and standards inspection of Jamaican exports. The other, involving the pre-clearance inspection of products exported to the U.S. market is new. A third, involving the inspection of vegetable products entering Jamaica, will be added as part of an expanded plant quarantine program. These three services are to be housed in a Plant Quarantine and Inspection Branch of the Division. The expanded quarantine service will require a new law

(well along in the legislative process), quarantine facilities being provided at the Bodles Station, and an increase in the number of inspectors. Assistance is being provided by an FAO-IBRD project.

This division also houses the traditional commodity monitoring service and a new market-price reporting service. Being associated with the donor project, this division had some flexibilities in recruiting and compensating personnel. Perhaps for that reason, this division does not seem to be suffering from low salaries and government austerity as much as others. Another explanation is that the responsibilities of the division do not require personnel highly qualified in specific areas. Inspectors are two-year graduates from the College of Agriculture and can be trained in large part by the Division. They need some training, however, from the U.S. Department of Agriculture in the United States. This need should present little problem.

The services of this Division rate from important to essential in Jamaica's export operations, including the monitoring of the commodity industry boards. All the evidence developed in this study indicate that the Division is performing well. An FAO/World Bank study suggested that the monitoring of the commodity boards was not adequate, but this study produced no evidence to support the suggestion.

2.2.4 Natural Resource Institutions

Two entities are providing data and analysis on two major resources of Jamaica -- soil and water. Both seem to be performing well in important areas and have a capability to do more than they were originally charged. Both are suffering from budget deficiencies, salary structures and competition for personnel. They represent a valuable resource developed with considerable investment, and they are currently at risk of significant deterioration.

2.2.4.1 Rural Physical Planning Division

This division is responsible for soil classification and mapping. It has assembled a great amount of information on Jamaican soils and has developed analytical systems and mapping procedures to make that information available quickly in useful forms. Some users have reported "extreme satisfaction" with the service.

The RPPD has been developed with generous donor support and is just now losing its expatriate director. Donor support is ending. This is a high-technology operation that does require some high-level training for critical positions. It is at considerable risk under the current austerity situation.

2.2.4.2 Underground Water Authority

The UWA is a statutory body closely related to the MOA. Created in the 1950s, it has recently been given authority, by administrative decree, over surface water. That authority is to be provided by statute under a new law currently in process.

Similar to RPPD, it has assembled a great deal of information on Jamaica's water resources and has developed procedures for collecting and analyzing data on quantity and quality changes. It is also a high-technology operation with personnel needs similar to RPPD. As a statutory body, its salary structure is somewhat better than that of the MOA, and its legal status may make adjustments less complicated.

2.2.5 Economic Data and Analysis Entities

Two divisions of the MOA are charged with economic data gathering and analysis. Both have suffered heavily from salary structure limitations and austerity. While certain basic work continues, they both stand in serious risk. One is a new program, and the other is of fairly long standing.

2.2.5.1 Economic Planning Division

This is a new division, aiming to collect analytical data, as opposed to production data, and to perform analyses that would lead to policies and program direction at different levels. It has not been able to overcome salary and budget problems to complete the development of a program and today appears to be barely hanging on. It depends on a few key personnel, whose working efficiency is impaired by the austere environment.

2.2.5.2 Data Bank and Evaluation Division

This division is charged with crop reporting and forecasting. It has developed a program which enjoys a good reputation for accuracy, but one that takes much time and human resource. It is in the process of changing the reporting system to one using crop reporters and sampling techniques similar to the Area Frame developed by the U.S. Department of Agriculture.

This division is in the same situation as the Economic Planning Division. It seems to be "hanging by a thread," depending on a limited number of key personnel who cannot be expected to persist indefinitely under the conditions that prevail.

2.3 Commodity Groups

There are six, well-defined commodity groups in Jamaica that perform a variety of functions. Some have major processing and marketing responsibilities, some have production functions; some conduct research and carry out extension programs related to the commodity. While enjoying considerable autonomy, they have close linkages with the Ministry of Agriculture. Each is quite different in terms of the manner in which it is organized and functions. Operations of boards are financed by marketing margins or a cess, either of which has to be approved by the MOA.

Following is a brief description of each group.

2.3.1 The Coconut Industry Board (CoIB)

The Coconut Industry Board is a combined government organization and a grower's association. Four Board members are appointed by the Ministry of Agriculture and five are elected by the coconut producers. The association has about 10,000 members but all are not producing.

The Board is financed by a cess on sales of coconut products (in the domestic market), by its share of profits from coconut factories (of which it owns 40%), by interest and dividends, exports of plant material, and a tax on imported coconut products. It apparently pays its own way.

The Board claims to be self-sufficient in research. In addition to two researchers assigned to extension, six planting officers spend much of their time on extension-type work. These officers deliver seedlings, fertilizers and pesticides free to farmers in an effort to increase the nation's coconut production. They also make grants for weed control work. The Board does some collaborative research with other commodity boards dealing with tree crops that can be intercropped with coconuts, such as bananas, cocoa and coffee. Its collaboration with MOA is limited to the use of land.

2.3.2 Sugar Industry Research Institute (SIRI)

The Sugar Industry Research Institute was created in the early 1950s as the R&D arm of sugar factories. It added production research about 1970.

There are about 17,000 sugar producers in Jamaica, but 100 large farms, plus up to a dozen estates, produce 90% of the sugar. The Sugar Industry Research Institute has a staff of some 15 university graduates and a comprehensive research program. It also has a significant extension effort involving four regional field days, 16 seminars and 50 field demonstrations dealing with a variety of production issues.

Overall, SIRI appears to have established a good reputation for research and extension activities in its area of responsibility.

2.3.3 Cocoa Industry Board (CaIB)

The CaIB is made up of seven members. Three, including the chairman, are appointed by the Minister of Agriculture. An MOA officer is on the Board. The other four are nominated or elected by the Cocoa Growers Federation, a federation of 14 Cocoa cooperatives. Cooperatives are organized into 320 groups, which were important in marketing and extension. There are 24,000 growers, producing some 30,000 acres of cocoa. The Board itself has several farms producing about 2,000 acres.

The Board operates as a company. It buys cocoa. The groups assemble it giving each farmer a receipt. The CaIB picks it up, pays

the group, which in turn pays the farmer. It then processes and markets the cocoa. It has four fermenting plants but everything is finally assembled in Kingston for marketing. The main export market is Europe.

Until a few years ago, the MOA was responsible for research and extension but then informed the CalB that it would have to take over these functions. Apparently, the research efforts are quite limited. Altogether the Board now has six extension officers and a research staff of three.

Apparently cocoa has never had adequate research support. For years the Board held that research was not its responsibility. However, it finally decided that if the industry was going to solve the productivity problems, it would have to deal with research.

2.3.4 Citrus Growers Association (CGA)

The CGA is a producer's association which acts as a commodity board. It deals in citrus products, mostly oranges, and owns two juice factories. Large scale growers can apply for approval to export directly, but CGA does most of the exporting and is responsible for overseeing the private exporters. CGA is financed by a cess collected from the sale of fruit, either to the factory or to the export market.

It is estimated that there are some 10,000 growers tending 13,000 acres.

CGA depends on the Ministry of Agriculture for research but apparently gets very little. The CGA claims that there is no continuity in the MOA research. CGA has four extension workers of its own and two seconded from the MOA as a part of a World Bank financed rehabilitation program.

2.3.5 Jamaica Banana Producers Association, Ltd. (JBPA) Banana Export Company (BECO)

The JBPA is a commercial operation in the shipping and fruit marketing business. It owns the Jamaica Products Marketing Company in England which markets bananas and other fruits. It has just opened the Jamaica Products Marketing Company in New York. It also owns outright one farm which produces a variety of fruit and vegetable products as well as beef and has part ownership in three banana producing operations.

BANCO, a general purpose organization, has been terminated and replaced by BECO which is solely an exporting company. The Banana Board, now largely a technical organization, has reestablished a research program with two full-time researchers. The All Island Banana Growers Association, formerly did extension work. It is now largely in the input supply business. The limited banana research program is located at the MOA Bodles Station.

2.3.6 The Coffee Industry Board (CIB) Coffee Industry Development Company (CIDCO)

The Coffee Industry Board buys coffee, processes and sells it. It is allowed a margin which finances its operation. The Coffee Industry Development Company is a production organization and is a subsidiary of CIB which finances much of the CIDCO program. Other activities are financed by grants from donor projects and from CIDCO farms. CIDCO was separated from CIB as a condition of one of the World Bank's structural adjustment loans.

CIDCO is a producers' support organization. It employs an extension staff of over 100. It provides inputs and has a credit program. Inputs are paid by the farmer with the CIB withholding the charges from the farmer's proceeds.

Research is done primarily by contract. MOA is supposed to do coffee research but very little is done. CIDCO has a research staff of two who do some field trials and short-term, testing-type research on varieties and fertilizers. They also manage the contract research with such organizations as CARDI and UWI. Most of the contract research is on plant protection.

2.3.7 Other Commodities

A new commodity group involving ornamentals, vegetables and tubers has emerged but does not have export support by a commodity board or the MOA. It has been one of the export growth areas of the last five years. Private enterprise currently provides its own technology and export marketing.

Pimento is an important traditional export but Jamaica has been losing ground in the world markets. It is not clear to what extent this is a productivity problem or a marketing strategy problem. Pimento has no commodity board or other organized group. MOA provides export marketing services.

2.4 General Producer Organizations

2.4.1 Jamaican Agricultural Society (JAS)

The Jamaican Agricultural Society is some 92 years old. For the first half of its life, it was the only agricultural organization in Jamaica. At one time it apparently was the real leader of agriculture in Jamaica. It still claims to be the primary advocate for agriculture.

At one time JAS was responsible for most of the public services to agriculture and reportedly was the initiator of extension. It is also said to have been an important force in the organizing of commodity groups.

It still has what it calls extension agents. There are currently some 22, down from 52. These are funded, along with other people and

activities, by grants from the MOA. To this extent, it is a part of the public sector. Its clientele is primarily that group of producers who are not represented by other organizations.

2.5 Regional and International Research Entities

Several regional and international organizations are either involved in programs in Jamaica or offer the potential for supporting agricultural research in the country.

Jamaica is a member of both the Caribbean Agricultural Research and Development Institute (CARDI) and the Interamerican Institute of Cooperation in Agriculture (IICA). Both have research and extension support operations in Jamaica.

CARDI has plans for a 7-person team (entomology, engineering, agronomy, animal nutrition, and forage, and biometrics). It also plans to be able to provide short-term consultation in plant pathology, virology, weed control and soil and water conservation. CARDI is also providing leadership in networking exercises to provide access to research information. Most CARDI personnel have been stationed at UWI/Mona, but new personnel in the future will be stationed at MOA/Bodles. Both CARDI and MOA extension report fruitful collaboration.

IICA has a five-person team in Jamaica working in farming systems research, farm management, and research program development. IDRC (Canada) supports the farming systems work and IICA directly supports the other activities.

Some elements of the 13-member Consultative Group for International Agricultural Research have worked in Jamaica to a limited extent. This involves, for example, the International Institute for Tropical Agriculture (IITA) working on yams and the International Potato Center (CIP) working on potatoes. Other Centers may well have been involved to a limited extent.

The USAID-supported Collaborative Research Support Program (CRSP), operated as a part of the Title XII effort in the U.S., is also involved in research efforts with a number of food commodities. To date, there has been limited cooperation with some of these projects within Jamaica. There is a potential for more.

The University of West Indies has a small agricultural research program in Jamaica.

2.6 Private Enterprise Support Agencies

2.6.1 Jamaica Agricultural Development Foundation (JADF)

The JADF represents an innovation in development banking. It is financed by sale of PL-480 butter and cheese. It has a flexible policy that allows it to take equity positions, capitalize interest, guarantee

loans, and grant moratoria on payments. It can invest in viable enterprises not backed by conventional collateral.

It gives the impression of being a carefully managed organization. It provides staff to review proposals and help prepare them. It has published instructions for borrowers on how to deal with the Foundation. It has financed 56 projects for J\$33 million.

The JADF administers a research grant program financed by USAID. It makes modest research grants with its own capital and sponsors seminars for borrowers and others.

2.6.2 Agro-21

Agro-21 is another innovative entity organized to facilitate the divestment of former sugar lands and encourage private investment. It began as a coordinating, facilitating secretariat, with a wide participation of conventional entities and was greeted with general optimism. Agro-21 has since been converted into an operating corporation, associated with the National Investment Bank of Jamaica, and participation of other entities has been substantially diminished.

Agro-21 is associated with the Ministry of Finance, a portfolio held by the Prime Minister. It has acquired the image of being another Ministry of Agriculture and even the dominant one. The Government assigns it responsibilities not closely related to the original mission of sugar land divestment.

Agro-21 has been criticized for trying to accomplish too much, too quickly, without adequate analysis and for not relying on the expertise of traditional institutions.

2.7 College of Agriculture

The Jamaican College of Agriculture is under the Ministry of Education. It replaces the Jamaican School of Agriculture, which was administratively under the Ministry of Agriculture and which was closed in the early 1980s. The College of Agriculture awards an Associate Degree which requires three years of study and counts for two years towards the B.S. degree. Its credits are recognized in UWI/Trinidad Faculty of Agriculture and in most U.S. agricultural colleges. Most of the quarantine and plant inspection personnel will be COA graduates. Other institutions of the MOA such as RPPD and UWA are planning to make more use of such graduates in positions normally filled by B.S. degree holders. Such graduates will require special training to meet the needs of the agencies involved.

2.8 Other Government Entities Not Directly Concerned With Agriculture

2.8.1 Office of the Prime Minister

It needs to be recognized that the Jamaica Constitution grants more power to the Office of the Prime Minister than is true in many

countries. This power can and does at times override the power of other Ministries and the influence that traditional institutions may be expected to exert on the decision environments of farmers and others. It may reduce the security of expectations of investors and donors regarding future policy. On the other hand such a strong office may expedite more rapid progress in achieving desired government action on matters relating to the agricultural sector.

2.8.2 Ministry of Public Services

The World Bank/IMF pressure for administrative reform led to the creation of this ministry. The MPS was not included in this study, but many institutions which were reviewed were quite sensitive to its presence. All of them, whether conventional public institutions or statutory bodies, must deal with the MPS regarding salaries. Its presence and operation are significant factors in the general environment in which the agricultural institutions must function. It would be an important actor in any major project this study might recommend. Indeed the MPS itself could be a collaborator in a donor project.

2.9 Impact of GOJ Policies on Agricultural Institutions

Two elements of GOJ policies have had significant impacts upon agricultural institutions. One is the important role assigned to statutory agencies and the other is the austerity program carried out as a part of fiscal reform efforts.

The increasing role of statutory bodies has resulted in the spreading of limited human resources over a significantly enlarged scope of operation. The statutory bodies have a much more liberal pay scale, so that the "spreading" has involved a quality skewing of talent in their favor. Since most agricultural talent had previously resided in the Ministry of Agriculture, the Ministry has suffered serious impact.

The increased number of agencies has had management impacts as well, but it is not easy to evaluate them. It is easier to manage a small enterprise than a large one, and some degree of competition, if it does exist, may improve performance. On the other hand, there can be confusion concerning role and responsibility. Four offices, for example, have a responsibility for agricultural policy analysis and planning. Agro-21, which operates out of the Prime Minister's Office seems to be the major actor in agricultural policy, although its primary objective is to divest sugar lands to private enterprises.

The FAO/WB report places great emphasis upon the Administrative Reform Program, but Ministry of Agriculture personnel are not optimistic about what it may contribute.

Fiscal reform, required by the International Monetary Fund, resulted in two "redundancy" exercises in which the MOA lost about half its personnel. The MOA was able to select the redundant personnel, thereby mitigating somewhat the effects of the reduction in force. The austerity program, however, keeps the salary scale low and reduces

budget. This together with competition, much of it from statutory bodies, has dealt a double shock to the Ministry.

3.0 Conclusions and Recommendations

This section provides the conclusions of this study with brief comment. They are interpretations based on information presented and discussed elsewhere in the report. Following the conclusions are recommendations.

3.1 Conclusions

By any measure the agricultural sector is not performing well. Agriculture's contribution to the GDP has declined significantly and currently accounts for only 5.5% of the total. Production of traditional export crops such as sugar and bananas has dropped sharply in recent years to the point that Jamaica is not even meeting its quota for these products in protected international markets.

The poor performance of Jamaican agriculture is reflected most dramatically in its low productivity. Yields of most Jamaican crops are below the average for all developing countries and even below yields of nearby Caribbean countries.

In countries which have made satisfactory progress in agricultural development, it is recognized that the agricultural sector needs the support of public institutions which supply essential services. Cost of these services are recognized to be legitimate government expenditures shared by the total public rather than expecting farmers and agricultural enterprises to provide their own. These services include price and market information, technology generation and dissemination, production and supply information, natural resource data, training and education, quality standards and control, certain transportation infrastructure, plant and animal protection, and perhaps others.

There are indications that many of the public services which normally support a nation's agricultural sector are weak and ineffective in Jamaica. Indeed this study leads to the general conclusion that problems with some of the public institutions serving Jamaican agriculture are limiting the performance of the agricultural sector and may actually become more serious inhibitors of agricultural development in the future. Some institutions seem to be performing well although they will be at risk if some of the problems in the institutional environment are not attended.

One of the obvious and, unquestionably, most serious problems limiting the performance of the agricultural sector is the very weak research effort in the country. This is apparently a problem of long standing and has been well recognized in previous assessments of Jamaican agricultural performance. Indeed, this is a problem so evident and of such magnitude that it need not be elaborated on here. However, it is well to note that an effort was made in the 1970s to revitalize research

following a consultant report that a prosperous agriculture was not possible without strong research programs. However, that effort supported by the Inter-American Development Bank has had little apparent effect. In fact, there was not even an annual research report issued from the time of the revitalization program until 1986 when a token report was published that reflected very modest results.

The USAID Mission's 1987 Agricultural Strategy Paper recognized the low productivity of Jamaican agriculture and emphasized that "Jamaica must improve its indigenous technology generation and transfer capacity." We fully agree and express the strong belief that until this is done, there can be little hope for substantial improvement in the nation's agricultural sector. (See Annex 2 for discussion of the importance of technology in agricultural development). There have been numerous attempts to develop improved research capabilities in the country. In addition to the unsuccessful efforts to strengthen the research program of the MOA in the 1970s, a number of commodity boards/associations have attempted to develop their own research capabilities. Such efforts have met with limited success -- with the development of what might be considered a satisfactory program with only sugar and possibly coconuts.

One incipient problem in commodity-financed research was identified. Commodity financing of research is done either through marketing margins or a cess that has to be approved by MOA. The MOA is sensitive to pressure from growers to keep margins or cess low. This concern for current income militates against long-term investment, as research often is.

Recognizing the great need for indigenous research technology, the USAID Mission in 1987 established a program of research grants to be administered by the Jamaican Agricultural Development Foundation. A total of \$7 million has been committed to this effort in the period from 1987-1992. While such an effort is laudatory, it suffers from a dearth of viable research entities within the country to which productive grants might be made. Furthermore, such an approach would likely do little to develop continuing institutional capacity to carry on such research activities once the grant program is terminated.

There are limited research activities by regional organizations such as CARDI, IICA, and the University of West Indies. However, while these organizations can be helpful, most have their own research agendas and their limited efforts are not likely to have a significant impact on solving major problems limiting the development of Jamaican agriculture. The International Agricultural Research Centers dealing primarily with food crops have a great potential to assist Jamaica but will require substantial funding assistance if they are to make a significant contribution.

It is recognized that the MOA extension program, as well as the research effort, is weak. And while a case could be made to provide assistance for strengthening the extension program, we believe this to be a matter of lower priority than the research problem. There is little need for an extension program to disseminate technology unless

something is first done to develop a technology generation capacity. Furthermore, it is recognized that in addition to the MOA, many other organizations, including the commodity boards and associations, the Jamaican Society of Agriculture, and commercial organizations have extension programs which could be made much more effective if they were served by adequate research programs generating the technology to meet the needs of various aspects of the nation's agriculture.

The circumstances described herein underscore the need to have a strong, continuing capability within Jamaica to develop the indigenous technology needed to improve the productivity and profitability of agriculture and to make its products more competitive in export markets. We believe this need can best be met through a public sector research organization either in the Ministry of Agriculture or as a statutory, semi autonomous body with close ties to the Ministry of Agriculture. Unless some of the current problems limiting the effectiveness of MOA agencies can be resolved, we believe the second alternative would be preferable.

Such an organization could complement the research efforts currently underway through the commodity organizations having a research capability. In time, however, if this new research entity develops into the effective organization which it should be, there may well be advantages in having it serve the needs of the total agricultural sector.

We fully recognize that there are major problems with Jamaican agricultural institutions that go far beyond issues of technology generation and dissemination. However, in view of the serious manner in which inadequate, indigenous technology is limiting the development of a viable, productive and efficient agricultural sector and given the need for USAID to prioritize its development assistance efforts, we believe that USAID should give priority attention to assisting in the development of a strong, public sector program to improve the development and dissemination of relevant, indigenous agricultural technology.

Our examination of the Ministry of Agriculture in areas other than research and extension leads us to conclude that two categories of institutions seem to be performing relatively well -- those dealing with natural resources and those concerned with quality control of export commodities. In addition, progress is being made in plant quarantine. Some important differences exist among these groups, however. The natural resource institutions are dealing with sophisticated information and processes. They make use of relatively high technology and consequently, rely on some highly trained personnel. Quality control and quarantine do not, apparently, require the same level of sophistication in personnel.

Institutions gathering and analyzing production information and dealing with policy analysis continue to function but under serious handicaps.

Some of the institutions under great stress and risk are still producing service of value to other entities both public and private. This is not necessarily, however, a measure of institutional strength. Rather it is a function of the dedication of a few individuals who literally by their own sacrifice are keeping things going. It cannot be expected that such dedication will persist indefinitely.

The net effect is that Jamaican agriculture is not being supported adequately by its institutions, except in a few cases, and in those cases the assurance of continued adequate support is not strong.

The most visible factor limiting their effectiveness is the low salary level for key personnel. That factor, however, can mask and overshadow some factors dealing with management, such as the tendency to try to do too much and the lack of overall mission and specific shorter term objectives and goals.

Creation of statutory bodies in an effort to compensate for low institutional performance often does not address the non-salary management problems but does contribute to a different set of problems, including dispersal of personnel and financial resources and confusion over institutional roles.

The salary issue is serious, in some cases more serious even than may be readily apparent. It actually threatens important resources that have been developed over time. No matter what the design of any one project is, its success is dependent upon certain institutional services in the sector. Furthermore, there is no evidence from experience that Jamaica can hope to build and sustain a prosperous agriculture without a means to provide adequate compensation to a certain level of technical expertise. Creation of new agencies to get around its own impeding rules is in many ways a losing game. It spreads scarce personnel over more program areas. It weakens old line agencies that still must provide some essential services. In some cases it threatens the destruction of institutional resources built over time with substantial investment.

The institutional problem is serious enough to warrant a comprehensive effort. Anything less will leave important institutions, necessary for a modern agriculture, at serious risk. Even the effectiveness of institutions whose problems might be addressed and resolved by a donor project will be limited by the general institutional weakness.

3.2 Recommendations

We recommend that consideration be given to the implementation of one or both of the following proposed projects. One is specific, the other is more general. We believe that both might be implemented without the expenditure of large additional amounts of resources -- either donor or GOJ. Yet both offer promise of improving the performance of key public sector institutions that serve agriculture.

The first might be identified as an agricultural research and development project. It would address one of the most serious

problems limiting the productivity of Jamaican agriculture -- the lack of relevant indigenous technology. The second project would be related to some of the administrative reform efforts already underway within the government -- but would go further in providing greater flexibility in using available resources to carry out assigned responsibilities. This might be referred to as "MOA management reform."

Following is a brief discussion of each proposal:

3.2.1 Agricultural Research and Development

Serious consideration is now being given within the Ministry of Agriculture to the development of the National Agricultural Research and Development Institute of Jamaica (NARDIJ). We believe that such an organization would offer substantial potential for improving the technology generation and dissemination efforts in Jamaica and could thus greatly enhance further agricultural productivity.

A project to support NARDIJ would not be limited primarily to research but would also address the "development" function. The development function can be thought of as going two steps beyond research, as "research" is often defined. One step would be to test technology in the production systems in which it is expected to serve. This would enable the researchers to produce a "farmer-ready" technology. The second step would be to deliver the "farmer-ready" technology to the MOA Extension Service and other entities having agricultural extension functions.

Through these two added "development" steps, NARDIJ could have a direct and significant impact on other institutions dealing in agricultural technology and would provide what, currently, is a serious missing link within the country in terms of technology dissemination.

3.2.1.1 Purpose

Purpose of the project would be "to support the development of an agricultural technology institution with the capability to provide leadership to the entire agricultural research and extension system of Jamaica." In the short run it cannot be expected that NARDIJ would be directly responsible for all agricultural research. However, in the longer run (a decade or so), the possibility of consolidating all agricultural research in the Institute should be recognized. In the interim, NARDIJ should be expected to provide gradually increasing leadership to research and extension-type effort throughout the country.

3.2.1.2 Outputs

Outputs of the project need, initially, to be thought of in terms of institutional characteristics, i.e., impact of the project on the institution. The impact of the institution on the nation's agriculture must be reflected in the institutional characteristics initially but ultimately upon the development of a more productive and efficient

agriculture within the country. Some of the institutional characteristics that need to be achieved are the following:

- (1) The institution needs to develop and articulate a clear statement of mission that addresses performance of the agricultural sector and welfare of producers. In other words, there needs to be a client-oriented mission. This mission statement needs to be reflected in the attitude of its personnel, and it needs to be made known to other institutions serving the sector.
- (2) The general statement of mission needs to be supported by (a) a systematic planning procedure; (b) a reporting program; and (c) a monitoring, evaluation system.
- (3) The institution needs to be of a size that is appropriate to the size of the economy that supports it and the sector of the economy it serves. In the Jamaican economy, this indicates a relatively modest-sized institution with a modest program that can be done well and is carefully designed to make an important difference in agricultural production.
- (4) The modest size of the institution needs to be reflected in its organization and program.
 - (a) It must rely heavily on international sources for much of its science and technology. This needs to be reflected in a pro-active program for systematically developing and maintaining linkages that will facilitate tapping these international sources.
 - (b) The institution's own research and development program will be concentrated in testing (much of it on farms), adapting, integrating, and disseminating technology. Without this program and capability, it cannot take full advantage of the international resources.
 - (c) It must have a thorough institutional knowledge and understanding of the nation's agriculture. Without this knowledge and understanding, it will not be able to know what it needs from the international sources of technology and science.
5. The institution needs to develop strong linkages with the Ministry of Agriculture's Extension Service and with all entities providing extension-type services to farmers. This will require personnel with specific position descriptions, program of work and budget support.
6. The technical personnel complement, both quantitatively and qualitatively, needs to be appropriate to the institution's size, mission, program and style of operation.

3.2.1.3 Inputs

The project needs to place a heavy emphasis on capacity-building in contrast to physical plant and equipment. The capacity-building needs to be in the areas of both technology and management. Project support is needed in the form of both training and technical assistance. Technical assistance and technology will likely have to come primarily from expatriates, but much of the management assistance may be available in Jamaica. Some training possibilities are available in Jamaica itself and others are available in the Caribbean region. Much of the technology training, however, would best be carried out in the United States or other developed countries. It is not clear from this perspective what will be the need for technical assistance from in-residence expatriates. It is almost certain some technical assistance of this type will be needed. Much of it can be provided by recurring consultancies, assistance that costs much less than in-residence assistance, broadens the source of assistance and often is just as effective.

In planning for technical assistance, it will be important to keep the criterion of modest size of institution and program in mind.

Although the NARDIJ would be the focus of the project, the project would provide for training and other support to the institutions directly involved in the NARDIJ program and important to its success.

There is also the potential for active collaboration with some of the International Agricultural Research Centers as efforts are made to build/strengthen various components of a total research program. In other countries such collaboration has been proven to be quite effective under contractual agreements with the international centers.

3.2.1.4 Project Related Activities

We would underscore the potential which the USAID funded grant project being administered by the Jamaican Agricultural Development Foundation might have for complementing and supporting the proposed agricultural research and development project. Resources of the grant program might be used initially in helping to identify major research needs in each commodity area, with such information being used in formulating the initial programs of a NARDIJ-type organization. Such resources might also be used to fund research projects carried out by some of the relevant International Agricultural Research Centers. Such projects might help the NARDIJ launch its own in-house research programs by providing assistance and direction to its start-up efforts in various areas of research activity.

Indeed the JADF project might be helpful in implementing the development of this current proposal. The Foundation and its USAID grant resources might provide the mechanism for bringing together appropriate parties and facilitating the planning and implementation of a program for the proposed national agricultural research and development institute. We believe it is indeed fortunate that the potential exists for utilizing such funds in the short term to initiate action such as

that proposed herein to greatly strengthen the agricultural research capacity with the country.

3.2.2 Management Reform

One of the most urgent problems within the Ministry of Agriculture is that of salaries for key personnel. Salary structure in the Ministry is similar to that in other government agencies. Government salaries generally are low in response to the need to curtail expenses; the so-called austerity program within government has tended to further exacerbate a long-standing problem in this area. The problem is not so much a question of total resources committed to salary, however, as it is one of salary structure. For this reason, solving the problem may not involve much, if any, additional costs.

The real problem is lack of a salary structure that allows government to be competitive for key management and technical personnel. The creation of statutory bodies and the opportunity to pay personnel therein salaries considerably in excess of those for personnel under civil service has contributed to major difficulties in keeping key personnel within the Ministry of Agriculture and other government agencies. At the same time, there may not be a sufficient differentiation between salaries for key management and technical personnel and others performing more routine tasks. Technology is now available that makes it possible for rather sophisticated tasks and operations to be executed by personnel with relatively low levels of training. It has long been possible to develop routine procedures for certain repetitive tasks so that personnel with a low level of training can perform them well. There appears to be an adequate number of personnel who can be trained at relatively low cost and who are willing to work for prevailing salaries in many of the jobs within the government.

In order to make the system work, however -- in order to develop, maintain and supervise the routine operations -- a few personnel, highly qualified both by training and experience, are needed. The government agencies are currently not permitted to compensate these few people at a competitive level. It is the compensation levels of a relatively few persons that is the problem much more than the general level. Another aspect of the problem is that the higher paid positions are associated only with administrative or management responsibility. The salary structure does not recognize the importance of technical competence in modern day, scientific agriculture and public administration.

We recommend that an additional dimension be added to the overall administrative reform efforts within the Jamaican government to include management reforms that would permit greater flexibility, consistent with economy and efficiency, within government agencies in using budgetary resources.

The organizing concept is this. Give Ministry management the authority or responsibility: (a) to identify "key personnel" in the Ministry; and (b) to compensate them at competitive levels, provided

that management will effect the economies in the Ministry that will at least offset the extra cost in salaries.

This type of flexibility in achieving management reform could be enriched by the addition of certain management concepts that would specify program goals and objectives more clearly and measure achievements and progress towards those goals.

If there is concern about applying such a concept government-wide, the Ministry of Agriculture might be used as a testing area for this concept, given the importance of the Ministry's programs, the problems currently encountered within the Ministry, and the interest in the agricultural sector by a major donor.

Two factors lend support to this concept. One is the IBRD-IMF insistence on administrative reform and the actions that Jamaica has already taken under its administrative reform program. The second factor is that these management reforms might be instituted at little or no additional cost to the government.

3.2.2.1 Purpose

The purpose of the project would be to assist the Government of Jamaica to improve the management of the Ministry of Agriculture in such a manner that general institutional performance could be maintained and strengthened at little or no additional cost to the Treasury.

3.2.2.2 Outputs

Following are indications of some of the outputs to be expected:

- (1) A management audit that would: (a) identify a limited number of critical positions in the Ministry; (b) establish criteria for the personnel needed to staff these positions; (c) identify lower priority program activities, ranging from components of programs to entire entities (that could be terminated or reduced substantially with little harm to the Ministry or the agricultural sector which it serves).
- (2) A revised salary structure that would allow the Ministry to be competitive in compensation of critical personnel.
- (3) Termination of low priority activities.
- (4) A management system for programs remaining in the Ministry that would emphasize program objectives and monitoring and evaluation of activities in achieving these objectives.

3.2.2.3 Inputs

Inputs for this component would be largely in the form of technical assistance. It is difficult from this perspective to be more specific in terms of the type and amount of expertise needed -- except as might

be inferred from the outputs. Much of the expertise is likely to be available in-country. Some training of Ministry personnel is also needed. Some of this may be needed before the management audit. In matters of this nature, the Ministry needs to have enough expertise of its own to participate fully in the exercise and not depend too heavily on consultants. There may be other training needs identified. Much management training can be obtained in short courses and workshops.

JAMAICA
AGRICULTURAL SECTOR INSTITUTIONS

Annex 1. Description of Selected Institutional Services

In this section are descriptions of some of the organizations, their services and programs and other institutional arrangements of the Jamaican public or quasi-public sector. It is not a description of all such arrangements. These were selected as those most relevant to the scope of work of this assignment.

Research is emphasized because of the generally low productivity of Jamaican agriculture and the apparent frustration in trying to deal with it. The commodity boards, in many ways, are doing MOA's work, including some research. When dealing with agricultural institutions, research has to be one of the key items.

A. Research Historical Note

This section is a summary of the description of the Jamaica research establishment by Jerome Maner and Kenneth Ratchie of Winrock International in 1985, plus some material clearly marked from a 1979 report by the University of Kentucky. The Maner-Ratchie report was done in preparation for the Mission/JADF research project. It is included because they were able to take a closer look at research than this exercise can.

1. Ministry of Agriculture

MOA research is centered on four research stations "with little if any linkage with extension or with farmer problems...tests and trials on farmers fields are lacking except in one or two rare instances."

At the Bodles Station, MOA's main research station, Maner and Ratchie reported livestock work on dairy cattle breeding and husbandry, nutrition, breeding and husbandry of goats, and pasture. They report that much of the research is "observational" with little data generation.

"There was very little annual crops research underway in early December, 1985. They reported a minimum tillage project, a cassava variety trial with CIAT, and the yam research in collaboration with IITA. There was a small banana breeding project supported by IDRC. They referred to work in plant protection but gave neither a description nor an evaluation of it.

At the Grove Place Station, they reported beef cattle breeding work under the direction of the station director, a JSA graduate with some training in nutrition at Cornell. They also reported a pasture program. They said this was the best livestock work on the island,

"however, for accurate research data to be collected, much refinement in experimental design and technique is required." No crops research was reported at this station.

On the Monpelier Station, which was established in 1981 and received IDB support for office and dairy facilities, "initial activities or planned programs have been significantly curtailed because of lack of funds." Most effort goes into maintaining a herd of 250 mixed dairy cattle. Some comparisons between different crosses were supposedly planned, "but there was little indication of a systematic crossing program or any real test of the milk producing potential of any of the crosses." An excellent milking parlor, provided by IDB could not be used because electricity had not been installed.

In summary, the livestock program is an attempt at commercial milk production. Little if any data are being obtained. "The small amount of milk produced in no way justifies the operation of the station." The potential is good, they say, with just a bit more budget and research attention. They also report that there are three stations with livestock research, and question if that much is needed.

The modest crops research program initiated early in the station's history have largely been abandoned. Some cocoa work was being carried out.

The Orange River Station is the national station for tree crops and is to serve for the introduction and testing of improved varieties with emphasis on tree crops, including cocoa, pimento, coffee, lychee, coconut, and citrus. It also is to do research in propagation techniques, fertilizer experiments, and agronomy.

The station was at the time the principal cocoa research station. Because of the MOA budget situation, the Cocoa Industry Board has helped with finances. (This station has since been turned over to the Cocoa Industry Board.)

No banana work was being done, with the termination of BANCO. Pimento research is searching for rust resistance. A cassava program to propagate new varieties from CIAT is underway here. The Livestock program is mostly a development program run by station personnel "with no trained livestock specialist on the station."

2. Other Research

CARDI, based at the University of West Indies/Mona had five professional staff in late 1985--two M.S. entomologists, one M.S. agronomist, one B.S. agricultural engineer, and one B.S. biometrician.

IICA in 1985 was working on hillside agriculture, including soil conservation, tree crop production, cassava variety testing, and farming systems research. IICA was also working in potato seed improvement, yams, tomatoes, cabbage, ginger, passion fruit, cucumbers, cowpeas, and corn.

The Scientific Research Council was funding yam research. Pioneer Hi-Bred International was working on sorghum. A division of the Ministry of Industry was researching rodent control and storage loss prevention and evaluating pesticides. Alcan Jamaica was doing crops and pasture studies as part of its land restoration program.

In 1985, AID grants to the 1890 Land-Grant Colleges provided for collaborative research with UWI/Mona, and another AID grant to the University of Florida supported research on lethal yellowing disease. An AID grant to INTSOY supported collaboration with Jamaica Soya Products Industries, Ltd., MOA, and others. IDRC was funding the IICA farming systems work in MOA, and the Dutch Government was assisting with rice research.

3. Statutory Body Research

a. Banana Board, was formerly BANCO and had a research program, but according to Maner and Ratchie, research funds came from MOA. BANCO is out of business, and its successor did no research in 1985.

b. Sugar Industry Research Institute is most independent of the statutory boards. It has laboratory facilities at Mandville, out of the sugar zone to facilitate quarantine of imported materials. It has no land and does its research on sugar plantations. In 1985, it had at least one university trained researcher working on each of the problems of variety improvement, soils and plant nutrition, plant protection, cultural practices, irrigation, plant physiology, harvesting, and economics.

c. Coconut Industry Board derives income from a cess collected by the purchasing agency and receives some funds from MOA. In 1985, variety improvement and soil fertility management were major research activities, besides the work on lethal yellowing. MOA land at Orange River station is used.

d. Coffee Industry Board limited its research in 1985 to validating technology imported from Costa Rica, Brazil, and other countries.

e. Cocoa Industry Board did no research in 1985.

The following information was taken from the University of Kentucky report of 1979 and reported 1978 data.

Table 2. Major Organization Units Engaged in Agricultural Research and Research Personnel by Level of Training, 1979

Organization	PhD	MS	BS	LMS	Total -
Banana Board	3	1	7	16	27
CARDI		2	5	7	14
Coconut Board		2	2	13	17
Sugar Research Institute	1	4	2	21	31
Scientific Research Council	2	6	7	12	27
Tobacco...Authority			1	1	2
Ministry of Agriculture	(2)	(15.5)	(21.5)	(24.5)	(63.5)
Crops		1	9		10
Soils		0.5	0.5	0.5	1.5
Forestry		1	2	6	9
Livestock	2	2	5	5	14
Plant Protection		11	5	13	29
TOTAL	8	30.5	48.5	94.5	181.5

Note: Table may overstate personnel dedicated to research since some work at service and extension.

The Banana Board depended on the MOA for research funds and land, and even for administrative costs. Little research other than chemical trials and variety testing was done in coffee. Then, as now, the Sugar Research Institute was the most independent. The Cocoa Board did no research but depended on the MOA.

B. Commodity Groups, 1987

1. The Coconut Industry Board (CoIB)

The Coconut Industry Board is a combined government organization and a growers association. Four board members are appointed by the Minister of Agriculture, and five are elected by the coconut producers. The association has about 10,000 members, but not all are producing. Some entered in the planting program, and their trees are not yet in production. The Board has a tradition of avoiding politics, and as a result maintains an impressive stability. In some cases chairmen have served through several administrations and ministers,

even though the chairman must be one of those appointed by the Minister.

The Board reports problems to the government; it makes a special point of proposing alternative solutions along with the problems. This helps get prompt response.

The Board is financed by a cess on sales of coconut products (largely on the domestic market), by its share of profits from coconut factories (of which it owns 40 percent), by interest and dividends, exports of plant material, and a tax on imported coconut products. It apparently pays its own way.

The Board claims to be self-sufficient in research. It has a director (MS), an agronomist (BS), and a botanist (BS). It has five associate degree holders from JSA in the research department, but two work in extension. Finally, it has four lab assistants. Some are associate degree holders from CAST, but others are high school graduates. It also has five field stations, and also uses MOA land as well as farmer land. Salaries of the scientists range from J\$42,000 to J\$69,000.

The MOA has done considerable research on coconut, but a research project seems never to get finished, and reports are not written. Thus it is not dependable, and the coconut industry has no assurance that any product will come out.

In addition to two researchers assigned to extension, six planting officers spend much of their time on extension type work. These officers deliver seedlings, fertilizer, pesticides, free to farmers in an effort to increase the nation's coconut production. They also make grants for weed control work. This subsidy is needed because of the long waiting period for the trees to come into production. The Board is producing hybrid seedlings on 135 acres.

The Board is proud of the skilled field workers it has trained to perform many routine research functions, such as hybridization, fruit counts, and the like, which are needed for research.

Funds have been approved by the Board in the 1988 budget to add a pathologist to the staff and pathology laboratory assistants. The Board at present relies on the UWI for its pathology work, through grants to the university. One Ph.D. candidate now is doing research on such a grant. The botanist is responsible for breeding and has produced the MayPan hybrid, using one parent from Panama and another from Malaysia. FAO, several years ago, helped import a wide range of genetic material from which they are still working.

The Board does some collaborative research with other commodity boards dealing with tree crops that can be inter-cropped with coconut, such as banana, cocoa, and coffee. Its collaboration with MOA is limited to use of land.

2. Sugar Industry Research Institute (SIRI)

SIRI is the most independent commodity technology operation and has the most comprehensive program. Created in the early 1950s as the R and D arm of sugar factories, it added production research about 1970. There are about 17,000 sugar producers in Jamaica, but 100 large farms plus up to a dozen estates produce 90% of the sugar.

SIRI staff consists of 17 researchers at the university level, plus some JSA/COA graduates. Its extension service has a director, plus six persons with the B.S. or higher degree, plus nine JSA/COA graduates.

Researcher salaries can go as high as J\$95,000. Extension workers with a university degree can go as high as J\$38,000, plus a vehicle that can be used for personal affairs. JSA/COA graduates can get to J\$38,000, plus vehicle. It is not clear to what extent MPS controls SIRI salaries, but SIRI does have to report salary levels. It encountered some salary problems in the early 1980s and lost some staff. It is now in the process of rebuilding.

Variety improvement is one of SIRI's major programs. In this program it works with the other English speaking countries of the West Indies. Headquarters of the program are The West Indies Sugar Cane Breeding Station in Barbados. Much of the plant protection work is done through genetics. It is also looking for saline tolerant varieties. It expects a good new variety every twelve years or so and several other new varieties between the good ones. It imports plant material and exports varieties.

The sugar industry has little problem with disease. It is very careful in importing plant material, requiring the exporter to go through a detailed sanitation, quarantine process. Then it brings the material through a station in the UK. Finally, it has its own quarantine facilities through which imported material must go before the material reaches the field. SIRI does not have a pathologist, but uses consultants when needed.

Agricultural engineering is an important program. It has two interests, one being machinery, which is the major cost of cane production. The other is irrigation and drainage. About 40% of the cane is grown on irrigated land, and drainage seems to be a major problem on some lands with a high water table.

The soils program includes a laboratory that appears to be well run. SIRI does soil testing for non-sugar interests and has a program of comparative testing with other labs to be sure its tests are accurate. It guarantees a report within 20 days and charges less than other soil testing services. The soils program deals also with fertilizer, trace elements, local limestone, and saline soils.

Other programs include entomology (which has developed a biological control for stalk borer) economics, and diversification. SIRI also has laboratory and computer facilities.

SIRI reported one frustrating experience in diversification, involving Agro-21. SIRI was interested in sunflower as a means of producing edible oil in the self-sufficiency program. It did considerable research and field testing on sunflower with what it considered excellent results. The sunflower proposal was not accepted.

The extension program includes four regional field days, 16 seminars, and 50 field demonstrations, dealing with harvest control and efficiency, ratoon management, tillage practices, weed control, land and water management, varieties, and crop nutrition control practices.

SIRI has an information program including a library, reports and publications (contracted out), and audio-visual aids. A sugar museum is being planned. The program of the SIRI is presented effectively in a 14-page xerox format.

SIRI claims that deterioration in production equipment and lack of capital, combined with deteriorating management, is responsible for Jamaica's sugar productivity problems. The sugar industry has a productivity goal of 3.25 tons of sugar per acre by 1991. Production was about 2 tons per acre in 1984 and is estimated to be about 2.36 in 1987.

3. Cocoa Industry Board (CaIB)

The CaIB is made up of seven members, three, including the chairman, are appointed by the Minister of Agriculture. An MOA officer is on the board. The other four are nominated (virtually elected) by the Cocoa Growers Federation, a federation of 14 cocoa cooperatives. The cooperatives are organized into 320 groups, which are important in marketing and extension. There are about 24,000 growers, producing some 30,000 acres of cocoa. The Board itself has several farms producing about 2,000 acres.

The Board operates as a company. It buys cocoa. The groups assemble it, giving each farmer a receipt. The CaIB picks it up, pays the group, which, in turn, pays the farmer. The CaIB pays within seven days of pickup. It then processes and markets the cocoa. It has four fermenting plants, but everything is finally assembled in Kingston for marketing. Main export market is Europe. None goes to the United States.

The CaIB claims to operate in very close collaboration with the MOA in setting prices, and margins, and in other efforts. The Board does nothing without MOA approval, although it receives no funding from MOA. All its revenue comes from commercial operations.

Until a few years ago, the MOA, was responsible for research and extension, but then informed the CaIB that it would have to take over the two functions. It had been doing an inadequate job. The Board

now has six extension officers, all JSA/COA graduates and a research staff of three. A Ph.D. heads both activities and is not included in the count.

Extension agents are paid about J\$25,000, plus vehicle, and a small field stipend. They work through the 320 groups and do much of their work in group meetings. Cocoa producers are said to have a "group" tradition. The CalB has trouble with operating funds. Its funding has to come from the growers through margins, and MOA keeps pressure on to return as much to the grower as possible. It has trouble keeping its vehicles running. It welcomes collaboration with donors and other sources of funds.

Research workers--one each of Ph.D., M.S., and B.S.--receive a starting salary of J\$30,000 and can go to J\$60,000. They get a vehicle, but no other allowance. The head of the Research-Extension operation is a Ph.D. The research group has "taken over" the Orange Grove Station of the MOA, but under what type of arrangement we do not know.

Cocoa has never had adequate research support. For years the Board held that research was not its responsibility. But it finally decided that if the industry was going to solve the productivity problem it would have to deal with the research problem. MOA research lacked continuity. Personnel have lacked stability in the MOA for a long time, and as new researchers came in they started their own line of work, which stopped when they did. One of the research group's first jobs is to find out what research has been done. They have found one research project on an important disease, interrupted in 1968, that they are trying to pick up.

One MOA management problem, as the CalB explains it, is the way it makes cuts when the government decides that cuts have to be made. Research managers don't participate enough in these decisions, leaving them to the accountants who simply are not in position to make good decisions regarding research. The implication is that research managers default on their responsibility rather than that they are overridden by accountants.

4. Citrus Growers Association (CGA)

The CGA is a producers association which acts as a commodity board. It deals mostly in oranges and owns two juice factories. Large scale growers can apply for approval to export directly, but CGA does most of the exporting and is responsible for overseeing the private exporters. CGA is financed on a cess collected from the sale of fruit, either to the factory or on the export market. Domestic sales do not pay the cess.

It is estimated that there are some 10,000 growers producing 13,000 acres. Some growers produce as many as 1,000 acres. The association has 50 branches which answer to four regional councils, which form the association. CGA produces some grapefruit and some "ortanique" which is considered a luxury fruit. Some say the

ortanique is a cross between orange and tangerine. Others say it is a mutation that was discovered.

CGA has a development program that aims to reach 16,000 acres in five years. There are some large investors, but CGA has very little contact with either Agro-21 or JADF. There was a production decline of oranges starting in the mid-1960s. Production started increasing in the mid-1970s. Brazil is the greatest competitor, but CGA expects the U.S. to be its growth market, and with the CBI trade concessions, CGA can compete with Brazil. The implication is that without this protection it could not compete.

CGA has four extension workers of its own and two seconded from the MOA as part of a World Bank financed rehabilitation program. That program also provides loan funds which the growers have not used, for reasons not identified. CGA extension agents are located in the most important producing areas and are responsible for technical matters, branch organization, and grower relations.

CGA sponsors a nursery and monitors private nurseries. It wants to start a nursery certification program, but needs a virologist. There is money in the FAO/WB export crops project, for the virologist, but so far none has been identified. The project also is to work on beetle control and root stock trials.

CGA depends on MOA for research, but gets very little. There is no continuity in MOA research, CGA claims. They seem to do some work, but nothing ever comes to conclusion. MOA has an entomologist working on the fiddler beetle, but CGA knows nothing of the results.

CGA, apparently, has no systematic program to monitor the world's citrus technology, although its people do international travel. They are using old varieties imported in the 1920s from California.

Technical work by field staff consists of work with fertilizers, pruning, and maintenance. They do not recognize any particular technological problems. It is interesting, however, that Jamaica cannot compete with Brazil except through market protection.

5. Jamaica Banana Producers Association, LTD (JBPA)

The banana industry is trying to resurrect itself. At one time Jamaica exported some 120,000 tons of bananas. That figure fell to 11,000. The industry was in deep trouble when hit by a hurricane about 1980. BANCO, a general purpose organization, has been terminated and replaced by BECO, which is solely an exporting company. The Banana Board, now largely a technical organization, has reestablished a research program with two full-time researchers headed by a banana breeder. The All Island Banana Growers Association, formerly did extension work. It is now largely in the input supply business. The banana research program is located on the MOA Bodles station.

The JBPA is a commercial operation in the shipping and fruit marketing business. It owned ships at one time and is getting back

into ship owning. In the meantime it contracts shipping space. It owns the Jamaica Products Marketing Company in England, which markets bananas and other fruits. It has just opened the Jamaica Products Marketing Company in New York. It also owns outright one farm which produces a variety of fruit and vegetable products and beef and has part ownership in three banana producing properties.

It has little contact with the MOA, but has had some dealings in trying to get soil tests and leaf analysis. MOA was so slow, JBPA now deals with the Jamaica Bauxite Institute for laboratory work. It has received help from Agro-21, in a livestock ration, using banana.

6. Coffee Industry Board (CIB)
Coffee Industry Development Company (CIDCO)

CIDCO is a production organization and is a subsidiary of CIB which is a marketing group. CIDCO is financed by a cess on coffee sales and returns from its own farms. Some program activities are financed by grants in connection with projects. CIB buys coffee, processes, and sells it. It is allowed a margin which finances its operations. CIDCO was separated from CIB as a condition of one of the World Bank's structural adjustment loans.

CIDCO is a complete producer support organization. It employs an extension staff of over 100. It provides inputs, including delivery, and it also has a credit program. Inputs are paid by the farmer. CIB withholds the charges from the farmer's proceeds. This is a type of merchant credit.

CIDCO has four programs -- extension, disease control, seedlings, and development. The first three are financed by a cess on coffee sales. Development is the planting of new crops, and this is not charged to current production. It is financed out of CIDCO farm earnings and grants associated with donor loan projects.

Research is mostly done by contract. MOA is supposed to do coffee research, but none is done. CIDCO has a research staff of two who do some field trials and short-term testing type research on varieties and fertilizers. They also manage the contract research, with CARDI and UWI. Contract research is mostly on plant protection. The coffee berry borer is fairly well under control. They feel they can live with it. They are doing some research on rust. JADF has made CIDCO a grant for borer and rust control. CIDCO maintains contact with CATIE and other coffee research centers.

Of CIDCO's 100 extension agents, some 20 are university graduates, and some 25 are JSA/COA graduates. The rest are field assistants. CIDCO doesn't talk of salary scales, and claims that a JSA graduate can make as high a salary as a B.S. degree holder if performance warrants it. Its top personnel are in the J\$75,000 range. Both MOA Research and Extension complain of losing personnel to CIDCO.

The CIB is monitored fairly closely by MOA. MOA must approve its margins, thereby influencing how much the producer receives. MO

has a goal of returning 75% of coffee proceeds to the farmer. Currently, he gets about 64%.

Coffee productivity is not high. CIDCO does not recommend nearly as high plant density as most countries do. It maintains that in order to maintain its premium quality, plant density is only about 40% of the ideal density recommended in most countries. Variety used is Typica Arabica, an old variety. It is not replanted. An old tree is severely pruned, and it comes out new, almost ratooning. Some new varieties do not give them the quality they want. Japan buys 90% of Jamaica's coffee and finances expansion in plantings.

C. General Producer Organizations

1. Jamaica Agricultural Society (JAS)

The JAS is 92 years old. For the first half of its life it was the only agricultural organization in Jamaica, but now there are many, including the Livestock Association and growers associations of the traditional export crops. At one time, it apparently was the real leader of agriculture in Jamaica. It still claims to be the advocate for agriculture, but complains that government policies change with each administration, as though agriculture does not have any significant political power.

At one time it was responsible for most of the public services to agriculture and reportedly was the initiator of extension. It is also said to have been an important force in the organizing of commodity groups.

It still has what it calls extension agents. It now has 22, down from 52. These are funded, along with some other personnel and activities by grants from the MOA. To this extent it is part of the public sector. Its clientele is that group of producers who are not represented by other organizations of various kinds.

JAS is in the farm supply business, and implements some projects for MOA such as agricultural fairs. Some of these earn income for the association.

The major farm problem JAS is sensitive to is the market. It reports that there is simply not enough confidence in the domestic market to elicit reasonable production from the small farmer. It claims the old Agricultural Marketing Corporation (AMC) was effective in building that confidence. JAS itself does not have either the confidence or the capital to take any market risk. It apparently has been assigned some responsibility for the assembly of pimento for the export market. There is a guaranteed demand for the product.

JAS expressed no concern for the low productivity problem, except to say it was a market problem. It recognized the trouble MOA Research was having, but did not list the lack of technology as a significant problem. The two problems it is most concerned with are lack of

stability in government policies and programs and the lack of a secure market for food crops.

D. Ministry of Agriculture

The Ministry withstood the redundancy exercises fairly well, since it could use discretion in deciding the "redundant" staff. The exercise may even have been helpful in reducing size of operations. MOA was relieved of some responsibilities that should not have been there in the first place. Incidentally, there are almost sure to be some marginal operations remaining that could be sacrificed in favor of keeping critical operations at a reasonable level.

In connection with that exercise, some statutory bodies were formed with the right to pay substantially higher salaries than the MOA could, and the loss of high quality personnel has been a shock. Most agricultural talent was in the MOA, and the pool was not large to begin with. The new agencies also have stimulated other activities that added to the competition. The MOA claims that so far it has been able to maintain some of its essential services, and that it has tried to adjust to policy directions. The future is not bright, however, and words such as "fatal" are used to describe the current salary situation. MOA recognizes some concessions that may be possible from MPS, but they are difficult to extract, small, and often temporary.

Salary level is the overwhelming and obvious problem. A division head makes about \$40,000, and the highest a technical person can get is about J\$38,000. It is not unusual for top personnel to double their salaries upon leaving MOA, with chances of further increases. That is within Jamaica. Many Jamaican professionals are known in international circles and have opportunities there as well.

The National Investment Bank of Jamaica (NIBJ) can contract personnel and place them in MOA, but NIBJ insists on payment before services are rendered, and it is reported that MOA finances are such that it cannot take advantage of this situation.

Ironically, when persons leave MOA for a better position, they often have to come back to MOA for support services, data, and even expertise. As one person says: "They do not have much agricultural data and information in those glass houses." Three unit heads have reported the same story--of statutory agencies calling on MOA for help and then publishing or using the data in such a way that they, not MOA, get credit for it. Some endure it and keep working. Others refuse cooperation.

The MOA has little confidence in the Administrative Reform Program, which is supposed to raise salaries, encourage training, and develop improved management procedures. MOA has done some management innovation itself, apparently predating ARP. It has created five "senior director" posts. These persons are division directors, but other division directors answer to them rather than to the Permanent Secretary. This was needed because of MOA's size and scope of operation.

It is difficult to evaluate the budget treatment the MOA has received. The FAO/WB study reports that from 1983-84 to 1985-86 the MOA recurrent budget moved from J\$57,515,000 to J\$58,847,000. In constant dollars that amounted to a 16% reduction one year and a 23% reduction the next. During the same period the national capital budget fell from J\$29 million to J\$10 million, a constant dollar fall of 75%. Offsetting this was the reduction in personnel the divestment of some money-losing services, and the shifting of some expenses to the commodity boards.

The 1987 USAID Agricultural Strategy Paper reports a total MOA budget of J\$82 million for 1987-88. How much will be received is not known. That includes J\$7.9 million for the Science, Technology, and Research Department.

The following reports of MOA entities aim to be descriptive. Impressions may be stated or implied, but this exercise neither provides opportunity nor assigns responsibility to evaluate.

1. Agricultural Research

In September, 1987, MOA had 112 technical posts authorized in Research and Development. Of these, 72 were filled. They range from laboratory technician to director. In addition, seven "temporary" posts were filled. These salaries were reported:

Director	J\$38,940
Deputy Director	27,400
Chief Plant Protection Officer	27,747
Director, Livestock Research	26,403
Director, Crop Research	26,403
Director, Plant Protection	26,403
Extension Specialist	23,800
Livestock Research Officer	24,980
Livestock Development Officer	21,500
Agricultural Economist	21,860
Livestock Research Assistant	15,500
Crops Research Assistant	16,500

The salary situation will not get much better, according to a report available at Bodles. Next year's scale for research officers (university graduates) is from J\$17,500 to J\$28,500, and the year after will be from J\$20,000 to J\$30,760. The high end of the range is increased about 25% by allowances, but in salary comparisons, competitors are increased also, some even more.

If our interpretation of the personnel tables is correct, MOA has ten university level researchers, including the director and deputy director. They are assisted by twelve research assistants. MOA has two job designations that may also do some research. One is the plant protection officer, and the other is the development officer. There is a plant protection department, and some research is done, but also done is a lot of service. Nine plant protection officers are listed, including the Chief. Development officers, who supposedly work with

extension, may do some field testing. Eight livestock development "officers" are listed, no crop development officer.

At the Bodles station, where most university level personnel, are stationed, these figures were reported: Crops Research, five B.S.; Plant Protection, four M.S. and three B.S.; Livestock Improvement and Breeding, two M.S. and three B.S.; Livestock Research, one Ph.D. and three B.S.; Pasture Research, one B.S. Any discrepancy in these reports could be due to classification. Much of the work that is considered research, is only marginally research. Performance and progeny testing of bulls, for example, is hardly research. Plant protection "researchers" spend much of their time in service work, fire fighting they call it.

The University of Kentucky report of 1978 staffing listed gave these figures for University level personnel in MOA research: Crops research, ten; soils research, one; forestry research, three; livestock research, nine; and plant protection, 16. They were assisted by 24 assistants. That report warned, however, that some "researchers" were not doing research. The UKy report did not mention "development officers." Thus, comparison is difficult and not reliable.

In addition to personnel problems, caused largely by salaries, the Bodles station does not consider its operating funds adequate. It cannot provide bus transportation for workers who live in Kingston, where many of the staff worked until several years ago. It cannot keep tractors running. It can, and does, hire custom tractors to do some station work. It also hires a private firm to take care of its security problems, as crops near harvest.

The move to Bodles occurred in the early 1980s after an IDB loan helped develop facilities there. Some facilities are good, but key missing pieces keep some of them from being used. A high water table has caused some problems as has the water quality. They claim they need housing for graduate students, from UWI/Mona.

The Station has more than 1200 acres of land, used for crop research and the Hope herd. It has a facility to maintain that herd as well as a dairy research facility. The post entry quarantine facilities built by the FAR/WB export project is located there. The director complains that there has been deterioration in some facilities. A house is provided for the station director, but he will not live in it because of its condition.

The general attitude in MOA research, from the Department of Science, Technology and Research down through the system, is one of pessimism, maybe extreme pessimism. One exception to this was one respondent who was "extremely optimistic" that NARDIJ was going to be set up.

Almost anyone can raid their staff. At Bodles, the greatest raiders were the commodity boards. MOA will second personnel to the boards, giving the seconded officer both the higher salary of the commodity board and tenure in the MOA system. When asked, MOA research

says it is getting research done, but it is difficult to find out much information on the program.

Between 1978 and 1986, there was no annual report of research. One was done in 1986, but it was mostly description of research projects with a few conclusions but very little data. MOA researchers themselves make no claim of linking with extension. One respondent said that when the Department of Science, Technology and Research was moved into MOA, when the ministry of the same name was terminated, traditional MOA research was distanced significantly from extension. The permanent secretary of that ministry became head of the STR Department in MOA, but acts as a second Permanent Secretary (PS). He answers directly to the Minister and not through the MOA PS.

The STR Department is now attempting to create the National Agricultural Research and Development Institute of Jamaica (NARDIJ), as a statutory body. The department head says that it is simply not possible to continue research in MOA under current arrangements. It is difficult to get a single picture of what is being thought of in NARDIJ. The head of the Department of Science, Technology, and Research is a strong advocate. This implies that it would be concerned with all three divisions of STRD. The head of the R and D division, the one of three divisions of STRD dealing with agricultural research, says that all of the conceptualizing has been focused on agricultural research. His aspiration is that it will become the umbrella agricultural research group of the country that eventually would consolidate all agricultural research. In the interim it would monitor the work of the commodity boards, even if it has no control.

He gave this account of developments in MOA research. Two reports were cited. One by Arthur Lewis, and the other by Eytan Jacobsen. The Lewis report (mid 1970s) concluded that without an R and D element in the MOA, Jamaica agriculture did not have a bright outlook. This resulted in the IDB project (about 1979) which had three components--institutional strengthening (organization and management, no training) facilities, and specific research.

The Jacobsen study was done in 1983 as a management audit requested by the Permanent Secretary who was unhappy with the lack of progress in MOA research. It identified three key problems--the civil service salary structure, the lack of policy and objectives, and no clear assignment of responsibility. It was recommended that research be placed in a statutory body, and a proposal was made that the Sugar Research Institute be given responsibility for agricultural research and be called the National Agricultural Research Institute (NARI). It was in response to that proposal, and perhaps as a defense against it, that the National Agricultural Research and Development Institute (NARDIJ) idea was proposed.

It is interesting to note that there was no annual report of research during the period of the IDB project which had one objective of strengthening the organization and management of agricultural research. And further that at about the end of the project the

Permanent Secretary ordered a management audit because of its lack of performance.

Also interesting is that three commodity boards reported that MOA research could never come out with results. Nothing, they say, ever happened. Several respondents have confirmed the observation of the management audit that MOA research had no policy, no objective, and that it was not responsive to client needs. Finally, it is interesting that other units of MOA report much the same situation. They are not openly critical of MOA research but cannot provide information that would refute the comments.

Regional Support

MOA research is getting support from two regional organizations, which are described below.

Caribbean Agricultural Research and Development Institute (CARDI)

CARDI now has plans for seven staff; two entomologists (one about to be awarded the Ph.D.), an agricultural engineer (for small machinery), a legume agronomist (peanut and cowpea), an animal feeding specialist, a pasture forage specialist, and a biometrician. In addition, CARDI expects to be able to provide short-term consultants in pathology, virology, weed control, and soil and water relationships. CARDI also has some capacity to access various agricultural networks, and it has an internal system for helping its own personnel keep up to date. As new personnel join the Jamaica program, they will be located at the Bodles station of MOA. Currently, they are on the UWI campus.

There is an optimism in the CARDI office that the Institute is winning the confidence of the Caribbean countries who provide its core support.

CARDI has a subcontract with CIDCO (from the JADF grant) to work on coffee disease. It also monitors some of CIDCO's plant protection work and counsels on control measures.

CARDI is linked with extension in its legume and machinery projects and reports good work by MOA extension.

Instituto Interamericano de Cooperacion Agricola

IICA has five persons in Jamaica in 1987, working in program development with MOA research, in farming systems research, and in farm management, which includes data gathering and processing, cost of production, model farm plans. The research program development work is aimed at the selection of research projects, the development of criteria, and prioritizing. It also includes research budgeting and planning and help with preparing proposals. The farming systems research is largely verification-demonstration trials. When asked about constraints the FSR economist listed capital and market and not

technology. There is no relation between the different components of the IICA program. Each operates independently. IDRC of Canada supports the FSR work, and IICA itself supports the other efforts. It provides staff, but has limited operating funds.

2. Agriculture Extension

Extension appears to have suffered badly from the austerity moves. The two redundancy exercises reduced staff from about 400 to about 200 professional and technical personnel, and eliminated almost the entire staff of 400 headmen. A headman is a worker with "practical training" for routine jobs. For some reason, staff has been declining since. Official reports are that the number is down to about 150, and some say fewer. The FAO/WB report says it lost mostly lower level people, but it appears that the cuts have been more serious. The number of specialists, the group that is responsible for technical support to field staff, has been reduced to only four people, even though there is authorization for eight. An FAO study of extension reports that the Learning Center staff has lost at least half its people.

The Training Unit, which includes the Learning Center was developed by help from the USAID Planning Project. Both are still in operation. They are to serve all units of the MOA. They have little or no budget, and units who use their services must pay operations cost. Extension has reduced the number of courses it gives its agents about half and has shortened them. It works the students harder while they are in training.

Extension reports that it makes use of radio and the farm page which comes out in the Saturday Gleaner. It also does publications and posters, through the Learning Resource Center.

Extension operates through the Land Authority, an MOA organization at the parish level. There are thirteen in Jamaica. All elements of MOA works through the Land Authority, but an extension person is the executive agricultural officer of the authority. The Land Authority is governed by a local board.

Extension has reportedly been assigned so many duties that it has no time for technology transfer (even if it had good technology to transfer). That, however, is difficult to verify. At one time, extension was reported to have responsibility for a credit program financed by IFAD, and 100 agents were assigned to it. The director says that now all agents work in the technical aspects of credit, but that none are full time, and none have administrative responsibilities.

At one time half of extension personnel were assigned to the "mother farm" program of some of Agro-21 clients. That extension effort has been discontinued. Various reasons have been given. One is that small farmers either were not paid for their production or could not sell it at all. Others say the concept just won't work.

Extension gets information from CARDI, large farms, and MOA research. It claims that it salvaged a great deal of information from a

large Agro-21 vegetable operation that went broke. Extension claims that it was not lack of technology that did the project in.

Extension meets regularly with MOA research personnel -- top management teams apparently. However, it does not claim that it gets much response from research. The research groups list a category of Extension Specialist. Extension does not recognize any activity from that post.

Extension is one of the few respondents that said the reason for Jamaica's low productivity was obsolete technology.

Personnel retention and mobility of personnel are two important problems.

FAO is working with the MOA to study both extension and research aiming to help MOA to decide a course of action and to prepare proposals for donor assistance. Involved in the extension study were two specialists from Virginia Polytechnic Institute, who interviewed agents, farmers, and others.

Farmers complained of the lack of adaptive research information, which they had been getting in publications, field days, and field research plots. Farmers were reported to be aware of Extension's budget cuts and lack of logistic support.

Agents themselves complained of lack of communication among MOA agencies, their non-technical assignments, lack of current research information, lack of MOA response for help in disease identification and other problems, lack of in-service training, lack of transport, lack of specialist support, low salaries, and lack of direction of the MOA.

Associated with the field study were two meetings, a two-day workshop of area extension officers with the director and some of his staff. The second was a one-day meeting involving higher level personnel of the MOA along with representatives of the College of Agriculture and other public agencies.

Both meetings were comprehensive. The first addressed five issues in four work groups. The issues were: appropriate technology, extension approach and methods, linkages with other relevant groups, key constraints, and training. The high level meeting addressed three issues: Operational requirements and linkages, approaches and methodologies, and training.

The conclusions presented few surprises. A working draft report implies that the National Agricultural Research and Development Institute will be created and that it "may have development officers functioning as subject matter specialists."

Few have a good word to say about MOA extension. Some think it is beyond salvage. CARDI, however, reports that in its peanut-cowpea program it is getting excellent collaboration from Extension. Others have verified this example. Extension keeps plugging away. A

training session on pest control in ornamentals was observed with 14 in attendance. Extension was interviewing COA graduates and hopes to hire some of them, at J\$13,000 starting. It has some housing that it may be able to use to make the job a bit more attractive.

There is a certain optimism regarding the future. Extension thinks that the small farmer discontent is going to make itself felt politically, and that rebuilding extension will be one of the most logical responses to such discontent.

3. Marketing and Credit Division

The Division was created in MOA by a USAID project. That project ends in early 1988, and the division will be moved to the Extension and Production division. It is expected that each will retain its identity.

There has been a considerable collaboration between the two. The five marketing extension officers work out of the Land Authorities, one per parish, just as production extension workers do. The personnel of the division have been on the MOA salary scale throughout the project. It has received one break in its recruitment. Salaries are not fixed by position classification, but can be determined within a range. This has been helpful, but the division is under pressure to classify positions and fix the salary, as is apparently the practice for other MOA positions. Some officers of the division are regular MOA personnel seconded to the project. Many, however, are new and do not have "tenure." With the consolidation, some will get tenure by using authorized extension positions that are vacant. The division reports some problems of personnel retention, caused by uncertainty, but the attitude seems to be that the problem is not seriously threatening the program.

The Marketing and Credit Division is responsible for plant quarantine, export quality control, and pre-clearance of commodities for the U.S. market. These three functions will be assigned to a new branch, that of Plant Quarantine and Product Inspection (PQPI), which is a consolidation of two current branches. The program has received assistance from an FAO/World Bank project. The PQPI branch will have 29 inspectors to handle pre-clearance, quarantine, and product inspection. This branch has the responsibility for quality control of all agricultural exports, except coffee. Sugar is considered a processed product.

The product inspection service, for quality control of exports serves the large farm export sector more than the small farm sector. It is an illustration of how private enterprise must rely on public services.

According to the Division director, the plant quarantine problem is under control, with one exception. They do have the people, progress is being made to develop a new quarantine law, and new facilities are being built. The problem is that of training inspectors, and they want that done by the USDA, in the United States, since they must study certain pests not in Jamaica.

This division is also responsible for "monitoring" the commodity boards. MOA officers attend board meetings, as observers or as board members. The groups must report their estimated budgets, which include prices to be paid to growers. The Minister must be "satisfied" that the price to growers is adequate and that marketing margins are reasonable. It is not clear how much he exercises this "power," but if growers are unhappy, apparently they can have recourse to the MOA. The Boards are responsible for their own audits but must report them to the Ministry. Division officers expressed no concern that the monitoring was not being done adequately.

The division has one full-time price reporting officer and access to part-time service of three others. Price information gathered is reported by radio, weekly reports to marketers, and other reports, including extension. The market news branch is experimenting with a supply forecast. The division has no export market information program.

4. Natural Resources

The MOA has two entities dealing with natural resources, and it is easy to be impressed with the programs both have developed. Both can be regarded as high technology operations. Most of their data is computerized, and each has software that can turn out answers to certain important problems quickly. One is the Rural Physical Planning Division (RPPD) and the other is the Underground Water Authority (UWA). The UWA is a statutory body, with statutory authority over ground water and executive order authority over surface water. A new law in draft will include surface water. Even though it is a statutory body, it is closely linked to the MOA and is physically housed near MOA.

Because of the data that has been gathered and the analytical capacity they have built over time, both these entities can do far more than their original charter asked for.

a. Rural Physical Planning Division (RPPD)

The program of the division can be characterized as a high-technology operation. Most work is done by computers, and use is made of ERDA (Earth Resource Data Analysis System) for handling satellite imagery. Also used is software called ARC/INFO from the Environment System Research Institute (ERSI) of the United States. Hardware includes Prime Super Mini-Computer and an IB/AT computer. The PPD has also used infra-red photography and has developed a complicated system called JAMPLES (Jamaica Physical Land Evaluation System), which gives a great amount of information, not only on soil but on climate, rainfall probability, and more.

Apparently, the division has had good support, both inside GOJ and in the donor community, and the technology has steadily become more sophisticated. Now in use is a Geographic Information System which handles a wide range of data on soil type, depth, erodability; climate; slope; land use; land capability; and much more. The division claims

ability to provide probability forecasting of crop failure, flood, and rainfall. This is the basis for JAMPLES. It can locate the best land for a specific crop or tell the crop best suited to specific land.

Currently, the division is authorized for 60 positions, of which only about half are filled, mostly with university graduates. It is expected that in the future more personnel will be recruited from College of Agriculture and College of Science and Technology two-year graduates. Apparently, the system is well enough developed that it can be maintained by the lower level training. They can be trained on the job in about 18 months. Training, obviously, is essential in a high-technology operation. It is the judgment of division leadership that the program can be maintained and implemented by GOJ funding, even though no additional developmental work could be done.

This division did not suffer much from the "redundancy" exercises, but it has suffered from competition for manpower from the new agencies that have been formed and perhaps others. The pool the division draws from is relatively small. Salary range is from J\$25,000 to J\$40,000, and that may include some fringe benefits.

The division is critical of Agro-21 operations, claiming that it is too big and is trying to do too much itself instead of relying on traditional services of the GOJ. PPD claims that Agro-21 has not only ignored PPD analyses, but has also virtually stopped listening to it. When Agro-21 started hiring away good people, the division complained to the Prime Minister. The drain did not stop, but consultation was required, and it may have been slowed.

Jamaica soils were first mapped in the 1950s. Much of the division's work has built on that, adding detail and correcting some errors. Given the donor generosity, there is no doubt that much improvement has been made, and activity continues to add detail and information. Apparently, most developmental work in computerizing the material has been completed. The division does little field testing but does have three soil survey teams in the field, down from eight, who are backed up by a soil testing laboratory, which also provides soil testing service to Extension. It reports the extension program has just about come to a stop.

So far, utilization of the division's data and analytic capability is not great. Some use has been made in identification of cocoa land and land for other crops, including coffee, and some small-scale holders and communities have used the data. The COA/LSU project has used their services and claim that their soil maps were excellent and "extremely usefui." RPPD also reported the crops their soils were best useful for. The project was quite satisfied.

Even though the PPD personnel who went to Agro-21 took much material which was used without credit to the MOA/PPD, the division claims Agro-21 is not using sound resource data and analysis in promoting investment. An example, PPD claims that neither the soil nor the ground water and surface water in the St. Catherine Plain is suitable for investments Agro-21 is promoting. Underground water, it

claims, is saline, caused from invasion by sea water. The Rio Cobra water is high in certain chemicals that exacerbates the "free lime" condition of the soils causing extremely high pH readings. The division claims that it had the data and did an analysis, which was ignored, warning against the corn production campaign of several years ago that apparently was not successful.

b. Underground Water Authority (UWA)

UWA is a statutory body "within the Ministry of Agriculture." It is concerned with both the supply of water and its quality. UWA has regulatory authority over well drilling and pumping rates from existing wells. It is responsible for allocating water to various users when allocation is necessary. It is involved in groundwater monitoring, studies in hydrology, updating and monitoring of national water plan. It also monitors and manages river basins, since 1985.

UWA depends on direct budgetary support from GOJ and from revenue generated from consultancies and well-drilling operations.

Sea water intrusion is the chief underground water worry, and contamination is the chief surface water problem. The bauxite operations are a special concern in the Rio Cobra. As long as water comes from the alluvium aquifer, sea water is no problem. The sea water-fresh water interface occurs in a deeper aquifer.

UWA has done water yield estimates of 11 basins in the country. These estimates of "safe potential yield" are calculated from "inflow" (rain), minus runoff to the sea, evapotranspiration, and any other way water may disappear. Then UWA will not issue well drilling or pumping beyond the safe yield. They have a computer program which can take the safe yield and compare it to all current uses and in very short time report what is still available.

Wells are monitored weekly for quality and yield. At the peak of the rainy season and again at the peak of the dry season, a more comprehensive survey is done in a week's time.

The UWA theoretically has flexibility in salaries, but its salary scale is subject to the Ministry of Public Service. It is one of the "old" statutory bodies, having been created in the late 1950s. At first its salaries were considerably better than regular salaries, but at present there is only about a 10% differential. The head of UWA is paid J\$44,000, for example, the head of RPPD of the MOA, J\$40,000.

Salary levels are a serious problem. UWA has lost personnel at the J\$36-38,000 level who went to jobs in the J\$65-86,000 range, some with relatively rapid promotions. UWA employs professional staff at the B.S. level and works to get them M.S. training. Ireland the Netherlands have been good supporters of training. UWA is now negotiating with the MPS to get a more realistic salary range. Like the RPPD it is also looking to the possibility of hiring sub-university level personnel and training them. UWA does not help with training to the Ph.D. level because that guarantees early mobility.

UWA has very much the same trouble and criticism of Agro-21 that was reported in RPPD. Agro-21 is trying to do too much too fast. It tends to ignore the technical work and competency of UWA and other traditional services of MOA. It uses material without credit. This bothers both RPPD and UWA because the traditional entities have an image of not being effective, and this practice, in effect, uses their own work to build Agro-21 as a can-do agency at their expense.

5. Economic Policy and Planning

This area of work is headed by a senior director who is also head of the Economic Planning Division. Two other divisions answer to this person. One is the Data Bank and Evaluation Division, and the other is the Rural Physical Planning Division, which is described under Natural Resources.

a. Economic Planning Division (EPD)

The EPD has four sections--micro planning (for feasibility studies), macro planning (for five-year plan and major policy issues), farm management, and data analysis.

The farm management section is involved in "analytical" data gathering and analysis. It is particularly interested in cost of production data, which is analyzed in the fourth section, the data analysis section. The EPD is interested in farm management analyses that show the components of production costs. The rationale is that with a good understanding of the components of production costs, it is possible to determine where serious constraints are in agriculture and to develop strategies for dealing with them. This program is considered the critical or key program in the EPD, and efforts are made to maintain this effort, even when other programs have to be sacrificed.

b. Data Bank and Evaluation Division (DBED)

Main responsibility of DBED is crop forecasting. It not only forecasts production but at the end of the season attempts to measure the actual production. With the help of the USAID project it is in the process of changing its system. The old system has not been abandoned and will not be until the new system has proved that it will work.

The old system depends on reports from extension officers who make their best estimates of production. The first estimates are massaged through the system, with checks and counterchecks, in order to gain as much accuracy as feasible. The system, they feel, has produced reliable data, but it takes many people (some who have to be taken from other jobs) and much time.

The "new" system is a sampling system which depends on crop reporters. The division went through a complex process, using aerial photographs and other techniques to select the samples. Reporters are hired full time. They are also used for special surveys and special information gathering needs (some in response to requests from statutory bodies who have hired away their personnel).

In addition to information gathering, the section has an analysis group to process the data. Evaluation is assigned to this unit as a matter of convenience, because evaluation requires data (baseline and other) and analysis.

These two divisions are barely hanging on. Agricultural economists are in high demand in Jamaica, and the supply is not great. A few key people have been retained, and they are holding the programs together at the present. The programs are at great risk, however, because any one could leave at any time. Another problem exists, which is not obvious. Because the divisions cannot retain personnel, they are working with inexperienced people for most of their activities. This situation places a heavy supervisory burden on the few key people that have been retained, and this greatly reduces their own efficiency.

E. Private Enterprise Support Agencies

1. Jamaica Agricultural Development Foundation (JADF)

The JADF is a retail, development bank, operating with capital formed by the sale of PL 480 butter and cheese. A flexible organization, it can take equity positions, capitalize interest in the first years of a loan, guarantee loans, and grant moratoria on repayments. It can invest in "poor risk" enterprises.

Even though it has these flexibilities, it gives the impression of being a careful, systematic organization. It has an adequate staff to review proposals and help prepare them. It also has published and made widely available information for borrowers on how to deal with the Foundation. It does not recover costs for technical support, which includes help with loan applications and review and appraisal of applications.

It has financed 56 projects, with a capital of J\$33 million in a variety of fields. An important interest is getting idle dairy processing plants into operation.

JADF considers itself to be a private sector entity. Its board is chaired by a senior bank official and includes three farmers, an accountant, and one representative each from Land-O-Lakes and the Rockefeller Brothers Fund. The PL 480 donation was to run six years, but the U.S. surplus has been exhausted. JADF's Board intends for the Foundation to be a continuing organization.

JADF is the administrative body for the USAID research project, which will be a discrete entity within the Foundation. A director has already been employed and will work with a Research Advisory Committee in managing the project, which is essentially a small grants operation. The JADF makes occasional research grants from its own resources. One is to CIDCO to help control berry borer and leaf rust.

2. Agro-21

Agro-21 is a highly favored entity operating out of the Prime Minister's office. It began as a "Secretariat," which many understood would be a coordinating, facilitating mechanism that would enable conventional entities in both the public and private sector to apply their talents and resources more effectively to the task of getting idle former sugar lands into production. At that time there was a wide participation of the traditional entities in regular meetings held by the Secretariat, those entities generally welcomed this initiative.

Along the way, the Secretariat was converted into an operating corporation. The regular meetings involving technical and service entities were replaced by a small Steering Committee, chaired by the Prime Minister and including the Minister of Agriculture, Agro-21, the National Investment Bank of Jamaica, the Planning Institute, the Agricultural Credit Bank, JNIP, and SIOJ. All are represented by senior officers.

Somewhere in Agro-21's history it acquired the image of being another "Ministry of Agriculture" and the dominant one, at that. There is evidence that the Government turns to Agro-21 for tasks that are typically MOA responsibilities and are outside the stated charter of Agro-21. It seems to be the policy leader for the sector.

The corporation does not lack for detractors. Few of them seem to argue with the objective of Agro-21, i.e., a specific action program to get the idle, excess sugar lands back into production. Nor do they question the philosophy of divestment (by long-term lease) or of diversification.

The FAO/WB report, referring to a USAID evaluation of Agro-21, says that the Steering Committee does not have adequate staff analysis of the issues it has to face and make decisions on. Some of these decisions have sector-wide policy implications, and this has led to its image as a second, and dominant, Ministry of Agriculture.

Furtick (p. 8) says, "...new initiatives are needed as the current efforts are about to founder without approaching their targets. Under capitalization, inability to get timely credit, need to depend on large numbers of expatriate management...has all of the divested operations giving the appearance of being in deep trouble. It would appear likely that some or all will fail within the next year or two unless they have better than expected luck or additional help."

Furtick also says a better process is needed to find proper investors...to overcome some of the problems being encountered by Agro-21 and JNIP. He says they are beset by a stream of visitors ranging from solid potential investors to the curious and the opportunists.

One critic questions the operational orientation, holding that Agro-21 expects the investor to provide (1) capital, (2) management, (3)

technology, (4) markets (perhaps including processing), and (5) extension and market for small farmers through the "mother farm" concept. That places a heavy burden on the investor, especially in the till uncertain investment environment of Jamaica and the uncertain production conditions for some of the crops involved in diversification..

Agro-21 itself lists lack of irrigation as its major constraint, saying that rainfall is either inadequate or undependable. The second constraint is a joint problem of access to market and the delivery of adequate supply. They also recognize a problem of lack of adequate technology for good quality product.

Agro-21 claims to depend on MOA for soil mapping and extension training and reports that the Permanent Secretary attends its staff meetings. Agro-21 needs MOA extension, to help with the "mother farm" program and respects the pre-clearance program and the plant quarantine initiative.

The salary differential Agro-21 reports is J\$50,000 for a MOA person topped out at J\$35,000. Agro-21 salaries are controlled by the Ministry of Public Service and are "locked in," but at a higher level. Agro-21 reported a current negotiation with MPS on salary adjustment.

F. Ministry of Public Service (MPS)

The MPS is a new ministry, a result of the Administrative Reform Program associated with IMF negotiations and required by one or more of the World Bank structural adjustment loans. Apparently, it is the agency responsible for adjusting government salaries in line with those of the statutory bodies, for training, and for improved administrative procedures.

MPS is active and is making its practice felt. Frequent references were made to it in the course of this investigation. One was by Agro-21 who was negotiating salary level. The second was by the Marketing and Credit Division which now has authority to recruit personnel in a salary range and not by fixed classification (a privilege MPS is threatening to withdraw). The third reference was by the Underground Water Authority which is negotiating for a new salary scale. The College of Agriculture negotiated higher salaries for some of the faculty. All, with the possible exception of Agro-21, report the negotiating is difficult. COA won its case, but some think that even though the raises were needed, the reasoning was not very good. Higher salaries were based on work load, which is not excessive.

G. College of Agriculture/Louisiana State University

Louisiana State University (along with Southern and Sam Houston Universities) has a five-year technical assistance contract to help with the development of the College of Agriculture (COA), Port Antonio, which was created in 1982 to replace the Jamaica School of Agriculture (JSA), which was closed. COA is a creature of the Ministry of Education. JSA was part of the MOA.

The project has three expatriates in residence -- an agricultural economist (team leader), an agricultural engineer, and an agricultural education expert. This group is supplemented by two Peace Corps volunteers and three or four professors each semester.

One of the group's jobs is to develop faculty, which it does largely by participant training, both to the B.S. and to the M.S. M.S. training is done in the United States, and most B.S. training is done in UWI/Trinidad. Two B.S. participants are in the States because of some problem UWI has with JSA graduates. It also is to provide teachers while staff is in training. The full-time staff does not teach, but the supplementary group does.

Also included is development of the physical facilities, which include two farms with a total of almost 900 acres. Three hundred are very productive. Some construction and remodeling is also involved.

The project is also involved in curriculum development, not only for COA, but also for the agricultural high schools in the country and for high schools which teach agriculture. COA is developing a curriculum development center, which also has some training responsibilities. COA has been chosen the regional training center for 4-H, which is separate from the extension program and not in the MOA.

The COA course runs three years and counts as two toward a B.S. degree. Three groups have been graduated with a total of 190 graduates. Enrollment is 220, of which 15% are women. It would be higher if housing were available. Most of the graduates go into the private sector. However, the pre-clearance personnel are Associate degree holders, and perhaps some of the other inspectors are. Most will be.

Students are said to be much more oriented to business and economic activity than to government work. Agricultural students would prefer going to the States or to Canada for the B.S., rather than to UWI/Trinidad, and some do. Many do not come back to Jamaica.

Seventeen faculty positions are planned. Currently, the faculty consists of a Ph.D., two M.S., three B.S., and eight with an Associate degree from JSA. Salaries range from J\$12,000 for an assistant lecturer to J\$36,000 for the top job. Each professor is provided a house and utilities if it's on campus. At some level, professors get an automobile allowance.

COA is expected to produce 25% of its recurrent budget by 1991, when the project ends. It is now planning a 65-acre banana nursery, 18 acres of which are in production. Reports of demand are promising. The farm also is producing heart of palm and other crops that do not compete in the local market with local producers.

The COA faculty do no research and have no experience with it. They consider themselves teachers and that everything else is extra work. New job descriptions are being written, and they will have research included. COA will call its extension program adult

education. The department of extension is doing work in some nearby areas, but more for teaching than as an extension program. It has been discussing with MOA Extension the possibility of giving agent training, apparently more in methods than in substance. JSA did train extension agents.

COA is currently trying to establish a Foundation with an endowment which it could use without MinEd supervision. A law is somewhere in process to create such a Foundation. The manager of the JADF is working with them and has offered JADF as an administrative agent without cost.

COA/LSU seems to be establishing good working relations with other government agencies. RPPD helped with the land-use plans for several tracts of land and did a "very useful" service. Contacts have been made with Extension, and the Banana Board was helpful in their getting into the banana nursery.

JAMAICA
AGRICULTURAL SECTOR INSTITUTIONS

Annex 2. Concepts Guiding Analysis

Some of the concepts guiding the analysis in this paper can be identified. Three are relevant: institutions, technology in development, and the technology innovation process.

A. Institutions in Agricultural Development

Institutions are considered to be collective action in control of individual action, or rules for individual action or behavior valued and maintained by the Society.

For our purposes, "collective action" will be largely government action in the form of regulations, policies, programs, and services that control individual action by conditioning the environment in which individuals, farmers and those who provide services to them, make decisions and take action. The aggregate result of these actions determine the performance of the economy. An institution is not an organization, but institutions themselves are invisible. Economic institutions are associated with and are implemented by organizations, which are visible and tangible. Thus, it is common to refer to some organizations as institutions, especially when the organization is dominant or significant, in relation to the institution. It is said to have "institutional quality."

Because Government can influence (or condition -- if not control) individual action by conditioning the decision environment, it is literally through institutions that Government "manages" the political economy. The government does manage the economy, even if by default and even if badly.

An institution can be harmful as well as useful, i.e., bad as well as good. A useful institution is one which encourages the individual to make decisions and take actions that serve the common interest at the same time it serves the individual self interest.

Several criteria need to be met if "institutionalization" is to occur. The most common of these is permanence or durability, and often it is the only criterion used. However, more is needed. For an organization to have significant impact on the decision environment of farmers and others, its program must:

- a) be effective
- b) operate on a scale large enough to have an impact on the Economy
- c) have enough stability to provide a certain "security of expectations" to farmers and others to facilitate long-range decisions.

B. Technology in Agricultural Development

"The capacity to develop and to manage technology in a manner consistent with a nation's physical and cultural endowments is the single most important variable accounting for differences in agricultural productivity among nations." from Ruttan, Agricultural Research Policy, 1982. Ruttan and colleagues and proteges have done a thorough empirical analysis of agricultural growth and productivity. The most useful presentation of this work is Agricultural Development: An International Perspective, Revised and Expanded Edition, 1985.

He continues: "The development of such capacity depends on many factors. These include:

The capacity to organize and to sustain the institutions that generate and transmit scientific and technical knowledge;

The ability to embody new technology in equipment and materials;

The level of husbandry skill and the educational accomplishments of rural people;

The efficiency of input and product markets;

The effectiveness of social and political institutions."

C. The Technology Innovation Process

Technology innovation is an autonomous social process that people have been engaged in since long before the invention of research and extension organizations in agriculture. In fact, the history of civilization is largely a history of technology innovation in agriculture. Research and extension organizations in agriculture and Research and Development (R&D) in industry were invented to facilitate the autonomous process.

Figure 2-1 is an oversimplified graphic representation of the process. Figure 2-2 is an attempt to match some administrative forms and research and extension procedures against the Model.

Some components need a word of explanation. Science is related to the accumulation and development of knowledge. Scientific research abstracts and analyzes in order to gain knowledge. To the extent feasible, all variables are controlled except the one under study. Technology generation, on the other hand, synthesizes. It puts pieces together into something that works in a relatively uncontrolled environment. Farmers use technology. They cannot handle "new knowledge." Technology can be embodied in a seed, chemical, or machine. Or it can be a procedure or technique for doing something, preserved in writing or in the minds and skills of the operators.

Integration has three dimensions. A proposed innovation must be integrated into the production system, into the product and input

markets, and into the national policy framework. Finally, technology innovation must include adoption and use on a significant scale. From a development standpoint, a "better" technology that is not put to use does not constitute an innovation.

If research and extension are not managed in such a way that all functions or components of the process are attended, then we have to rely on the autonomous social process of technology innovation. And, autonomous processes set their own direction and take their own time. If research and extension do not test in the production system, then the process will take its own time until the test is done.

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Annex 4. Acronyms

BANCO	Banana Company
BECO	Banana Export Company
CaIB	Cocoa Industry Board
CARDI	Caribbean Agricultural Research and Development Institute
CAST	College of Arts, Science, and Technology
CBI	Caribbean Basin Initiative
CGA	Citrus Growers Association
CIB	Coffee Industry Board
CIDCO	Coffee Industry Development Corporation
COA	College of Agriculture
CoIb	Coconut Industry Board
DBED	Data Base and Evaluation Division
EPD	Economic Planning Division
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GOJ	Government of Jamaica
IICA	Interamerican Institute of Cooperation in Agriculture
IMF	International Monetary Fund
JADF	Jamaican Agricultural Development Foundation
JAS	Jamaica Agricultural Society
JBPA	Jamaica Banana Producers Association, Ltd.
JSA	Jamaica School of Agriculture
LSU	Louisiana State University
MOA	Ministry of Agriculture
MPS	Ministry of Public Service
NARDIJ	National Agricultural Research and Development Institute
NIBJ	National Investment Bank of Jamaica
RPPD	Rural Physical Planning Division
SIRI	Sugar Industry Research Institute
STR	Science and Technology Research
UWA	Underground Water Authority
UWI/M	University of West Indies at Mona
UWI/T	University of West Indies at Trinidad
WB	World Bank