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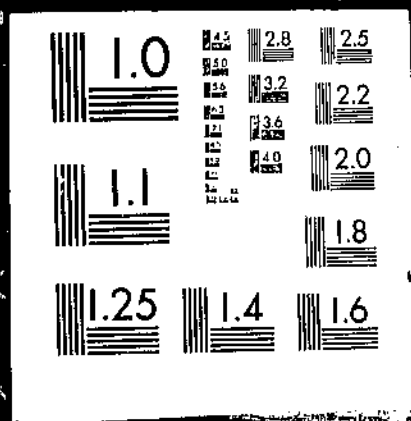
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PROSPECTS for AGRICULTURE in the **CARIBBEAN**



U.S. DEPARTMENT OF AGRICULTURE • ECONOMIC RESEARCH SERVICE

ABSTRACT

Limitations in natural resources, small physical size of individual nations and territories, lack of complementarity among them, and a rapid rate of population growth have seriously impeded development in the Caribbean region. Because opportunities for exporting are limited, attempts are being made to integrate individual Caribbean economies in various ways. These include efforts to specialize in certain enterprises to maximize economies of scale and to create opportunities for trade within the region. The direction of economic development should be guided by intensive feasibility studies. Outside technical and financial assistance have made some contributions to development programs, but this assistance and local efforts need to be strengthened.

Key Words: Caribbean agriculture, policy, diversification, development, exports, imports, economics, trade, aid, marketing.

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FOREWORD

To provide better knowledge for planning and implementing programs in developing countries, the Economic Research Service of the U.S. Department of Agriculture cooperates with the Agency for International Development (AID) in conducting research relating to foreign economic development as it pertains to agriculture. Such research is needed by U.S. Government organizations in evaluating U.S. foreign agricultural trade programs and policies and by developing countries concerned with strengthening their agricultural economies.

This report was prepared while the author was on special assignment in the Caribbean as a USDA short-term consultant with AID. Field work plus secondary information available in the United States provided the basis for the analysis. For the most part, the material presented reflects the Caribbean agricultural situation in mid-1968.

In addition to describing the structure of agriculture in the Caribbean, this report discusses agricultural policy objectives, factors constraining agricultural production, the region's agricultural exports and imports, and incentives to agricultural development.

Raymond P. Christensen

R.P. Christensen, Director
Foreign Development and Trade Division
Economic Research Service

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Countries and dependencies visited by the author include the U.S. Virgin Islands, Puerto Rico, the Dominican Republic, Jamaica, British Honduras, Trinidad and Tobago, Guyana, Barbados, and the Bahama Islands.

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CONTENTS

	<u>Page</u>
Summary and Recommendations	v
Introduction	1
Structure of Agriculture	1
Estate Agriculture	2
Peasant Agriculture	2
Agricultural Production, Exports, Imports	3
Policy Objectives and the Role of Agriculture	4
Major Constraints to Diversifying Agriculture	5
Natural Factors	5
Water	6
Land	6
Pests, Diseases, and Weeds	7
Physical Size	8
Economic and Institutional Factors	9
Attitudes	9
Salaries	10
Land Tenure and Taxes	10
Infrastructure	11
Policies of Other Countries	12
Methods Used to Encourage Agricultural Development	15
Export Sector	15
Domestic Food Sector	16
Technical Assistance	16
Input Subsidies	16
Credit and Land Settlement Schemes	17
Guaranteed Prices	18
Tariffs and Licensing	19
Bibliography	21

SUMMARY AND RECOMMENDATIONS

Agricultural development in the Caribbean faces a number of formidable obstacles. With the exception of some traditional tropical crops and some vegetables, much of the food production for domestic markets has depended on some form of subsidy. Most agricultural exports also benefit from some form of subsidy or preference, especially from the United Kingdom. Entry of the United Kingdom into the European Economic Community (EEC) could pose a severe hardship on the Commonwealth Caribbean unless Commonwealth preferences were retained as a condition of Britain's entry.

Despite many obstacles--both natural and cultural--to agricultural development, agriculture is an important source of economic gain in the Caribbean. Given the resource base of the region, there are few such sources. Except for large deposits of bauxite in Jamaica and Guyana and oil in Trinidad, most areas must rely on tourism, light manufacturing, or agriculture as the basis for economic development.

Because necessary data are not available, it is not possible to indicate which specific alternatives in the agricultural sector of each area offer the greatest potential for contributing to economic development and increased incomes in the Caribbean region. However, recommendations can be made as to a line of action that would contribute toward these objectives if steps were also taken to retard the region's present rapid rate of population growth.

1. Little research has been done to select or develop crop varieties or livestock breeds that are particularly adaptable to Caribbean conditions, and results of the studies that have been made are inconclusive. Experience in various countries throughout the world has shown that few biological techniques can be successfully transferred directly from one region to another. Therefore, information on yields from regions with ecological conditions seemingly comparable to the Caribbean's is not usually meaningful for the Caribbean.

Soil surveys have been made and soil maps prepared for most of the Caribbean, but little has been done to establish meaningful correlations between soil characteristics and their capabilities to produce different crops. Also, not enough research has been done to evaluate the results that can be expected from application of fertilizers to crops grown on different soil types.

Although adaptive research to select the best available varieties or breeds may result in selection of those that give acceptable yields, basic research is needed to develop plant and livestock breeds that yield the best results under Caribbean conditions. With one or two possible exceptions--beef cattle breeding in Jamaica, for example--there is little evidence of basic breeding research in the region.

2. Once capabilities for specific crop varieties and livestock breeds have been established, cost estimates should be made to ascertain the feasibility of producing them for domestic use and for export. Such studies must take into account the direct costs associated with production and marketing as well as the costs of the infrastructure for providing the necessary market news and extension services, and the communication, transportation, and marketing facilities that are so badly needed throughout the region.

Feasibility studies should be accompanied by careful analyses of the cost and effectiveness of different incentives and subsidies, including use of the pricing system, for encouraging agricultural production. Limited analyses have been made in some parts of the region, but the total social costs of incentive systems for encouraging domestic production have not been compared with the costs of importing comparable products.

3. Presently, there is little food processing in the Caribbean. Research to identify opportunities for this industry is needed. Such research should cover fruit and vegetable canning and freezing operations, flour milling, oilseed processing, pork processing, abattoir operations, poultry processing, dairy plants, and feed-mixing operations.

The small size of domestic markets would, in most cases, require the development of export markets, or at least intra-Caribbean trade, to permit operations of efficient size. For some operations to be conducted on an efficient scale, each area would need to specialize in operations in which it has a comparative advantage. The comparative advantage may be locational, which would result in transportation savings, or may be due to already existing investments in infrastructure.

4. Studies are needed to identify on a continuing basis those areas that are free of pests or diseases against which the United States or another country levies a plant quarantine. Revisions in plant quarantine regulations could be considered when it has been proved that the condition against which the quarantine is levied is not present in the exporting country. Such studies are not being made by Caribbean countries because of a lack of necessary technical skills.

Many agricultural commodities are excluded from the United States or shipments are sometimes rejected because the products do not meet specified standards. Studies are needed to evaluate the cost and benefits of making the necessary improvements in quality, condition, and packaging of certain products to meet U.S. standards. Many observers believe that revisions in U.S. plant quarantine regulations and improvements in product quality would result in sizable benefits to the region by providing it with greater marketing opportunities in the United States. Improvements in product quality also would result in increased demand for local products by Caribbean luxury hotels and supermarkets, which now rely largely on imports.

5. Many countries in the region are attempting to encourage private foreign investment. In agriculture, much of this type of investment has been for developing land and processing facilities that serve the export market.

In some cases, enterprises of this type are given concessions initially and often have limited linkages to the local economy. Even so, this type of investment helps reduce unemployment by creating new jobs and it might be the only source of new income.

6. Much of what has been recommended thus far should, when possible, be carried out by Caribbean governments. Major obstacles to this course seem to be lack of enough trained people and insufficient financial resources. The possible role of the United States, other countries, or international organizations in these efforts could be to provide technical and capital assistance.

In the past, foreign aid programs in agriculture have usually given emphasis to solving specific problems by sending in teams of technicians or by making loans or grants for a specific purpose. At present, the greatest need seems to be for a long-range program to build up the local institutions and develop the capabilities of the Caribbean people so they can solve their own agricultural problems. An integrated program of agricultural teaching, research, and extension for the entire region could be one of the primary goals of foreign assistance policies. Established institutions, including the University of the West Indies for the English speaking Caribbean peoples, and the University of Puerto Rico for the Spanish speaking peoples, are already receiving some assistance.

7. Finally, it should be recognized that long-range solutions to agricultural problems are possible only if the more basic problems of the region are solved. Although there are numerous social, economic, and political problems to be overcome, it would seem that the basic problems of the Caribbean region arise out of four major conditions: the relatively small size of each country or territory, the lack of any significant natural complementarity among them, the limited natural resource base, and the rapid rate of population growth.

The small size and the lack of natural complementarity require integrated regional planning and a striving for agreements whereby each country or territory could specialize in enterprises in which they have advantages. Although there are still many problems to be worked out in bringing about regional economic integration, initial steps have been taken. Some of them are being encouraged and assisted by Canada, the United Kingdom, and the United States.

Even with outside assistance of any realistically conceivable scale, the limited natural resource base poses serious constraints on the region to provide even the present inadequate levels of income if population continues to grow at current rates. Also, at current rates of population growth, it is extremely unlikely that the region can develop rapidly enough to significantly reduce present high levels of unemployment and underemployment.



U.S. DEPARTMENT OF AGRICULTURE

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PROSPECTS FOR AGRICULTURE IN THE CARIBBEAN

By Robert V. Enochian^{1/}

INTRODUCTION

The major objectives of this report are to identify the barriers to increasing production in the agricultural sector of the Caribbean region and to indicate what is being done and what needs to be done to overcome these barriers.

Agricultural policies in the Caribbean are concerned with reducing food imports by increasing local production of food and with increasing production of export crops. It should be recognized at the outset that increasing local food production may not be the best way of increasing real income in the region. The possible alternative methods of providing a region with its food supply must ultimately include trade with other regions. If all factors are considered, it may turn out that various degrees of dependency on other regions for food imports in exchange for either agricultural or other goods and services may be to the best advantage of a given region.

Furthermore, increasing agricultural production for export either through increased yields or expanded acreage may not necessarily be the best use of resources, even when there is idle land available with agricultural potential. Resources required to increase yields or bring new land into production may be able to earn a greater return in other uses.

To determine whether agricultural resources are being used as efficiently as possible, all aspects of the situation must be carefully evaluated. Such a complete evaluation is outside the scope of this report. Furthermore, the type of data needed for such an evaluation are either not presently available, or are incomplete and unreliable. Therefore, this report presents only a partial analysis of problems in the agricultural sector of the Caribbean.

STRUCTURE OF AGRICULTURE

Historically, agriculture in most areas of the Caribbean has been characterized by two general structural types: estate, or plantation agriculture, and small peasant farms. In many areas, the agricultural

^{1/} Agricultural economist on detail from Marketing Economics Division, ERS, during the time of this study.

structure has been changing and an agriculture of various sized owner-operated commercial farms is emerging. The dominant organizations of agricultural production in most of the Caribbean, however, are still the large estates and the small peasant farms. Each of these two types has distinct characteristics.

Estate Agriculture

Estate agriculture is characterized by large farms usually growing a single crop for the export market. Some estates are owned by the government and some are owned by local people, but most estates in the Caribbean are owned and operated by foreign companies. Estates are frequently vertically integrated from production of the primary crop through processing and marketing of the finished product. The most important crop produced by estates is sugar. Sugar mills in the region process cane into raw sugar, most of which is shipped to major using countries for final refining. Other crops--especially bananas, citrus, coconuts, cocoa, and sisal--are also grown by estates.

Foreign-owned estates generally are well financed and have well-trained research and management staffs--a high proportion of which are usually aliens. These staffs continually search for and apply the best cultural practices to find ways of increasing yields and reducing operating costs. In addition, estates enjoy the advantage of being able to export most of their output at preferential guaranteed prices.

Peasant Agriculture

Peasant farms are small in size and are often located on marginal lands. These conditions, plus the poor cultural practices employed on most of these farms, result in relatively low yields.

These farms grow both export crops and food crops for the domestic market. Export crops--especially sugar and bananas--are sold to large integrated firms that usually produce and market these same crops for their own account. This outlet presents to the small farmer a ready market at relatively stable prices that are known well in advance of delivery of the crop.

Food crops grown for the domestic market are sold either by a member of the farmer's family at a roadside stand or at a farmers' market, or through market vendors (higglers, hucksters). When growing for the domestic sector, the farmer faces an uncertain market situation. There is generally little communication of market information, and transport conditions are poor. Further, because of the small markets, relatively slight changes in supply result in wide price fluctuations. Most of the products are sold with little or no grading, and there are usually no incentives to improve quality.

AGRICULTURAL PRODUCTION, EXPORTS, AND IMPORTS^{2/}

Sugar is produced throughout the Caribbean region and is by far the major export. Projections indicate that it will remain the most important commercial crop produced in the area. Large quantities are used locally and exports are in the form of raw sugar, molasses, and rum. Production is expected to increase in the future, primarily from increased yields.

The next most important crop is bananas, which are produced in most of the region. Jamaica and the Windward Islands are major exporters. Production, primarily for export markets in the United Kingdom, is increasing rapidly, mainly because of expansion in acreage in several areas.

Citrus is grown in many areas and is especially important in Jamaica, British Honduras, and Trinidad and Tobago. Citrus output in the region is expected to increase rapidly, mostly from new plantings. Exports are mainly to the United Kingdom, because of preferential arrangements between that nation and the Commonwealth Caribbean. Some fresh citrus, as well as frozen concentrated juice, is exported from Surinam to the Netherlands.

Cocoa beans, coffee, tobacco, sisal, and spices are important export crops for some areas and are expected to increase.

Food grains and feed grains are deficit in the region and are among the major agricultural imports. The region does not produce any wheat and relies on imports of wheat and wheat flour to meet the rapidly increasing demand for these items. Some corn is grown, and increases in production are projected. However, demand and imports are expected to increase more rapidly than production. Rice is grown in several areas, but the region as a whole continues to be a net importer. Guyana has long been an exporter of rice, and the Dominican Republic is nearly self-sufficient. Production of rice is expected to increase in some areas, and the region is expected to become a net exporter in the future.

Fruits, other than bananas and citrus, and vegetables of different types are produced in large quantities and some are exported. Most of the exports are either tropical specialties or fresh vegetables produced for off-season export to the United States. On balance, however, the region is deficit in vegetables and deciduous fruits. Although large quantities of starchy vegetables such as sweet potatoes and yams are produced locally, sizable quantities of Irish potatoes are imported from outside the region because of their generally lower cost compared with cost of locally grown potatoes. Other vegetable imports include mainly onions, garlic, carrots, lettuce, and dried peas and beans.

^{2/} More comprehensive information on projected levels of supply and demand is contained in several of the sources listed in the bibliography. A comprehensive review of the agricultural trade of the area by commodity classification, country of origin, and destination is in preparation by the Economic Research Service.

Meat, eggs, dairy products, and food fats and oils are deficit in the region as a whole. Although increases in output are anticipated, the region is expected to remain deficit in these products. In some areas, incentives for increasing production of poultry, eggs, and pork have resulted in exportable surpluses of these products, but the region as a whole remains deficit in animal products.

Available agricultural productivity indexes indicate that for some crops productivity is increasing. New acreages are also resulting in increased agricultural production, but for the region as a whole the demand for food is expected to rise faster than increases in agricultural output. Therefore, agricultural imports are expected to grow faster than agricultural exports. If these projections are correct, other sectors of the economy must be developed more rapidly to make up for the trade deficit. The remainder of this report is devoted to examining the barriers to increasing agricultural production.

POLICY OBJECTIVES AND THE ROLE OF AGRICULTURE

The long-term basic goals of each of the governments in the Caribbean region are to develop their economies and to increase incomes. Two specific goals in most of the region are to reduce the high levels of unemployment and underemployment and to achieve a more favorable balance of trade.

In addition to food, major imports by most of the countries and dependent territories in the Caribbean region are machinery and, with the exception of Trinidad and Tobago, fuels. Since the only major natural resource in most of the region is land, not much can be done to reduce imports of machinery and fuel if economic development is to be pursued.^{3/} Therefore, planners in most of the areas are emphasizing agricultural development to help with the balance-of-payments deficits. Both import substitution and export expansion are being pursued through attempts to diversify into new crops and to increase agricultural production through improving farming practices and, in some areas, bringing new land under cultivation.

Agriculture is also being looked to for help with the unemployment problem. Population in the region is growing at very rapid rates--about 2.7 percent per year for the Caribbean as a whole. This high rate is due to high birth rates and reduced death rates, plus reduced rates of emigration from the region due to more restrictive policies adopted by other countries in recent years. Present rates of population growth are generally conceded to be above levels that these relatively poor countries can deal with effectively. It is highly unlikely that savings and investment can be made at rapid enough rates to develop jobs for the growing population. Birth control and family planning are being encouraged, but in some areas religious and political barriers restrict adoption of measures to reduce birth rates; in any case, such measures would be effective only in the long run.

^{3/} Bauxite deposits are important to Jamaica and Guyana. Jamaica is the world's largest producer and has the world's largest reserves.

Because of these factors, many Caribbean governments have adopted policies that restrict the adoption of technologies by the agricultural sector that will result in reduced employment. In particular, mechanization of the sugar harvest has been restricted. These policies place a burden on the export sector, which in time would cease to exist should all of its output have to be sold in unprotected markets.

As a means of saving on balance of payments and creating employment, some attempts are being made to encourage imports of agricultural commodities in their least processed form for processing in the region. Attempts include importing wheat instead of flour, oilseeds instead of vegetable oils, and feed grains and concentrates for feeding livestock instead of importing eggs, milk, and meat. Little attention has been given to the economics of such enterprises, such as how many plants of each type are required in the region, what their capacity should be, and where they should be located.

MAJOR CONSTRAINTS TO DIVERSIFYING AGRICULTURE

Numerous constraints or barriers, both natural and manmade, have thus far handicapped efforts to diversify and increase agricultural production in the region.

Natural Factors

Given the present state of knowledge, plus length of day, water shortages, and high temperatures and humidity in the region, production of certain types of crops and livestock is not economic. Some plant and animal breeders believe that much can be done to overcome these natural barriers by research that would result in varieties and breeds that are better adapted to the region. Other scientists question the wisdom of this approach because of its high cost and the uncertainty of results, and believe that selections should be made after trials of existing varieties and breeds. Since funds for research are limited, and the trial method requires less time and cost, this approach is currently being pursued.

Trial plantings are being made of existing varieties of sorghum in the U.S. Virgin Islands and the Dominican Republic, corn in Jamaica and British Honduras, rice in Guyana and British Honduras, and a number of different vegetables and pasture grasses in many areas throughout the region. This work is being done independently or with the assistance of the U.S. Agency for International Development, the United Kingdom's Ministry for Overseas Development (ODM), and the Food and Agriculture Organization of the United Nations (FAO). Similar work, though on a very small scale, is done on livestock. The hot humid climate of the tropics generally results in poor performance of livestock in terms of converting feed to meat, milk, or eggs. Whether varieties and breeds that are economic will be found, only time will tell.

Natural barriers to diversifying agriculture are discussed in detail below.

Water

In some parts of the region, lack of water due to inadequate and irregular rainfall, small or uneconomic underground supplies, or unfavorable natural conditions for storage, severely limits agricultural development. In some areas, periodic droughts also make the growing of most agricultural crops extremely risky.

In recent years, lack of rainfall--coupled with rising wage rates and prices of other production inputs--has resulted in virtual elimination of sugar production in St. Lucia, St. Vincent, and the U.S. Virgin Islands and a decline in output of sugar in Puerto Rico and Antigua. In the U.S. Virgin Islands, agricultural production is limited to small quantities of fruits and vegetables, eggs, milk, and beef. Production of eggs and milk is based on imported feeds and is heavily subsidized. To determine whether areas that have gone out of sugar production can economically produce sorghum and other crops requiring less water requires much more information from planting trials than is now available.

In the Dominican Republic, land suitable for certain crops is considerably distant from areas of adequate rainfall. Study is needed of the feasibility of dams and irrigation works for these situations.

For some crops, too much water can be a problem. Although considerable quantities of citrus are grown for export--especially in British Honduras, Jamaica, and Trinidad--poor yields in some years, apparently due to too much rainfall plus disease problems, make citrus a high-cost industry. Without preferential treatment from the United Kingdom and a very short seasonal advantage, the Caribbean probably could not compete with other countries that produce citrus for world markets.

Land

The amount of land is not an absolute limiting factor to the development of self-sufficiency in agriculture in the region as a whole, but in some areas serious erosion problems and poor soil place severe limitations on agriculture. For example, the Netherlands West Indies islands of Curacao and Aruba are unimportant in agriculture because of poor soil as well as low rainfall. On Aruba, some vegetables are grown hydroponically at high cost. Hydroponic culture has been tried on some of the other islands but has been abandoned because of the cost.

Some islands can not become self-sufficient in food production unless part of the land now devoted to export crops is diverted to food crops and feed and pasture for livestock. This is probably true for most of the small islands of the Eastern Caribbean.

Some increases in food production probably could be achieved by more intensive use of land, including more double and triple cropping, more interplanting, and planting of quick-maturing food crops on sugar land that is in rotation. In Barbados, for example, 12 percent of the land that is normally planted to sugar cane is required by law to be in food crops during the period between cane plantings. This regulation is not enforced, however, and crops that are planted are usually those requiring the least care--mainly root crops. Thus, the regulation results in little increase in food supply or employment opportunities. Some observers have pointed out that if the regulation were enforced there would be large surpluses in some crops for which export markets would have to be found to make the operation profitable.

On some of the large islands, such as Hispaniola, Jamaica, and Trinidad, and the mainland areas of British Honduras, Guyana, and Surinam, there are large acreages of idle land that from a technical point of view could be made suitable for crop and livestock production. The major reasons for this land being idle are the questionable economic feasibility of its development and the lack of capital for this purpose. Some observers believe that land in some parts of Haiti is so severely eroded that it is beyond even the technical possibility of reclamation.

Some of the coastal lands of Guyana and Surinam could be made productive if drainage and irrigation developments were made. In British Honduras, the Bahama Islands, and the interior of Surinam, large areas could be made suitable for agriculture if they were first cleared and leveled. In the interior savannahs of Guyana, trials have shown that if certain soil deficiencies were corrected many vegetable and feed crops could be grown. The major question is, of course, whether such developments would pay. Experimental work and trial plantings in some of these areas are being evaluated. The Guyanese Government in cooperation with the University of the West Indies is studying the economics of producing livestock in the interior savannahs.

Pests, Diseases, and Weeds

Problems with pests, diseases, and weeds are generally much greater in tropical environments than in temperate zones. Nematode infestation is a particularly important problem in some areas although, according to one source, nematodes sometimes go undetected and their damage is attributed to other factors.^{4/}

Large banana operations have had to be abandoned in some areas of the Caribbean because of disease problems in the Gros Michel variety that could not be controlled economically. Ways are being sought to divert the affected estates to other profitable uses. The most important commercially grown variety of banana in most of the region is now the Lacatan, which has been developed for disease resistance.

^{4/} McPherson, W. W., Economic Development of Tropical Agriculture, Univ. of Fla. Press, Gainesville, Fla.

Weed control problems inhibit economical production of certain crops in the region. Onions, for example, are consumed in large quantities in the region but are mostly imported. One of the limiting factors in large-scale production of onions in some of the region is that no selective chemical weed killer is available. Much more research is needed on these problems.

Physical Size

The small size of some of the individual Caribbean countries and territories and the relatively small population result in limited markets. Because of this, these economies must rely on outside markets. Small size of population and low incomes also restrict the amount of capital available for research and investment. To the extent possible, therefore, each area should specialize in certain enterprises to take advantage of possible economies of scale.

Because of the physical separation of the different countries and territories, complete integration, or integration of any category of resource or sector, is not only impossible but probably not entirely desirable. A certain degree of independence is a form of insurance against political uncertainty as well as uncertainties of weather and navigation. If the Caribbean region is to grow economically, however, ways must be found to overcome the barriers caused by small physical size.

The number of agricultural industries that would be economically feasible would increase as the size of market increased. Thus CARIFTA and other trading arrangements may increase opportunities for feasible enterprises, providing the cost of transport between areas does not offset scale economies.^{5/} If agreements could be worked out it would seem that there would

^{5/} CARIFTA refers to the Caribbean Free Trade Association, an integration of 11 of the Commonwealth Caribbean lands formed to free tariffs on all commodities traded with each other and to study other mechanisms that might benefit regional development. Members are: Antigua, Barbados, Guyana, Trinidad and Tobago, Dominica, Grenada, St. Kitts-Nevis-Anguilla, St. Lucia, St. Vincent, Montserrat, and Jamaica. Commonwealth areas that are not members are British Honduras, the Bahamas, and the British Virgin Islands

Another step toward regional economic integration was the establishment in April 1968 of the Regional Development Agency (RDA) by the 8 island governments of Antigua, Barbados, Dominica, St. Kitts-Nevis-Anguilla, Grenada, St. Lucia, St. Vincent, and Montserrat. The Executive Secretariat of the RDA is headquartered in St. Johns, Antigua. The purposes of the RDA, on behalf of and for the benefit of the participating governments, are: (1) To promote activities in the fields of tourism, industrial development, agriculture, forestry, fisheries, and the use of industrial materials. (2) To promote the development of regional and external communications both by air and sea. (3) To obtain from abroad technical services in such fields as technical education, land use, town planning and cadastral survey, regional statistical services, specialized training programs, market research, and intelligence services. (4) To carry out development planning and feasibility studies.

be many opportunities for specialization and trade between areas that would result in mutual benefits. A start is being made in this direction for manufactured products, but, with the possible exception of rice from Guyana and small schooner trade in fruits and vegetables, there is not much evidence of it in the agricultural sector.

Economic and Institutional Factors

In addition to natural factors, a number of economic and institutional factors inhibit the diversification and development of Caribbean agriculture. These include attitudes of the people, salary levels, land tenure arrangements, taxes, lack of infrastructure, and policies of other countries.

Attitudes

Interviewees reported that in most of the Caribbean, agricultural employment is considered demeaning. Further, in some areas, attitudes against work in agriculture are so strong that many people prefer to remain unemployed if their only alternative is agricultural employment. This situation prevails even in areas with high unemployment. Yet the same unemployed people in such areas will seek seasonal agricultural employment in the United States, where wage rates are higher and other working conditions are more favorable. As would be expected, parents employed in agriculture do what they can to make it possible for their children to leave agriculture.

These attitudes seem to prevail at all levels, including government. Some agricultural extension workers are political appointees who are reported to have little training in agriculture. In one country, an observer reported that extension assistance frequently was not available during normal working hours.

There are some exceptions to the general low esteem given to employment in agriculture. In the Dominican Republic, such employment seems to have equal status with other types of employment. The generally negative attitudes toward agricultural employment are a definite handicap to producing a quality product for timely delivery to markets such as developing food supermarkets and hotels, and for export. However, experience indicates that certain types of incentives--such as guaranteed prices and higher wage rates--can induce people to work in agriculture. Whether the incentives that are necessary to achieve given levels of output are economically feasible is a question that needs to be considered.

Personal problems of various types reportedly hinder the formation of cooperatives and result in inefficient operations. A citrus cooperative in one country was delayed from being formed for 3 years because prospective members couldn't agree on a slate of officers. In the same country, members of a livestock association would like to develop a cooperative feed mill to reduce their feed costs, but apparently can't agree as to how to organize to

accomplish this. In another country, attempts at forming farm machinery cooperatives have been frustrated because ownership of a vehicle of any kind is a symbol of one's status in the community.

Another factor hindering the efficient development and diversification of agriculture throughout the Caribbean is the frequent and significant amount of stealing of food crops from the land. In some areas, this problem is so serious that farmers will not plant certain food crops but resort to sugar cane and other crops that require processing and are therefore not as likely to be stolen. The basic cause of the problem is undoubtedly the high levels of unemployment in the region.

Salaries

The region has very few people trained in the agricultural sciences. Lack of interest in agriculture in the past and lack of educational opportunities in agriculture are only two of the factors accounting for this. Another important factor is that salaries offered to agricultural scientists and economists, for example, are generally too low to attract or retain a sufficient number of qualified people. Once a person has been trained in a scientific discipline the market for his services is worldwide. A large proportion of the small number of scientifically trained people in the region are usually lost to countries that pay higher salaries. To attract and keep such people, the region must be competitive in its salaries on a worldwide basis.

Land Tenure and Taxes

As was indicated earlier, land in the Caribbean is generally in very large estates or is fragmented into very small farms. The Dominican Republic has some owner-operated family size farms. In some of the areas, the Government owns large tracts of land, some of which are leased to farmers for agricultural use. In many areas, land titles are not clear; in the Dominican Republic this has resulted in many squatters on the land.

Land taxes are generally very low or nonexistent, a situation which results in much speculation by owners holding their land in nonproductive use in anticipation of much higher prices in the future.

Most of these conditions can hinder agricultural development. But any recommendations for changing the existing structure must be based on an intimate knowledge of the economic, political, and cultural factors in each country or territory. In Jamaica, for example, consolidation of the large number of small, fragmented hillside plots may seem to be a worthwhile goal. Yet, such a scheme would have adverse economic repercussions unless (1) it was necessary for the introduction of new technologies that would have a significant impact on raising yields, and (2) there were alternatives for employment of the unskilled farmers--many of whom are women and most of whom are middle aged or older--whose sustenance comes largely from these small plots.

The frequently advanced proposal for breaking up large estates should be viewed, at least in part, in terms of the impact on yields and costs. In some types of farming, relatively small acreages result in optimum scale economies; in others, application of the most efficient technologies requires very large holdings. Before serious recommendations can be made, careful feasibility studies will be required.

In Jamaica, AID is assisting in the establishment of dairy farms on land that has been purchased by the Government for redistribution. In Trinidad, the Government is settling farmers on Government-owned land. In these schemes, operational efficiency was not the determining criteria for establishing size of farm. Rather, because of the large number of unemployed, size of farm was established on the basis of what planners decided would result in the largest number of farm operators at a "fair" or "adequate" level of net return. Such criteria seriously impair operation efficiency and, because they restrict the income of the farm operator, also result in definite disincentives to improvement.

Improvement of agriculture in many parts of the Caribbean is hindered by the system of leaseholds granted on government land. In many instances, these leases are believed by farmers to be insecure because of the insecure position of the government. If a new government comes into power, it is generally believed that a lease may not be honored. Thus, very little improvement is made that requires long-term capital investment.

Infrastructure

Concentration on traditional export agriculture has resulted in a lack of infrastructure for production and marketing of domestic food crops. In some areas, the lack is not as great in the physical sense as it is in the development of institutions that encourage production of food crops. In the Dominican Republic, for example, although the road and communications networks could be improved, they do not inhibit agricultural development in an absolute sense. Much more pressing is the need for research, extension, and market news services, organized markets, adequate grading systems, and, as discussed earlier, appropriate quality controls.

Some areas have undeveloped land that may be suitable for agriculture but lack roads for opening up these areas. In British Honduras, the United Nations is studying the feasibility of a road network that would make it possible to develop land in the interior of the country that is now in bush.

Some areas lack deep water ports or have so seriously neglected their port facilities that they have become very inefficient. In Guyana, a large sandbar across the mouth of the major river requires that large vessels be partially loaded by hand from lighters after leaving dockside. In British Honduras, shallow harbors result in a similar situation. Plans for developing a deep-water channel and port near Belize are being compared with an alternate proposal for building a long pier from shore out to deep water. The latter would probably cost less initially but would be more subject to possible damage from hurricanes. In the Dominican Republic, major ports have

become very inefficient because of long-time neglect of equipment and poor safety measures. At the time of this study, a U.S. consulting firm was studying the 11 key ports in the Dominican Republic for the purpose of making recommendations for improvements.

Presently, in many areas of the Caribbean, there is very infrequent shipping service--particularly refrigerated shipping. This is both a result and a cause of a relatively small export trade. If shipping services were improved, export trade would no doubt increase; conversely, if more export trade were available, shipping probably would improve.

Proposals for development or improvement of infrastructure need to come under cost/benefit evaluation. In some parts of the Caribbean--particularly the smaller islands--the possibility that necessary expenditures would be justified would seem remote insofar as agriculture alone is concerned. In other areas--particularly the Dominican Republic, British Honduras, Guyana, and Surinam--there seems to be enough promise for agricultural development to justify giving consideration to an integrated infrastructural development.

Policies of Other Countries

The policies of countries which are potential importers of Caribbean products have a significant influence on development of the exporting country. Policies on tariffs, export subsidies, plant quarantine regulations, standards, and development of synthetic or substitute products can encourage or discourage production of certain products.

Even though the United States, the United Kingdom, and other countries give preferential treatment to the Caribbean on certain commodities--mainly sugar--they also have restrictive policies on imports of many agricultural commodities produced in the region. Tariffs on some commodities--especially in processed form--are now very restrictive. On the basis of agreements made during The Kennedy Round trade negotiations, some of these will decline in stages to 1972. However, the highest tariffs are on products that would seem to have the greatest potential in U.S. markets, and on many of these the staged declines are small or nonexistent. Included among those products which will receive only small concessions are fresh cucumbers, tomatoes, avocados, and fresh and processed mangoes. Beef exports, which some countries in the region are attempting to expand, received no tariff reduction. Also included among the commodities which seem to have a good potential is tomato paste, the tariff for which will be reduced only 20 percent, from 17 percent ad valorem to 13.6 percent ad valorem, by 1972.

Plant quarantine regulations against certain pests and diseases, and identity, sanitation, and other standards restrict the entry of certain products into the United States. Much could be done by the Caribbean region to meet the standards that have been established if concerned persons had the necessary technical skill. Under certain conditions, plant quarantine regulations can be changed. In the case of mangoes from Trinidad, for example, shipments can be made only to New York, where they must be fumigated against fruit fly upon arrival. The cost of fumigation must be borne by the

shipper, and the fumigation frequently results in adverse effects on quality. Trinidad claims to have no fruit fly, but to petition the Plant Quarantine Division of the U.S. Department of Agriculture to change the regulation they must provide conclusive evidence to back this claim. Marketing Board officials in Trinidad reported that they have neither the technical skill nor the funds to develop the necessary evidence.

It is frequently pointed out that at one time Cuba exported fresh fruits and vegetables to the United States during seasons that they were not produced here. It is reasoned, therefore, that it should be possible for the Dominican Republic or other Caribbean countries to do this. Some such exporting is being done and it may well be that with well-conceived research and extension programs, the markets could be expanded. But factors that may hinder this expansion must not be overlooked. For example, new production areas which have been developed in Mexico in recent years are probably more efficient in producing most vegetables than most areas in the Caribbean. For the time being, the Dominican Republic, Jamaica, and British Honduras may have a competitive advantage over Mexico because of lower wage rates and because they are closer to eastern U.S. markets both by air and water. These apparent advantages, however, may be offset by more efficient management and higher labor productivity in Mexico.

The Caribbean region exports some tropical horticultural specialties to the United States, primarily for Caribbeans now living here. As Caribbean emigrants take up U.S. eating habits, however, their consumption of such products will tend to decrease. With appropriate quality controls, promotion programs, and other marketing efforts, perhaps this trade could be expanded to other parts of the U.S. population.

Some observers believe that as Puerto Rico deemphasizes agriculture and pursues a policy of industrialization it could become an important market for agricultural products from other Caribbean territories and they, in turn, could become markets for Puerto Rican industrial products. Attempts are being made to encourage such trade through bilateral arrangements such as those between the Dominican Republic and Puerto Rico and by analysis of the possibilities and problems by organizations such as CODECA^{6/} and the University of Puerto Rico's Institute of Caribbean Studies.

As incomes and population continue to increase in Puerto Rico, demand for agricultural products undoubtedly will also continue to grow. Much of this demand is being supplied by imports. Because of the types of products demanded in Puerto Rico and the competitive advantage of the United States, since Puerto Rico is part of the U.S. domestic market, most food imports will continue to be from the United States. As Puerto Rican agriculture declines

^{6/} CODECA is the Spanish acronym for the Caribbean Economic Development Corporation in Puerto Rico. This agency maintains a library for the benefit of Caribbean researchers and does various things to promote regionalism in the Caribbean. Most importantly it finances and performs research toward this end and represents Puerto Rico in the Joint Economic Commission with the Dominican Republic.

in relative importance; however, tropical specialties that are not available from the United States but that are grown in the neighboring Caribbean islands, may find expanded outlets in Puerto Rico. The extent of agricultural imports by Puerto Rico from the rest of the Caribbean will depend ultimately on the reliability of quality, which was discussed earlier, the relative costs of the imports from the Caribbean and those from the United States, and the extent to which favorable trading arrangements can be developed.

Even if U.S. tariffs and other restrictive regulations were reduced or eliminated, it would not necessarily benefit the Caribbean unless it were done on a preferential basis. Because Cuba once received tariff concessions from the United States, some Caribbeans believe their countries should now receive similar concessions. Under GATT, the United States is phasing out preferences such as were granted to Cuba and the Philippines, but studies are being made on the possibility of granting preferences to all less developed countries.

Synthetics or substitutes for agricultural commodities have had a significant impact on tropical countries and will undoubtedly have a greater impact in the future. Synthetic fibers have taken markets away from cotton, sisal, and hemp. Synthetic rubber has replaced natural rubber in many uses. Before the Food and Drug Administration's ban on cyclamates, synthetic sweeteners were beginning to have an impact on the demand for sugar. Undoubtedly new acceptable synthetic sweeteners will be discovered and become important competitors of sugar in the future. Chemical modification of cocoa to upgrade quality has resulted in a reduction of the price differential between different quality cocoa beans. Research now underway to determine the flavor components of coffee could eventually result in a substitute for the natural form of this beverage. Many of these developments have had or could have adverse impacts on the economies of Caribbean countries.

The Caribbean region, despite its land limitations, could probably supply larger tonnages of sugar to the United States at the price currently received for such exports and even at somewhat lower prices. Any realistically attainable liberalization of U.S. sugar import policy, however, would not be likely to give the Caribbean countries additional purchasing power. If the United States substituted a global sugar import quota system for the present system of individual country quotas, Caribbean sugar prices probably would be depressed. Also, Caribbean countries are favored under the present individual country quota system and might lose to Southern Hemisphere competition in its absence.

Cost of sugar production in the Caribbean countries varies widely. The Dominican Republic has a long record of low-cost production, although significant cost increases occurred during the sixties. The Commonwealth countries, by contrast, have a long record of higher cost production but are under the protection of the Commonwealth Sugar Agreement.

If future membership of the United Kingdom in the European Community will cause the Caribbean Commonwealth countries to lose their preferential market for sugar in the United Kingdom, they would suffer an annual revenue

loss of at least \$20 million for their 3/4-million-ton "negotiated price" quota. They would suffer an even greater loss if the world sugar price were to drop below the International Sugar Agreement minimum level.

METHODS USED TO ENCOURAGE AGRICULTURAL DEVELOPMENT

To stimulate production and encourage development in both the export and domestic food sector, most governments in the Caribbean are providing various incentives to farmers and investors.

Export Sector

Export agriculture is encouraged by various measures aimed at creating a favorable investment climate. Companies investing in the development of new agricultural enterprises that the governments are attempting to encourage are given various concessions. These include tax holidays, low land rentals, and reduced tariffs on imports of supplies and equipment needed by the new industry.

Some success is being achieved with this type of investment--particularly in the production of fresh vegetables for export to the United States during seasons that they are not available here. The Dominican Republic, Haiti, Jamaica, British Honduras, and the Bahama Islands have encouraged this type of investment.

In addition, investments are beginning to be made to develop the needed infrastructure--including such elements as irrigation and drainage systems, roads, and port facilities. Investments for developing an adequate infrastructure are usually made with grants or loans from other governments or international organizations on the basis of studies they have made.

The new agricultural enterprises are generally very capital-intensive, and most of their equipment and supplies are imported. In many cases, land rentals, taxes, and duties on imports are low or available on favorable terms. The new enterprises usually introduce a sophisticated type of agricultural operation that requires outside managers and technicians who employ local unskilled workers. In countries where opportunities for capital investment are limited, introduction of capital-intensive agricultural enterprise may be the best choice available to developing economies.

Perhaps because of some of the foregoing reasons, governments that have permitted investments on very liberal terms subsequently sometimes seek to adjust these agreements as development progresses. Such practices diminish the opportunities of encouraging other foreign investments. Examples of governmental adjustment that have been experienced by foreign investors after agreements have been made are the levying of new taxes and tolls that result in higher costs than had been anticipated. No adequate legal remedies seem to be available under prevailing international law to compromise disputes between contracting parties.

Domestic Food Sector

Increased production of food crops and livestock for the domestic sector is being sought through increasing both productivity and cultivated area. The food crops would be used for reducing imports, for increasing intra-Caribbean trade of locally produced foods, and for increasing exports of both fresh and processed foods--particularly specialty fruits and vegetables.

The various means being used to encourage production of food crops and livestock include technical assistance, input subsidies, licensing, credit, land settlement schemes, and guaranteed prices. Progress has been slow for various reasons, but major factors are the rapid population growth in most areas, coupled with inadequate resources. Other reasons are inadequate development plans and problems in their administration arising out of the general lack of qualified personnel.

Technical Assistance

In some areas, attempts are being made to encourage and assist small farmers to adopt better management practices, use more fertilizer, control diseases and insects, use higher yielding varieties and breeds, and select better seeds. A number of small agricultural experiment stations operated by either local governments or universities are located throughout the Caribbean. Most of these stations are beset by budgetary problems and lack of qualified personnel. These problems arise out of the general disinterest in agriculture and the greater emphasis on other sectors of the economy by most governments in the region.

Research and extension programs that have been developed are frequently staffed and financed by foreign or international organizations such as the United States' AID, the United Kingdom's ODM, and the United Nations' FAO. The effectiveness of these programs is sometimes limited by lack of continuity due to premature transfer of technicians or limited funding; by poor planning due to lack of knowledge of local conditions, both technical and sociological; and by administrative regulations imposed by the host government. Greater coordination of the research and extension activities throughout the region may help in overcoming some of the problems.

However, even if these problems were overcome, many farmers have neither the wherewithal nor the incentives to adopt improved practices. The various means being used to attempt to overcome these barriers are discussed below.

Input Subsidies

To encourage increased production of certain crops and livestock, some governments supply farmers with various materials at little or no cost, or give bonuses for planting certain crops or making specified improvements.

Materials supplied include feeds, fertilizers, seeds, seedlings, and young trees. In one country, farmers are given subsidies for building pigpens and in another they are given bonuses for planting beans that are in short supply.

Although in some instances these subsidies result in increases in the food supply, they tend to foster inefficiency and frequently do not accomplish the intended objective. Feed and fertilizer grants are sometimes sold by farmers as a quick means of obtaining ready cash. In the country that gives farmers a bonus for planting beans, many farmers plow up the young bean plants and plant rice or sugarcane because these crops are not as subject to being stolen. Policing of farmers to enforce the intended use of this subsidy may cost more than the results would warrant.

If subsidies are granted to accomplish a specific objective, government planners should know the costs of alternative ways of accomplishing the same objective so that they can choose the one which has the lowest cost-effectiveness ratio. In most cases, use of the pricing mechanism to stimulate production would probably be more efficient than the use of input subsidies.

Credit and Land Settlement Schemes

Several governments are attempting to increase production in the domestic food sector by granting low-interest loans to small farmers either independently or in conjunction with settling them on government-owned land. In the case of loans that are made independently of land settlement schemes, the results have not been significant. There are several reasons for this. In the first place, the amount of money usually budgeted for such loans has been small. Second, individual loans are usually made to the smallest farmers and are generally too small to be of much value in increasing food production. Finally, there is little supervision or technical assistance accompanying the loans and in many cases loans are not repayed. Some government officials in one country are critical of the farm credit program there because loans are granted more on the basis of political than economic considerations.

Jamaica and Trinidad have the most active land resettlement schemes. In Jamaica, AID is assisting with attempts to establish dairy farms. In Trinidad, the Government is concentrating on dairy farms and hogs, tobacco, and several food crops. These schemes provide land, credit, and technical assistance to selected farmers. Although the programs have been in operation for a number of years, little progress has been made because of a multitude of problems.

A serious fault with Trinidad's dairy farms is that they have been located on unsuitable sites. However, the major problems seem to be the way in which the farms were developed and the basis on which settlers were selected. When the scheme was initiated, each farm was completely developed and stocked with cows, a house was built, and the farm was made ready to operate before a farmer was selected for settlement. The criteria for selecting applicants for settling these farms were not the ones that would

usually be used by commercial or government lending agencies, such as credit-worthiness, amount of farming experience, or potential for becoming a successful dairy farmer. Rather, according to some government officials, farmers were chosen on the basis of economic need and "political" acceptability.

Although technical assistance is provided, mostly through FAO, many of the operators reportedly were not really interested in becoming farmers. With the recent hiring of a credit consultant, criteria for loans have changed and expectations are that the program will be more successful. To date, however, on the basis of feed costs and milk yields, these operations are not economic.

Whether these farms will eventually be successful will depend on whether the many natural, as well as economic and sociological, barriers can be overcome. It would seem, however, that under present conditions, since farmers have little stake in the operations and since size of farm, and therefore earning capacity, is limited, they have little incentive to develop and improve these farms.

Guaranteed Prices

Many Caribbean economies have set up marketing boards to encourage production by providing technical assistance and marketing outlets and by offering farmers guaranteed prices for specified agricultural commodities. Guaranteed prices are set on the basis of estimated production costs, world prices, and local demand conditions. Although some areas attempt to control production through preplanting agreements with farmers, generally the marketing boards will purchase at the guaranteed price any quantity of the commodity offered by farmers at specified points throughout the country. Products purchased by the boards are sold to market vendors, institutions, and supermarkets. In some areas, the retail price is also set by the marketing board. Because of the low food price policies of some Caribbean governments, the retail price is sometimes lower than the price paid to the farmer.

Since most of these programs make no attempt to control supply and set no limit on the quantities that will be purchased by the board, fluctuations in supply result in serious problems. In periods of short supply, farmers bypass the marketing board because they can get a higher price in the open market. In periods of heavy production, the marketing board is flooded with products for which there is no ready market. Products that are relatively easy to store, such as rice, corn, and dry beans, can be held until needed during periods of short production, but fresh fruits and vegetables frequently spoil before they can be sold. Because of this, and because rice, corn, and beans are major staples in the diet, they are the only products for which the marketing board in British Honduras offers guaranteed prices.

Marketing boards in Jamaica and most of the Eastern Caribbean have guaranteed prices for many vegetables, some fruits, pork, and in some cases, eggs. Frequent surpluses of these products have led to development of storage facilities for extending the marketing period of these products in fresh form.

Some areas are attempting to expand export markets for these surpluses and many are considering the development of facilities for canning or freezing to extend the marketing period.

Refrigerated storage can help only for short periods of temporary surplus. For seasonal surpluses of fruits and vegetables and surpluses of pork, processing may be a partial answer. Trinidad is planning to build a plant for making sausages and for processing hams and bacon, which are now imported. Some countries are considering building canneries for fruits and vegetables. Barbados has requested assistance from Canada for establishing a cannery. However, a major problem is that many of the areas do not produce enough over a long enough season to justify investments in canning facilities. There are a number of technical problems as well that would require much research and technical assistance to develop viable processing operations.

With respect to the development of intra-Caribbean trade in agricultural commodities, natural conditions do not provide much opportunity for complementarity among the areas. With a few minor exceptions, as was noted earlier, each can produce nearly the same food crops and livestock during the same seasons. Whether there are enough economies of scale to make specialization in different crops and trade with each other feasible is a question that needs further study. Other problems are lack of facilities for communicating information on prices and supplies, irregular and uncertain shipping service, and lack of refrigerated shipping for moving fresh produce over long distances.

These same factors also pose problems in the development of export markets to the United States, the United Kingdom, Canada, and other countries. Distances to such markets, poorly developed grading systems, and poor quality of some farm products also restrict exports. Whether it would be economically feasible to develop the infrastructure necessary for increasing intra-Caribbean and export trade would require further analysis.

The entire question of guaranteed prices administered by marketing boards as a means of encouraging increased production needs more study than it has received. If an area wishes to diversify to become more self-sufficient in food or to increase employment opportunities, studies are needed to indicate at what minimum guaranteed price levels to local farmers the desired quantity of food or level of employment can be obtained. If the objective of policy is to obtain food at the lowest possible cost, the costs of importing certain foods should be compared with the costs of producing them locally. Such cost comparisons must take into consideration total social costs. If, for example, an incentive program for increasing domestic food production takes some unemployed people off of welfare roles, the foregone welfare costs can be considered a net return to the program.

Tariffs and Licensing

Perhaps the oldest method used to encourage development of a particular enterprise within a country is the restriction of imports through the use of protective tariffs and licensing. These methods are used by several countries in the Caribbean to encourage a number of agricultural enterprises. An

important example is use of these devices for protection of the poultry and egg industries in many areas. As a consequence, some areas in the region have become self-sufficient in poultry and eggs. Most feeds, however, are imported and conversion ratios are lower than in the United States; therefore, costs are generally higher.

Another form of licensing restricts or prohibits development of an industry within a country for the purpose of promoting or encouraging another industry that produces the same or a similar product. To encourage local production of fresh milk, for example, the Jamaican Government restricts the manufacture of recombined milk--milk made by recombining imported dry skim milk, anhydrous butterfat, and water.

If such practices are temporary and are expected to eventually result in a lower cost source of supply for a commodity, they can be justified on economic grounds. So long as the tariffs and licensing requirements restrict the marketing of a food with lower production costs, however, the result is higher costs for food. In an underdeveloped country, with a high percentage of the population earning low incomes, such regulations are at best a regressive form of taxation. At worst, they may result in inadequate nourishment for some of the people.

The economics of these types of devices for encouraging production need to be evaluated, as does the entire question of how the Caribbean region can most economically supply its livestock product needs. Would it cost less to import livestock products, or to import feeds for growing livestock, or to attempt to grow feeds locally? Some potentially good sources of livestock feed exist locally, but in some areas the feed is sold to countries outside the Caribbean. This is the case for peanut meal in the Dominican Republic and rice bran in Guyana. In the meantime, other livestock feeds are imported by these countries. Is this seeming anomaly due to balance-of-payments situations? Is it good economics? There are indications that some Caribbean governments are attempting to find answers to these kinds of questions.

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